

Stewardship of Trees and Forests

A Great Harvest Da'zhó' Nít'eego Inest'aa: Could Apaches Use Moon Phases to Get a Great Harvest?

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Author Note:

Roberta Patten is a sixth-grade science teacher at San Carlos School in San Carlos Unified School District. San Carlos is the southeastern part of Arizona on the San Carlos Apache Reservation. Patten is a member of the San Carlos Apache tribe and has been an educator with the school district for over thirty years. She has devoted her life to educating her people. She credits the students and community in her quest to provide education to regenerate a healthy Apache diet and lifestyle. The high rate of diabetes is ongoing, perhaps this unit of study will serve as a catalyst to educate Apaches. She gives recognition to the efforts of Seth Pilsk; botanist, Forest Service Resource Program, San Carlos Apache Tribe. The knowledge he has researched and provided to the San Carlos community compelled Ms. Patten to design a curriculum for Apaches to return to the traditional diet. Roberta Patten can be contacted at: Roberta Patten, P. O. Box 1377, San Carlos, AZ 85550 or gozhoo.naghaa.286@gmail.com.

Context

I have taught for over thirty years in the San Carlos Unified School District. In my junior year of college, I changed my major from business to education. At that point in time, I felt like I was being streamlined into a vocation to be an executive secretary by the high school counselor. After watching children at Eastburn Education School play on the lawn with the student teacher, I changed my major. I went to teach in San Carlos as soon as I graduated from Northern Arizona University. Each year was different because I was always trying to make learning easier for students. My experience includes teaching at all grade levels, even at a junior college. Being an enrolled member of the San Carlos Apache Tribe fueled my desire to find a way to teach Apache children. I was born and raised in Chicago, Illinois. I am a product of “relocation,” where tribal members were given the opportunity to assimilate in a city. That situation alone convinced my parents to raise me speaking English. I am fortunate that I understand Apache, but unfortunately, I cannot speak it. My life has been dedicated to being an advocate for education on the reservation.

San Carlos Apache Reservation is in the southeastern part of Arizona, which is in the southwestern part of the United States. San Carlos is a rural community on the San Carlos Apache Reservation containing four voting districts: Bylas, Peridot, Gilson Wash, and Seven Mile Wash. According to the World Population Review (2022) and the US Census Bureau American Community Survey (2022), these are some demographics that provide insight to a community battling to survive. The population in San Carlos, Arizona, is 3,977, with 90.82% being American Indian in 2022. The average household income on the San Carlos Apache Reservation is \$41,619. The poverty rate is 53.96%. The median age on the reservation is 26.6% male and 25.6% female. Most households are single parents, with only 32.1% being married. The highest level of education is 2.16% obtaining a Graduate Degree. The lowest level of education attained is less than the ninth grade at 6.13%. As far as language goes, 67.1% speak English.

The San Carlos community has a number of educational facilities. The San Carlos Apache College was founded in 2014 on the reservation and is tailored to meet the diverse needs of students. The Apache College provides dual credit classes to the community high school. collaboration with educational facilities provides motivation for students to strive for a higher education. This past year 19 graduates participated in commencement exercises. The San Carlos Unified School District contains an elementary, intermediate, middle, and high school. The student population at the San Carlos Middle School is 378, and 99.2% are Native American. (“Schooldigger,” 2022). San Carlos Head Start also operates on the reservation, serving the Gilson Wash district, Seven Mile Wash district, Peridot district, and the Bylas district. The St. Charles Mission School and Our Savior’s Lutheran School are also located in San Carlos.

As stated in the *Globe-Miami Times* (Daley, 2019), of the 14,000 tribal members, only 20% are fluent speakers of the Western Apache language. The written form of Apache was not addressed before 1960. Consequently, the language is rapidly diminishing, with almost 0% of speakers in the sixth grade.

San Carlos has a number of primary employers, such as the San Carlos Unified School District, San Carlos Apache Tribe, San Carlos Apache Healthcare Corporation, Apache Gold Casino, and several other departments operated by the Bureau of Indian Affairs or private entities.

All grade levels at San Carlos Middle School are departmentalized. I teach sixth-grade science. The class size is approximately 22 students for five class periods. Students are primarily English speakers; however, Special Education and English Language Learners are intermingled into every class period. There are approximately eighteen instructional staff, three custodians, one truant officer, one IT classified staff, one dean of students, and the principal.

