

Understanding Our World through Geometric Reasoning

Geometry in a Hogan

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2023

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## **Introduction**

“We need good, solid homes. We want a comfortable place to raise our children. We don’t want to live in cold, damp caves. We need homes that can keep the cold winds out in winter and protect us from the hot summer sun.” (... , 1<sup>st</sup> Woman. Moses, Don JR.)

According to the oral stories, this was what First Woman stated to the men as they began to gather ideas on how to build a shelter for themselves.

This unit on the geometry of Hogans will be created for all the third-grade students at Canyon DeChelly Elementary School. All students are taught the core subjects in their regular classroom with their regular classroom teacher. I am part of the Specials/elective teachers who teach Navajo/Diné Studies. Students come to my classroom once a week for fifty minutes. In this curriculum I am going to expand a unit on Hogans by including a third-grade math standard. Third grade students will be creating a 3-dimensional traditional Navajo Hogan. They will be labeling areas in the Hogan, along with identifying traditional items that belong in the Hogan. Third grade students will be applying math terminologies that will help them to recognize and identify attributes of quadrilaterals and other shapes in different sectors of a Hogan. When constructing their 3-dimensional representation of a Hogan, they will also find the perimeter of the interior base/footprint of the Hogan.

## **Context**

### Demographic Information

Chinle, Arizona is located in the central part of the Navajo Nation, in the northeast corner of Arizona. The population of Chinle is estimated to be about 5, 000. The town serves about 8,000 additional residents from surrounding small communities. There are small businesses such as a grocery store, gas stations, a hardware store and Navajo Arts and Craft store. Chinle community has tribal offices for the local government, a hospital, a police station, a fire station, housing complexes and apartments, and five schools.

The Canyon DeChelly National Monument, which is also located near Chinle, brings in tourists who want to visit the attraction. The school that I teach at is named after Canyon DeChelly. There are many historical events that have taken place there. The canyon has Anasazi ruins, caves in which the Navajo People sought refuge in during the “Fearing Time.” This was a time when the Navajo people were trying to escape the fate of the Navajo Long Walk to Fort Sumner in New Mexico, where the United States government created a small reservation for the people to move to. This canyon has been used in many beautiful photos and used in movies. Families still reside in this canyon. They have traditional Navajo Hogan homes with their sheep camp and farms to grow traditional Navajo corn to utilize in traditional foods. Canyon DeChelly is protected by the National Park Service along with the Bureau of Indian Affairs and other stakeholders. Canyon DeChelly in Navajo is called Tseyi’, meaning in the canyon.

In the small town of Chinle, people have their own land through what is called a homesite lease. A majority of the Navajo people on the Navajo Nation have homesite leases. Through this

program a homesite is leased to them as long as they build, farm and cultivate the land. Some families that have their own areas have a separate permit that allows them to own livestock, but the herd would have to be a reasonable size. People live very close to one another. Some are family members to each other, and others aren't. This closeness does not allow much room for the livestock and so you will see cows or horses along the road as you drive to work, making it an open range. As such, you would need to be careful driving in town.

Chinle community is becoming a modernized small town but still holds some of the Navajo traditional values. There are still traditional homes, or Hogans, where sacred ceremonies are held. The Navajo language, the culture, and the customs are still valued.

As I mentioned before there are five schools in Chinle. Three elementary schools, one junior high school and one high school. There are families in Chinle called seasonal families, they leave, move a while for jobs and come back. Students enroll, withdraw, and reenroll. Each elementary school teaches children who come from Chinle or surrounding areas. Chinle Unified School District does have seven schools all together. They have two more schools located in nearby towns, Many Farms, Arizona and Tsaile, Arizona. These two additional schools educate students from Pre-Kindergarten to eighth grade. In Many Farms, there is a boarding school run by the Bureau of Indian Education and a high school that is a state public school but is not a part of the Chinle Unified.

At Canyon DeChelly, we get an average of 130-150 students. The elementary schools in Chinle are for Pre-Kindergarten to sixth grade. When one school is at maximum capacity, parents and students are suggested to another elementary school, but Canyon DeChelly will make accommodations if necessary. Based on previous enrollment, grade levels are numbered. In the school year 2022- 2023, there were one Pre-Kindergarten class, two Kindergarten classes, three first grade classes, second grade and fifth grade classes, and two third grade, fourth, and six grade classes.

Canyon DeChelly Elementary School currently has twenty-three certified teachers and four paraprofessionals. There are also two counselors and two special education teachers. Of the twenty-three certified teachers there are five specials' teachers. The Special teachers teach elective classes. These classes teach PE, Music, Art, etc. Students come to these classes once a week on a rotation schedule. Every week all certified teachers attend a professional development meeting called Cluster, where we reflect and develop our lesson plans.

All students who attend Chinle Unified School District are being taught from the Beyond Textbook curriculum of Vail School District. The Navajo Culture and Language teachers and I have been creating our curriculum units like Vail School District. The Beyond Textbook curriculum has many resources that teachers utilize that have many options on how to teach a standard. That is the intent for the Navajo Culture and Language standards. Each teacher teaches different, and it is hard to find resources for our content. This mimicking of Beyond Textbook helps to see what other resources the Navajo Culture and Language teachers are doing and using. There are times we are able to collaborate and give each other ideas. The Navajo Culture and Language curriculum gets updated and new resources come in to help teach the eight units that

are taught. Each curriculum unit of the Navajo Culture and Language are scaffold by grade level. Each year, they build upon what was being taught from the previous year.

## **Rationale**

There are currently three third grade classes in the school of Canyon De Chelly Elementary. This curriculum being developed will be taught to all the third graders in the school. The third graders are taught the subjects reading, math, writing, science, and social studies. They attend specials classes, Art, Music, P.E., Navajo Studies and Why Try (Why Try is a program for Social Emotional Learning). Since there are five of these specials classes, they attend each one once a week for forty-five minutes. At third grade, this is the beginning of when students are required to take the Arizona State assessment. They're assessed in reading, math and writing.

In the state of Arizona, third graders are a part of Arizona's "Move on When Reading" law. The state of Arizona partnered with Read on Arizona where case studies were conducted and showed that when students fail to demonstrate sufficiency in reading skills, they would continue to struggle if there is no intervention. Reading is utilized in all subjects and so it is important students have the skills they need to work in other subject areas.

This curriculum will include 3<sup>rd</sup> grade mathematics standards that will touch base on identifying quadrilaterals and non-quadrilaterals. Students will be introduced to and will explore shapes with respect to symmetries, angles, and looking at different shapes. Students will also use graph paper to explore and create a three dimensional shape of a Hogan.

According to the 2022 state math assessment scores, third grade students at Canyon DeChelly had 20% of students meet the Arizona State standards in the math assessment. The year before, 34% of students met the assessment and from the year before, 42% students met the state assessment. Observing these scores, there is a decline in students passing the Arizona state assessment. There could be different factors affecting this outcome, including teacher turn over and the COVID pandemic. Including this geometric standard in the curriculum unit will help to meet the needs of core teachers' content.

One of the units that I teach in Dine/Navajo Studies is the Navajo shelter, or Hogan. I teach about the features it has, where it came from, and how it is utilized. In this curriculum, I would like students to go into further depth about the logic of the shape, space, measurement and design of the Hogan. There are two big ideas that I want to address in my unit:

1. I feel students would be able to understand that math is used in everyday situations and that most of our cultural arts, tools and day to day living deals with math. I would like my students to get to that higher order mathematical thinking and reasoning. They should be able to see math in everything they do and be able to solve simple problems with the skills they've learned.
2. There are not many traditional Hogans today. Students see a home as a western colonized home that has bedrooms, bathrooms, a kitchen, and a living room. There are cultural teachings about the Hogan that tie to everyday living. Instead of students wanting a

westernized home, I would like them to think about how to modernize a Hogan with features they want using those mathematical skills.