Rationale

Science is indeed an abstract word to Apache children. The concepts taught in a traditional classroom are hard for students to master. In this modern world of pushing buttons to gain answers, critical thinking skills have taken the back seat in education. Thinking, exploring, observing, analyzing, generating ideas, hypothesizing, and recording data is overwhelming to most, if not all, students in science. The pandemic has robbed students of hands-on teaching and differentiated teaching. In virtual learning, nothing could take the place of hands-on teaching for Apache students. As most students are tactile and visual learners, the past two years have been difficult as far as making sure they comprehend the concepts introduced in science. I have also seen an increase in behavioral issues and an effect on the attitude toward learning.

Self-identity, self-confidence, and motivating students to succeed have always been one of my goals in my teaching career. Apache tradition and folklore have engaged students in the classroom. Science and Apache lifestyle practically go hand in hand. Students do not realize that life is science and science is life. They don't realize they hold critical thinking skills just living their lives. From discovering how much air a bonfire for a Sunrise Dance needs to choosing which plant twigs bends to make a basket, science is in their life! In the public school system, the core content areas include reading, writing, and math. Science is put on the back burner. The manner in which subjects are taught may not be the ideal one for tactile learners. Apaches come from a society where they are taught by watching and experimenting in order to master a concert. It is time-consuming and requires prompting, modeling, and applying what they have learned. Where the public school system and the Apache Tribe have failed, I can now give it my best shot and watch to see what happens after teaching this unit.

Apache values can be the backbone of introducing a scientific standard for most of the science standards that are taught. Our philosophy of "Mother Earth" is illuminated in the study of celestial beings. The idea of reciprocal care and respect for the earth, celestial beings, and abiotic factors that exist in the Apache world has diminished so that hardly anything is known by most Apache students. Today's society neglects to raise children, so they abide by Apache values. At one time, Apaches respected all living things as humans. Apaches knew the obligation they had to all living things and took care of each other. Teaching this unit may persuade students to see what is missing in their lives and work to revitalize values concerning moon phases and the effect it has on our world. As a result, when introducing a scientific concept based on Apache values, students get hooked on learning. It has made learning and becoming proficient in science standards easier.

Apache language is also diminishing rapidly. Most students come to class not knowing their clan and basic Apache words. In this moon phase unit, Apache words will be included, and students will be expected to use and pronounce them correctly. As an Apache teacher, it will be worth the time it takes to do this.

Behavioral problems are in excess at our school. Family support is nonexistent. Dysfunctional homes lend to the behavior problems that exist. Self-identity has switched from being Apache to being the tough guy or girl, imitating influences at home and in the community. By teaching moon phases using Apache words, stories, and other Native American folklore, a student's self-identity may change in the classroom setting. Who knows, it may change their lifestyle!

Consequently, becoming aware of the importance moon phases have on other denominations leads to a theory that seeds planted during a certain phase produce healthier and plentiful crops. Apaches harvest wild Indigenous crops in areas where they know they exist. These crops may soon become rare in the ecosystems where they once thrived. Apaches may have to search far and wide for Indigenous crops. Therefore, Apaches may have no choice but to plant and harvest wild Indigenous crops that once existed in the wild.

The ultimate goal is to make learning easy and fun, to teach and hear students say, "I can't believe I learned that" or "I really made an "A" on my test!" Those are the rewards of teaching!

Content Objectives

This unit will basically cover the eight moon phases as presented in the curriculum used by San Carlos Middle School for science. Edmentum's Study Island is a curriculum that provides lessons in the content areas, practice, and formative tests and aligns with Arizona State standards (Edmentum, 2022). This unit will also include the Apache moon phases as presented in a lecture given by Seth Pilsk, San Carlos Apache Tribe botanist (S. Pilsk, personal communication, 2022). A creation story of the Western Apaches is presented in two videos as told by two Western Apaches (Apachecreation, 2017; Alamac, 2009). The Farmer's Almanac will provide information on how plant growth depends on moon phases. The lunar influence on plants is another perspective by Ian Cole and Michael J. Balick that will be presented in 2022. It supports the theory of seeds growing healthier and more plentiful if planted during a certain moon phase. Students will use the WYLDE 2022 Moon Calendar as it visualizes that moon phases last for a duration of time. It will determine the days of the month students will plant above or below-ground seeds. Students will also see that the month does not begin with the new moon phase but that it is determined by the rotation/revolution of the earth and moon and begins at different intervals of the moon phases. The 2017-2018 Lunar Calendar, Nest'an, Harvest, created by the Traditional Western Apache Diet Project, covers the wild Indigenous native plants and animals available for harvest. At different times of the year, Western Apaches harvested plants or animals needed for their traditional diet.