The Navajo Hogan is a traditional shelter made of logs and mud plaster. It is called Hogan Nimazi, a home that is round. The traditional Navajo Hogan is an octagon shape with no windows or interior walls that separate areas like a bedroom, kitchen, living room or a bathroom. It is a one room home that accommodates all these areas. This Navajo Hogan that the third-grade students are going to learn about is a female Hogan. In everything culturally for the Navajo People, there are male and female traits.

The story of the Navajo female Hogan is that it was created by gaining ideas from the animals who inhabit the Earth before them. The Navajo People believe that there are deities and these deities wanted a home that would protect their children. They wanted their home to come from nature, to be warm in the winter and cool in the summer. Each animal the deities visited gave them an idea on how to build their home and to have a representation with each idea they gained. The majority of the animals' homes were in a circle shape giving the idea of having their home round. The Hogan would face the East for that is where the Sun rises from. They wanted the Sun to awaken them each day. They wanted their home to come from nature to blend in with the landscape to protect them. They also learned about items their homes would need and gained ideas like the Navajo basket, rug weaving and having a drum. They also learned about the importance of keeping their homes tidy.

Some Navajo female Hogans today are mostly used for ceremony purposes. An ideal home today is a westernized home that has multiple rooms, plumbing, and electricity. There are some Navajo Hogans that are built using modern supplies. Supplies that are bought at a lumber store. Some of the Navajo Hogans of today are being built with some of the westernized accommodations. They are now being built larger to have rooms, to have indoor plumbing and electricity. They are modernizing them to be two story structures, to have a porch and have added adjacent rooms outside of the octagon shape. When this happens, the Hogan is made more for living in and cannot be used for ceremonies.

### **Content Objective**

In the Chinle Unified School District curriculum, the objective for this Hogan Unit for third grade states, "Students will identify directional areas and classify six items in a Hogan." In addition to this objective, I will also have the following sub-objectives, "Students will use attributes of a quadrilateral to create a Navajo Hogan. Students will identify and name the shapes of the four sectors in the Hogan and place the traditional items where they belong in the Navajo Hogan." This curriculum will touch upon the Arizona state math standards of geometry related specifically to quadrilaterals.

### Hogan

As mentioned above, the traditional Navajo Hogan is an octagon shaped shelter that is a one room home constructed from nature. Generations after generations, this shelter was the ideal home for a Navajo family. According to our elders when there was a traditional wedding to be

conducted, the soon to be new husband was instructed to build a Hogan for his soon be to wife and future family near her parents' home. This was a way to also test to see if he was able to provide for his family. He would of course get help from family members but he would be the one to initiate the action.

There are three types of Navajo Hogans. They are called, all covered mud Hogan, log cabin style Hogan and many legged Hogan. The size of the Hogan is up to the preference of the builder. According to the oral stories, the first Hogan was a male Hogan. It was built to cleanse the Holy People after emerging from the third world. This male Hogan was not made for living in. It is called a sweat lodge, which is still used today for cleansing. After this, the Coyote was instructed to create a home for First Woman and Man which is called the Fork Stick Hogan. This Hogan was only used by them, which became one of the two Male Hogans. The rest of the People seeked and asked the animals how they should build their home. The ideas from the animals, the People created the Female Hogan. It was decided everything of the home would be built from nature.

In a study conducted by Kerry Frances Thompson in 2009, she has dated the Navajos' presence as far as 1539 in which she calls the "Spanish Period." Through her research, she was able to date this due to several hogans' archaeological visibilities throughout the Navajo reservation. Knowing these dates, helps the Navajo People see how long the Navajo female Hogan has been in existence.

When a Hogan is completed, it is blessed by a medicine man or the head of household. A Blessing way ceremony is held for the home because there are many teachings that will come from it. It is blessed with corn pollen at the main poles of each cardinal direction, with the doorway facing east. This blessing is a thankfulness of having a home to live in and to be able to grow and care for one another in. The Navajo People call the Earth, Mother Earth, Nahasdzáán. The Hogan becomes one with the Mother Earth and replicates that of a female who is with child. When viewing the Hogan from the top, it is a dome shape like mound on the Earth. We reside in the Hogan like a child resides in the womb of her mom. We are protected, fed and cared for in the Hogan.

The material used to make the traditional female Hogan is juniper wood due to resistance to decay. The logs are carved, shaved, and sanded. In the beginning, nails were not used to hold the Hogan together. The shaved bark was saved to tuck in between the logs of the structure and the roof. Mud plaster is made to give an installation feel and is also placed in between the logs to keep drafts out and to keep warm in the wintertime. The traditional Hogan does not have windows but has an opening in the center of the roof for where the stove pipe would be sticking out.

There are different areas/sectors in the Navajo traditional female Hogan created by splitting the Hogan into four equal parts or sectors. Remind you, this is a one room home. In the southeast sector of the Hogan, it is classified as the working area. In the southwest sector, it is classified as the sleeping area. In the Northwest sector, it is classified as the story telling area. And in the fourth sector, the Northeast area, it is classified as the cooking area. The family were all able to

see and be together in the Hogan. It made a unified family where the family conversed with each other.

Today's modern Navajo Hogan does a mixture of contemporary material with traditional. Supplies are bought at the lumber store, however it is still constructed in an Octagon shape, it may or may not have a dirt floor. They still face the East and are used for living in or for just ceremonial purposes. Modern Hogans today may have windows, electricity and plumbing. It may also have additions to the side that feature the plumbing system. With new ideas, the Modern Navajo Hogan may be built large enough now to have actual walls that create a living room area, bedrooms and a kitchen.

### Math: Geometry

“Geometry, a branch of mathematics that deals with the measurement, properties, and relationships of points, lines, angles, surfaces, and solids” (Merriam-Webster.com), is visible in our everyday lives. From the shape of our school building to the chairs and desk that we work on and to the way we want to place items in our home. Geometry has been dated back to the 6<sup>th</sup> century BCE, when the Greeks devised mathematical rules and techniques to use when surveying land areas, constructing buildings and measuring storage containers. (Britannica.com) The word Geometry is a Greek word. ‘Geo,’ means Earth and ‘metron,’ means measure. Over time, mathematicians have contributed to Geometry to make it the area of study that it is today.

“Geometry is the study of spatial objects, relationships, and transformations; their mathematical systems that have been constructed to represent them” (NCTM, 2003, p. 151). Through research and practice of geometry, it has been found that it can be more (NCTM, 2003). At the lower grade levels, geometry is used as recognizing and naming shapes and as children go through their learning, they name more shapes without analyzing them, but if they do analyze them, they will increase their knowledge.

It has been found that the domain of geometry and spatial reasoning have not been modeled or given much developmental time (Tatsuoka et al., 2004). Geometry and spatial reasoning are taught broadly and given very little professional development. These two math concepts are the main foundation of the mathematical thought. In spatial reasoning, one is learning how to build and maneuver objects mentally. The learner is using the world around them to get around and are using visualization. When it is learned, it can lead into other math concepts and skills, like problem solving, pattern recognition and variables.

According to research, students need these concepts at an early age in education (Clements & Sarama, 2011). It builds the mind to where students will be able to use what they have learned through geometry to other mathematical problems. They are able to use spatial abilities to understand, reason and remember visually the objects they are working with. Having this ability, helps students to be able to use in other subjects and in everyday life scenarios. The core components that students learn builds the foundation of number lines, arrays, fractions, and graphing. Learners would be able to use the concepts in subjects like chemistry, biology, geology, art and architecture. In the real world, learners can use what they know from geometry in video games, GPS maps, and pictures they see on television.

In a study conducted to identify the patterns of mathematical content processing, the U.S. has scored the lowest in geometry but they did relatively well in other areas (Tatsuoka et al., 2004). Geometry is commonly taught at the end of the year, when state assessment are about to be given. Teachers are also not being given the proper professional development to teach geometry, hence not being prepared to teach the content. If teachers had the advantage to continually teach geometry and get adequate training, they would see better scores not only in geometry but other contents.