In Edmentum's Study Island, the eight moon phases are introduced. An explanation for the cause of moon changes involves three celestial bodies (sun, moon, and earth). The rotation and revolution of the earth and moon around the sun create moon changes in a matter of twenty-nine and a half days. Details have been presented that support the fact that the earth bulges where the

most gravitational pull is happening. The reason for the creation of tides on the earth is presented. This bulge occurs because the ocean areas can easily be pulled to create bulges on each side of the earth during the new and full moon phases. Thus, we have high and low tides (Edmentum, 2022). The reason we have eclipses are covered in this unit also. When learning the phases of the moon, students are very confused about the effects made between the moon, the sun, and the earth. The shadow made by the earth on the moon is misinterpreted to be the moon changing its shape. Students also find it hard to understand that the sun does not move, but the earth and moon rotate and revolve. The twenty-nine-and-a-half day cycle does not change, but the days on which they happen do change. In our lessons, the eight phases of the moon are created because of the rotation and revolution of the earth around the sun and the rotation and revolution of the moon around the earth. In turn, this creates the relationship that the sun, earth, and moon have.

As far back as the Old Farmer's Almanac originated, the belief was that planting by the moon phases would yield a healthier and great harvest. Moon phases affect plant growth due to the gravitational pull made on the earth by the moon and sun, which affects water in the soil. As stated in the article, *Gardening by the Moon*, seeds swell with water during the new and full moon phase, which enables greater germination and better-established plants. The amount of moisture that rises in the soil happens during the new and full moon phases ("Almanac," 2022). In the video, *Planting by the Moon*, also created by the Almanac, states that the gravitational pull determines moisture in the soil and the moon's light affects plant growth ("Almanac," 2009). This article states that above-ground plants should be planted during the waxing phase of the moon. Below-ground plants should be planted during the waning moon phase.

In an article written by Ian Cole and Michael J. Balick (2022), the lunar influence on medicinal plants is covered. Medicinal Indigenous plants may also become scarce in the future. Chĩchĩg, which is a greasewood bush, is an Apache all-medicinal plant for minor ailments. There are many more Indigenous native plants that I have yet to learn about. Apache medicinal plants may also become scarce due to environmental changes. The article presents the fact that we have pharmaceutical drugs because of traditional herbal knowledge. One thing that today's acquisition of pharmaceutical drugs does not address is the connectivity traditional healers have with the earth. This includes the knowledge of the earth around them, and the respect for the earth and the universe as well. Not only were medical plants mentioned in this article, but fruits, trees, and wood harvesting were presented. Softwood was cut during the waxing moon phase, and hardwood during the waning moon phase was the rule of thumb. Surprisingly, this coincides with Apache tradition that old mesquite wood (softwood) be gathered and not wet wood (hardwood). Other ethnicities have folklore and tradition that stress the importance of moon phases and planting and harvesting Indigenous plants. Terms such as: plant rhythm, phytochemistry, central oscillator, and germination are in this article. They deal with essential mechanisms that occur within plants and state their benefits. The first thing that crossed my mind when plant rhythm was addressed is that plants are living and should be treated just as humans, each having unique characteristics. They may not directly have to do with moon phases, but the moon is of importance so that these mechanisms occur. The understanding of the best time to plant and harvest plants enables healthy plants rich in medicinal components to grow. The attributes of plant mechanisms are what Apache students need to know; it is a big part of their lives already. Though our culture does not have books written about plant mechanisms, it has been spoken of

by healers. It has been a way that we respect the earth. When told by grandma to drink this tea, we knew it was Indian Tea meant to soothe our throats, calm our stomachs, and get rid of worry.