### Polygons

A polygon is a plane figure with at least 3 straight sides and angles. It takes spatial structuring to understand the classification of polygons. Learners need to identify similarities and differences between the polygons to recognize attributes. The attributes are then used to classify the polygons. In one research by Bernabeu et al. (2021), there are levels of sophistication in elementary to understanding polygon concepts and classes. The levels identified are partial structuring of polygon concept, global structuring of polygon concept, partial structuring of polygon classes and global structuring of polygon classes. Each level includes elements of cognitive apprehensions, dimensional deconstruction and using mathematical language to understand polygons (Bernabeu et al., 2021).

Activities in everyday life of people involve a lot of mathematical applications. As part of this unit, students will be exploring the types of polygons there are. Although not a part of their standard, students need to be able to recall what a polygon is to identify the Arizona math standard on quadrilaterals and non-examples quadrilaterals. Just as the research by Bernabeu et al. (2021) stated, the different types of levels need to happen to understand this standard. So, understanding general polygon characteristics, and then, more specifically, the defining attributes and characteristics of various quadrilaterals (e.g. parallelograms, trapezoids, rectangles, rhombuses, and squares) is an important part of developing geometric reasoning in elementary grades. In addition, students' ability to manipulate shapes in the plane is part of understanding the constant relationship of shape attributes and characteristics. For example, understanding rigid transformation like rotations, reflections and translations helps students build robust understanding of defining attributes of different polygons.

### Teaching Strategies

The teaching strategies that will be used in this curriculum unit are the gradual release model, the Kagan Strategies, graphic organizers, and use of manipulatives.

In Chinle Unified School District, teachers use the Gradual Release Model. This model is a framework that gradually releases all responsibility of learning to the student. The student takes ownership of their learning. The model is in a hierarchy of steps but does not necessarily have to follow those steps. The model begins with the "I do" step. Which means the teacher models and introduces the lesson. The next step is "We do." In this step, the teacher and the students do the lesson together. The next step is "You do it with some support." Student is guided with some teacher assistant. The last step is "You do." In this step, the student has taken total ownership of the lesson. As mention earlier, these steps sometimes are not in that order. This model is built of



several theories of Jean Piaget's cognitive structure and schema, Lev Vygotsky's Zone of proximal development, Albert Bandura's Attention, retention, reproduction and motivation and David Wood, Jerome Bruner and Gail Ross' Scaffolded instruction (ASCD, 2013). All these theories together suggest that learning happens when it is specific, purposeful and there is engagement with other learners. The Gradual Release Model has four components. They are Focus Learning, Guided Instruction, Productive Group Work and Independent Learning. The framework helps to target the specific learning.

Using the Gradual Release Model has helped me to stay focus to the learning objective. I've created majority of my PowerPoints that follows this model for each of my units. My content has a limited time. This model helps me to pace the intended learning.

### Kagan Strategies

The Kagan strategies are cooperative learning structures. They are intended to increase classroom engagement and get all students actively involved in their learning. In the Kagan Cooperative Learning structure, students create teambuilding that establishes trust and encourages support among each other. It also promotes language acquisition. Students are listening to each other and building vocabulary. Two of the Kagan strategies students will be using is the "Think, Pair, Share," and "Round Robin." In "Think, Pair, Share," students are thinking about the problem that is presented to them. They will then pair up with a peer and then share with each other their thoughts. This strategy helps to get students to have that wait time to think and solve the problem the way they want. The share time gives students ideas. In "Round Robin," students will be taking turns to talk and peers are listening. This gives each student a chance to speak and to be able to hear each other and then give feedback to each other.

### Graphic Organizers

Graphic organizers help to organize, clarify and simplify complex information. Graphic organizers break down information students struggle with. Majority of our students are considered English language learners (ELL) due to having the Navajo language being spoken in the home. Through research, ELL students struggle with content due to not having the vocabulary knowledge. In this curriculum students will be using the T-chart. The T-chart compares and contrasts two things. In this curriculum, students will be comparing quadrilateral and polygons.

### Manipulatives

The use of manipulatives gives students opportunities to explore and understand math concepts. It gives students the chance to engage in hands on math activities that would build a strong understanding of the math concept being taught. The manipulatives that students will be using are geoboards, nets and patty paper. Students will use geoboards to create quadrilaterals and polygons, and then compare/contrast the characteristics of each. In making nets, students are able to examine the shapes that make up the sides and the base of the Hogan (i.e. octagonal prism). Finally, students will be creating an octagonal prism. They will explore the footprints of the traditional items that belong in the Hogan by placing the patty paper with the shape in the Hogan.

## **Classroom Activities**

### **Activity 1: Identifying Quadrilaterals and Non-quadrilaterals in a Hogan**

The first activity students will complete, is to identify and describe the features of a Traditional Navajo Hogan. The teacher will give students pictures of several types of shelters. Students will then identify which are Traditional Navajo Hogans. Students will then draw their own Hogan and create a web around the Hogan and describe the features. What is it made out of? What is the shape of the Hogan? What is it for? Where did this idea of a Hogan come from? The teacher will then have students do Round Robin, where students will share at their tables by taking turns and telling what feature they wrote about the Hogan. If they do not have that feature, they can add to their web. The teacher will monitor and listen to these discussions and pick selected students to share with the class what features they shared in their group. The teacher will create an anchor chart where the shared features will be listed. Once all selected students share, teacher will then have students think of the Hogan in math terms. The teacher will give an introduction to quadrilaterals and non-quadrilaterals. During this introduction, students will have a review of what polygons are. They will identify what a polygon is. Students will then look at the Hogan again and see if the Hogan is a polygon and then identify if the Hogan is made up of quadrilaterals and non-quadrilaterals. Students will then explore polygons using a geoboard. They then will move into creating quadrilaterals and non-quadrilaterals on the geoboard. Students will then turn in a worksheet that shows and explains attributes of a Hogan using the vocabulary words quadrilateral and non-quadrilaterals.

### **Activity 2: Identifying the traditional and mathematical areas of the Hogan.**

In this activity students will identify traditional areas within a Hogan and name the mathematical terms that are in those different areas of the Hogan. Students will be given a mixture of items that belong in a home (e.g. a weaving loom, a T.V., a bed, a curved desk, a sheep skin, grinding stones, a table, etc.). They will then sort the items on what they think are traditional items and what are modern items. Students will again use Round Robin at their table to discuss what they think are traditional items and modern items. The teacher will monitor and walk around the groups to listen to the table talks. The teacher will then create an anchor chart that has a T-chart labeling traditional Navajo items and Modern items. Teacher will call on students to share their answers as to what belongs where and place the items on the chart. Teacher will then talk about the traditional items and their importance of belonging in a home. The teacher will then present on where in the home do these items belong. The teacher will give students a grid paper in which they will create quadrilaterals and non-quadrilaterals as a review. The teacher will then have students create the Hogan's floor shape and tell if the shape is quadrilateral or non-quadrilateral. They will then section the traditional areas in the shape and they will look at what the area shape makes. In this part of the lesson, students will review quickly of what a polygon is. Students will use "Think, Pair, Share," strategy when doing this. Students will then place the traditional items in the Hogan and make a footprint of where these items would go in the Hogan. Students will then explain the type of shape that item occupies. Is it a quadrilateral or non-quadrilateral shape? Students will create math sentences that explains where the item is placed in the Hogan, how

much of that area it occupies and what that area shape is called. Students will “Pair, Share,” when they are done with their sentences. The sentences they created and the grid papers will be an informal assessment.