This curriculum unit will not only explain how the moon changes its appearance during its twenty-nine-and-a-half-day cycle but will also experiment on how Apaches may be able to use the theory of plants growing healthier if planted during certain moon phases. Not knowing what the future holds, it will be beneficial for Apaches to know how to prepare to plant and harvest Indigenous native foods.

Some Indigenous native foods I can remember picking are banana yucca (goshkán), wild spinach (It'aa Ditudé), tea (Izee Ts'qosé), onions (tsétá'lbáh), berries (Chinkozhé), and acorn (chich'il). When I was a child and a young adult with my grandmother, father, and mother, there was always plenty of Indigenous native wild foods to harvest. Within the last ten years, I would return to the same area to harvest these foods and find that the harvest was minimal. The reason could have been that I was late to go out and harvest, but I strongly believe that environmental changes cause the lack of a plentiful harvest. My mother has instilled in me that if you treat the earth respectfully, it will reciprocate that to you. This leads to my question: Why is there a minimal amount to harvest in places I was guaranteed to fill my basket? Can Apache people do anything to make sure we will always be able to harvest Indigenous native foods? Will Apache people eventually have to consider planting Indigenous native foods? The Apache traditional value of respecting the earth to enable a plentiful harvest of Indigenous plants may be hard to revive, but the attempt to use moon phases to plant and produce a plentiful harvest may be a thing to do in the future. Because of this, I introduce this unit so my students will continue questioning the fact that Apache people may have to plant Indigenous native foods. Will the moon phase hypothesis play an important role? Will a reserve enable wild Indigenous plants to survive environmental changes? We will venture to plant these three Indigenous native seeds: mesquite beans, native tea, and onions. The 2017-2018 lunar calendar, Nest'án, Harvest, created and published by the Traditional Western Apache Diet Project, will serve as a resource of when wild Indigenous native plants and animals are available and the time of the year they are available to harvest.

To support the fact that the Apache people should be living in harmony with Mother Earth, the video called White Mountain Creation Story, told by Ramon Riley, and Apache Creation Story, Bylas Apache People, told by Franklin Stanley, will be shown. Both videos support the fact that the earth began with energy and darkness. It was unstable, and eventually, the Creator endowed the People with gifts to value and survive on the earth and in the universe. All living things had their respective responsibilities on the earth. The basis for all life settles on the maternal lifeline for the Western Apache people. Humans have the responsibility to make sure Apaches, then and now, value the earth for the life it brings. Although this is based on folklore and tradition, it coincides with scientific facts. This understanding should motivate students to play their part in the Creation Story.

In a lecture given by Pilsk, a forestry botanist, the moon phases also reflect the stages of learning Apache people apply to their lives. In the pre-reservation era, Apache people valued bonding by making sure people learned the way to survive off the land. In acquiring mastery of a skill, Apaches questioned, observed, practiced, learned, mastered, and shared new things they learned.

The moon phases are: *Dahitaa (crescent)-hangs there* (phase one), *Tl'e'gona'ai Hilniyu-moon halfway there* (phase two), *Tl'e'gona'ai Nchaa-large moon* (phase three), *Tl'e'gona'ai Hilniyu-moon halfway there* (phase four), and *Chogolhyeel-complete darkness* (phase five). Again, the difference between science and the Apache way is that we relate the moon phases to personal growth by learning new things. Amazingly, it follows the scientific inquiry theory of observation, gathering information, forming a hypothesis, testing, and sharing.

In the Apache way or belief, all living and nonliving things exist because of Mother Earth. The Apache information needs to be told to Apache students so they learn their role on this planet. We coexist and must maintain harmony. Folklore and tradition emphasize proper care of all things, and that women must display values so families live accordingly. Self-identity has faded from the lives of young Apaches. Time has changed many things, but I was always told to remember where I come from. The videos on the Creation Story support this; in the meantime, inappropriate classroom behavior has intensified. There is a need to bring Apache stories or folklore back; it may help engage students in the classroom. This point can be related back to the philosophy of the Apaches: Ni'godzán "the earth/land is a mature woman," it will take care of us if we take care of her. Or as quoted by an Apache elder: "*Be humble, respect and acknowledge the energy.*" As the universe, earth, and the young girl hold energy; the Apache community must acknowledge this.

Teaching Strategies

Most learners at San Carlos Middle School operate in a classroom with minimal mastery skills in all subjects. The speaking vocabulary of many is low. Students tend to answer with one or two-word responses. Writing skills are at a minimum. Some students come to school with a few hours of sleep. Some students still have a tendency to avoid eye contact and shy away from discussions. The last two items listed are practices of Western Apaches from years ago that students may still see exhibited at home. To be humble and patient was of noble character, of course, there are exceptions to this. The teacher looks for ways to individualize strategies for students in the class. I have chosen the following strategies to make sure I engage and motivate students in class.

Classroom Management

The utmost in teaching strategies that must exist is classroom management. This is to ensure the environment is conducive to learning. Students are aware of expectations and responsibilities so they perform satisfactorily in class. Behavior and the desire to learn are addressed with respect to the Apache culture. Students are unique as far as their mode of learning. It may not be an easy thing for students to learn in the westernized teaching mode, but students do learn when taught in the Apache way. The primary focus is that everyone has something to contribute, and everyone will learn at their pace.

Teacher Directed Instruction

Instruction will be guided by the teacher. The technique guarantees proper use of all other strategies being used. Knowledge of students' weaknesses and strengths governs the amount of

time spent on each strategy. Revisions needed for students requiring extra guidance will be determined by the teacher. The teacher should be willing to facilitate learning by providing directions, motivating discussions, and giving assignments. A PowerPoint on A Great Harvest, Da'zhó' Nht'eego Inest'aa, will guide instruction to the students. It will contain all that is needed for the remaining strategies. The teacher must be knowledgeable of the scientific reasoning behind planting by the moon phases, as well as the Apache way of respecting and caring for the land as you would for yourself. She will be an expert in this area. Student objectives will be presented and clearly understood. Performance objectives will be displayed as students use the knowledge of planting by moon phases to grow plants in the classroom. The teacher will engage students and provide them with an opportunity to succeed.

Inquiry-based instruction

Students will want to find out the answer to the questions on the scientific or Apache moon phase. The questions are student-oriented; the teacher merely serves as a guide for them to reach the questions the student will present. The teacher also guides them through designing illustrations and models and interpreting and composing data that must be compiled. Students will share their knowledge, whether it be school-based or home-based. The teacher will guide them to observe the significance of what they know and what will be taught. Generating ideas, questions, and information they want to know, is guided by the teacher. This will start as a whole group activity and then be prepared as an individual activity by the student. During each part of the content objectives, students will inquire about the Farmer's Almanac, the Apache moon phases, plant rhythm, and the Apache Creation Story. The exciting part of it all is that their lives fit into the information being taught.

Modeling

The teacher will serve as the person who pronounces new vocabulary and Apache words. The student will then echo the pronunciation of the word. The Apache language is full of diacritical markings, high-pitch tones, and glottal and nasal pronunciation of letters. The students will be guided by the written form of the word and use it to pronounce the Apache word correctly. In all new vocabulary, the definition is stressed, and examples are given to make the word meaningful to each student. Students will be given the opportunity to pronounce the Apache words to each other. Thus, modeling is not only done by the teacher but by the students' peers as well.

Spaced Practice

Spaced practice will occur verbally or through illustrations. When labeling illustrations, the written word will be available in student notes. This provides the student with small successes that lead to big ones. They are able to work at their pace and interpret information gained in their own way, emphasizing the importance they gain. The practice will basically be recalling information previously presented.

Multimedia/Technology

A multi-media approach supports the idea that students have different learning styles. Apache students tend to be tactile learners. Our culture is one where seeing, hearing, feeling, and touching objects is the way we learn. A power point will provide images and videos of the scientific and Apache information being taught in this unit. Learning will be made meaningful by using images students can relate to and showing videos that are focused on their interest level.

Project-based learning

At the conclusion of the unit, students will choose from a variety of Indigenous seeds and commercial seeds. The objective will be to plant and care for an Indigenous native plant and a commercial plant. Knowledge will be increased through the application of facts presented in the unit. Students will find ways to solve complications encountered in doing this project. At the conclusion of their project, students must present their conclusion. Most importantly, students will determine if they can apply this to real life.