### Activity 3: Creating nets to form an Octagonal Prism

In this activity students will create nets of an octagon/ octagonal prism. The teacher will read the story, “The Story of the First Hogan.” This story tells the Navajo origin story of how the Navajo female Hogan came about. The teacher will then give students quadrilateral and non-quadrilateral shapes to create the octagonal prism. Students will create different ways to make a folding net for the octagonal prism. Students will explore this by cutting out the quadrilateral and non-quadrilateral shapes. They will experiment with the shapes and discover how many nets an octagonal prism can make. Students will then choose the net that allows them to be able to open the top so that they will be able to make footprints of traditional items in the Hogan and to also label the Hogan’s correct traditional area. Students will be allowed to place modern items in the Hogan but they will be placed in the correct traditional areas. They will also place the original traditional areas in the Hogan. When they complete this, students will share at their tables what they have created. They will then color and have a choice of whether they will have a Many legged Hogan (logs sticking up) or a Cabin log stacked Hogan for the exterior. Student will then write up a two paragraph description. One paragraph will explain the cultural discoveries and the other paragraph will explain the math discovery. Both the project and the writing will be graded based on a rubric.

### Assessment

This unit will use informal and formal assessments. At the beginning of the year, students take a pretest. This pretest lets me know how much students know about their culture. There are also District formative assessments for each of the units that we teach. After each unit, students take this assessment. In the general core classrooms, students take a district formative assessment for each content and if they need to do interventions, this is given for them. In my case of being a Specials area teacher, I myself will review the unit I taught and scaffold to the next unit. I tell my students, “We learned about this because this ties into our next unit.”

The first activity in identifying quadrilaterals and non-quadrilaterals. As part of these activities, students will be doing two informal assessments and one formal assessment. The first informal assessment is to identify a Navajo Hogan. Second is another informal assessment where students review what polygons are from their second-grade math and then identifying what type of polygon the Hogan is and what other polygons make a Hogan. The third assessment, the formal assessment, is to turn in a worksheet that shows students are able to identify quadrilaterals and non-quadrilaterals and how the Hogan fits into that category. There will be three multiple choice questions, two illustration questions and three questions to pertain to the Navajo female Hogan.

The second activity will again have informal and formal assessments. The first is to identify the cultural and modern items that belong in a traditional female Hogan. The second is to create and label the traditional areas in the Hogan. The third and fourth assessment are formal. Students will make footprints of the traditional items in the Hogan on grid paper. They will then create

sentences using sentence stems to explain what type of footprint shape it makes. They will be required to label all six traditional items in the Hogan and explain their footprints using the math vocabulary words to explain them.

In the third activity, students will also have informal and formal assessments. The first informal assessment is answer questions about the story. They will answer questions like, “Who did the People seek to get ideas to build their homes, Why did they want homes, What idea did they get from (animal name), What types of home did they want, What type of shape did the People come up with to build their home and why?” The second assessment is to create an octagonal prism with a net. The formal assessment will be to create an octagonal prism that will feature the traditional items inside. Students will get a rubric on what this octagonal prism project will have. Students will also have a writing piece that will be assessed with a rubric too.

There will be a summative assessment which will be the district formative assessment for this Hogan unit. This summative assessment, as mentioned above will have three multiple choice questions and two written response questions.

## **Standards**

Arizona State Standards: World and Native Languages

In this curriculum, third grade students will be working on the following Arizona math standards: 3.M.G.A.01: The Highly Proficient student can recognize and sort examples of quadrilaterals that have shared attributes and draws examples and non-examples of quadrilaterals that are not rhombuses, rectangles, or squares and 3.M.MD.C.08: the Highly Proficient student can construct rectangles that have the same perimeter but different areas. Students will be building 3 dimensional Hogans using quadrilaterals and non-examples of quadrilaterals. They will also identify traditional items that are quadrilaterals and non-examples of quadrilaterals in a Hogan.

Navajo Nation Standards: Diné Culture Standard

The curriculum will cover standards from the Diné Culture standards: I will develop an understanding of Diné way of life: Concept 1: I will acknowledge and value my thoughts and personality, PO 3: I will describe cultural items and jewelry. Standard: I will develop an understanding of Diné way of life, Concept 3: I will implement and recognize the lifestyle, PO 1: I will recognize the stories of a Hogan. Students will learn and explain the story of the Navajo Hogan. They will analyze how a traditional Hogan is built and what belongs in a traditional Hogan.

## Resources

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