Differentiated Instruction

This technique will be employed to ensure that learning occurs for all students. The weaknesses and strengths of students are noted by way of teacher observation. Worksheets, illustrations, verbal discussions, and quizzes will be revised accordingly. For instance, if a student has writing difficulties, a multiple-choice quiz will be given instead of an open-ended quiz. The manner in which teachers teach is not solely by a textbook, providing diverse learners the opportunity to succeed is the goal of differentiated learning. Some students have a wealth of information not stated in a textbook, yet if improvised, so it applies to their knowledge; they know the knowledge being presented.

Classroom Activities

Since the majority of the class is San Carlos Apache, I realize that most students don't use the most conventional ways to perform the essential tasks to live. Our lives have always been focused on using practical ways to ensure our survival. This relates to the classroom in that textbooks are not one of Apache students' favorite ways to learn. Using anchor charts, journals, graphic organizers, storytelling, and the internet will give students the opportunity to learn outside of the textbook.

T Chart

The T Chart will be used to compare/contrast the scientific and Apache point of view on the creation of the earth. This form of comparing two concepts is the easiest diagram for students to follow as it simply requires one horizontal and vertical line to make it. It is a quick way to list comparisons and also promotes thinking to determine similarities. The T graph will be recorded in the student's science journal of notes. To begin the activity, students will first generate ideas on the way the earth was created in a scientific way while the teacher records them on the whiteboard. This will be based on information presented in previous units of solar energy, solar

system, constellations, and moon phases. The teacher will lead the discussion and use visual prompts within the classroom to refresh the minds of students. Students will watch the video on the White Mountain Creation Story and the Bylas Creation Story Science. Taking notes during the video is necessary. Students will generalize the process in which the earth was created according to Apache folklore. These stories slightly vary, and the teacher will lead the students to generalize their ideas. She will question what happens first, second, and so on. After completion, students will come to the conclusion that science provides inanimate objects, and the Apache version provides animate objects in the creation of the earth. Therefore, planting seeds and caring for them as humans is a principle one should think about using in order to produce successful plant growth.

Note Taking

Students will take notes in their science journal on presentations of the moon phase, Farmers' Almanac article, PowerPoint on A Great Harvest, Da'zhó' Nlt'eego Inest'aa, videos, and the article on lunar influence. Note-taking is used in class so that students stay engaged, as they are tactile learners. Notes are taken using printed text or illustrations. Students have a need to write information down and hear the information in order to retain the information presented. It tends to be a synchronous motion. The information students record in their journal is used for review, projects, and quizzes.

Moon Log

The teacher will distribute a moon log in the form of a calendar. This is an independent activity in which the teacher displays a picture of the moon the night before using the whiteboard projector. The picture of the moon is taken by the teacher or a dependable student. This activity is done in this way because some students do not have an opportunity to look at the moon. Home responsibilities and family activities may deprive students of doing this. If done in this way, all students can participate in this activity. Students will color in the portion of the moon that is shadowed by the earth. By doing this activity, students will see the duration of time each of the eight moon phases occurs. The teacher will guide a discussion about this. Students will offer their comments on which dates show the moon in the waxing and waning stages and whether it is a crescent, quarter, or gibbous-shaped moon. The teacher will question whether a pattern exists, and whether it would be useful to them if there was not any way to keep track of time, days, months, or years. The questions will lead to how what we are studying relates to our lives. Students will also form a hypothesis on the pattern that exists every twenty-nine and a half days. This will enable them to predict when their plants should grow, produce, and stay healthy. If the moon is not visible because of clouds or if the student is absent and cannot record an illustration of a nightly moon, they can go to WYLDE Moon Calendar 2022 and find accurate information.

Popcorn Response

This whole group activity is called the Popcorn Response. It can be used to review the content of any portion of the unit being studied. It can also be used to summarize a new portion of the unit being studied. The teacher leads this activity by asking a question on the subject. It can be a closed or open-ended question. It can also be extended to a leading question, which leads the

student to eventually give a certain answer. Answers are not recorded; this is purely a verbal discussion. This activity is chosen for discussion because Apache students are reluctant to provide an answer when singled out by others in the class. They feel like they are put on the spot and don't want to be wrong in front of the whole class. They usually say, "I don't know," or provide no answer at all. I also use the "thumbs up–thumbs down" response to yes or no questions. Students can model responses, and other students can echo the response. It is a way to secretly provide peer interaction and instruction. This is done in an effort to give students a chance to succeed as well as participate.

Anchor Chart–Apache Harvest–Nest'án

This is a teacher-directed activity designed to generate ideas on what kinds of seeds to plant. The popcorn response will be used to record all responses to this question, *Before there were stores, what food do you think Apaches ate?* which will be written on the whiteboard. After all, responses have been recorded, the process of elimination will be used to eliminate food that was unavailable to Apaches during pre-reservation times. The teacher will display the 2017-2018 Lunar Calendar: Nest'án Harvest printed by the San Carlos Apache Tribe Department of Forest Resources, the Christensen Fund, and the Center for Disease Control and Prevention. After discussion, students will be asked what foods Apache still uses today that cannot be bought at a store. This will be placed in an anchor chart labeled: Apache Harvest–Nest'án. Students will work in four groups to do this. All they will need is a piece of chart paper and markers. This will lead to what Indigenous native seeds students or the teacher can bring to class to plant.

Project-Based Learning–Planting during Moon Phases

Students will plant Indigenous native seeds and conventional seeds that grow above and below ground. Student volunteers will bring in the necessary supplies to plant the seeds. After careful review and designating the best phase to plant above and below-ground seeds, students will begin the independent activity. Their responsibility will answer the question: How can the Apache people make sure Indigenous native plants continue to survive and grow? Students will need to keep a journal on the observations and steps taken to grow their plants. They will also display a growth chart for their plant. A compare/contrast chart will also need to be recorded. In answering the question presented, students will need to question, research, hypothesize, test, analyze data, and present their conclusion.

Student Assessment Plan

Due to the unique lifestyles most Apache students have, their social, mental, and physical needs need to be addressed. Their lifestyles can range from running a household to having a fantastic support system. There are students who should be placed in the ESS (Exceptional Student Services) program but miss criteria by a hairline. Therefore, the academic ability could be below average. Physical needs range from a student not having meals to eat at home to an embarrassment of simple things, such as clothing worn, unkempt hair, and so on. These can all affect the performance on assessments given in class. Teacher observation will be essential so these needs are addressed in all types of assessments given. The majority of Apache students within our school district have always struggled with test taking. This may also be the case with

other socio-economic groups, but it has always been something we struggle with at our school district. Because of this, the teacher will use informal techniques such as teacher observation and participation during each session for this unit. The teacher must make every effort to keep students engaged in daily lessons or activities

Pretest

This test will consist of a simple graphic organizer called the KWL chart. Students receive a handout with the graphic organizer displayed. It contains three columns labeled: What I Know, What I Want to Know, and What I Learned. Initially, students will fill in the first two columns; the last column will serve as the post-test. Students are encouraged to spell words as best as they can, or they can ask peers or the teacher to assist them in spelling the words used.

Throughout the course of the unit, formative assessments will be given in the form of concept maps, quizzes, teacher observation, participation, and assignments. Vocabulary will be key in note-taking and classroom discussions. Open-ended and short-answer questions will be used in quizzes. (For Exceptional Student Services students, a multiple choice quiz will be used.) Concept maps, moon logs, and journals will be used to make sure students are on track and will be handed in as assignments.

Formative Assessment

The students' science journal will serve as a form of assessment. This journal should have the observations made of the seed they have planted. It will include questions, research, hypothesize, test, analyze data, and present their conclusion.

Posters and illustrations created in order to explain seed growth and illustrate how Indigenous native seeds grow above or below ground summarize the content they have learned and mastered. In this way, students show their strengths while learning,

A quiz will be given after each portion of the unit is taught. This will encompass a quiz on the moon phases as presented in the Edmentum Study Island program. Also on the Apache moon phases and the creation story. The information covered on the lunar influence on plants and how the waxing and waning moon phases contribute to seed growth will be assessed using a quiz. The quiz will contain up to twenty-five questions covering the content of the lessons they learned. Students will be able to use their notes during the quiz. It will feature open-ended questions so that students' degree of mastery is measured by the details given in their answers. A revised multiple-choice test will be given to ESS (Exceptional Student Services) students as they mainstream them into our classes.

Summative Assessment

A summative assessment will be given using the benchmark test given at the end of each quarter. The San Carlos Middle School has this test scheduled to be given quarterly. It is devised by the school administrators. The content tested includes the Arizona State Standards covered during

this time period. Questions are based on the test devised by the Edmentum Study Island program. It consists of 25 multiple-choice questions that include diagrams, data tables, and word problems.

Any one of the differentiated class activities can serve as a form of assessment. Learning styles are unique characteristics that each student brings to the class.

Alignment with Standards

Arizona State Standards

Standards are based on the Arizona State Standards given by the Department of Education, Arizona. The standard that will be covered is 6.E2U1.9: Develop and use models to construct an explanation of how eclipses, moon phases, and tides occur within the Sun-Earth-Moon system (National Academies of Sciences, Engineering, and Medicine, 2012). When introducing the unit, the Arizona standard is revised so that students understand the meaning of it, and is worded with appropriate vocabulary. During this time, three to four student objectives are established. Ideally, objectives correlate with Bloom's taxonomy, which begins with basic to higher thinking skills. Student objectives will initiate with basic cognitive thinking skills, such as recalling and understanding what the presentation is about. The teacher will guide students' cognitive thinking skills so they apply, analyze, and create in reference to the context of each presentation. This means that Edmentum's Study Island lesson will entail basic cognitive thinking skills of recalling and understanding facts presented. The extensions coming from learning the moon phases will occur with presentations made on the Farmer's Almanac, the Apache moon phases, Creation Story, and the Lunar Influence made when planting seeds. During this time, students will display such cognitive skills as; applying, analyzing, and creating.

Culturally Responsive Principles

Because I am San Carlos Apache and have been brought up to respect the unique qualities people have, culturally responsive principles are ingrained in my teaching strategies. Using Apache folklore and tradition, as well as the language, when appropriate, has proven to maintain a conducive learning environment in class. This is not necessarily signified by achieving outstanding academic performance, but it definitely provides a respectful learning environment, so everyone learns.

A number of culturally responsive principles are interwoven in this unit on moon phases. An integral part of this unit is: one day will the Apache people need to plant and harvest Indigenous native plants? This may happen due to environmental changes that cause wild Indigenous native plants to diminish from the harvest areas. There may be diverse ethnicities who already use and produce a plentiful harvest of Indigenous native plants. So, Apache people have to establish a relationship within and among Indigenous communities. If collaboration within Indigenous communities is established, the growing pains experienced will lead to success, and initiatives will prevail.

This unit will also encourage students to understand themselves within broader communities. Students will realize that all ethnicities could possibly experience this same problem and that

they will need to grow their wild Indigenous native plants. Whether or not they use moon phases to grow plentiful and healthier crops will be the factor that ties ethnicities to their belief in respecting Mother Earth.

Traditional and/or cultural knowledge is included in this unit because students will be able to identify the five moon phase names in the Apache language. The inclusion of being able to pronounce local wild Indigenous plants for food or medicine will come with a wealth of traditional knowledge. This may serve as motivation for students to return to a traditional Western Apache diet. In the same respect, the Apache language is revitalized within the classroom and could lead students to seek out Apache language programs within the community or from their families. SC Middle school has an Apache language class, although it is not available to sixth-grade students; if presented to school officials, this may cause a change so students do receive the Apache language class. There is also an attempt by the San Carlos Apache Tribe to revitalize the language through the San Carlos Language Preservation Program. This program offers after-school activities that students may wind up participating in.

San Carlos Apache people are living in this technological society but still retain tradition. A struggle to exist in two societies nudges the San Carlos community to exist in a contemporary world. In teaching strategies for this unit, information that is not Apache-oriented is presented. Primarily, to question and probe the minds of students to contemplate the thought that San Carlos Apaches may one day have to plant their wild Indigenous native plants intrigues them to think outside the box. In that respect, the students are represented as contemporary, not only historical figures.

There are programs that exist on the San Carlos Apache Reservation that reflect the local Indigenous community. The San Carlos Apache Tribe has a program called the Traditional Western Apache Diet Program and the Language Preservation Program, as well as the Apache Culture Center. All of these programs encourage the return to Western Apache traditional values and language revitalization. These programs are unique due to the fact that there are not many resources that have been developed and available in the Apache language. Another unique factor is that Apaches still harvest and eat Indigenous native foods. Hypothesizing that one of these days, the Indigenous native foods may diminish makes it an ever more unique condition.

Resources

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