

Exploring Cultures through Fractions in Fry Bread and Filipino *Pandesal*

Writing a Research-Based Personal Essay

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CONTEXT

In an increasingly interconnected world, the appreciation of diverse cultures and their culinary traditions has become an integral part of our global society. Food serves as a powerful gateway to understanding different cultures, as it embodies the history, values, and identities of communities around the world. Bread is one of these foods that identifies the culture of a group of people.

Whichever way you slice it, bread is a delicious bite of culture. Customs and traditions are built around this dietary staple, folk beliefs and rituals permeate its preparation and consuming it is imbued with symbolism. The humble loaf is an identity, a way of life and a connection with others and to the past (Diab, 2021). Furthermore, bread has been part of human history for many centuries. This piece of food plays an essential role in the daily life of people from different cultures including the Apache and Filipinos. It has become a symbol of culture, history, hunger, wealth, war, and even peace. In many cultures, it becomes a staple food and has been key in human survival. Bread created the structure of modern-day society and has given order to the way of living.

The process of making a bread is not as easy as it is. It is like learning Mathematics. One of these processes is the scaling or measuring the ingredients. One needs to gather all the ingredients needed, namely: flour, water, salt, yeast and other ingredients. Get the exact amount of each ingredient needed, and once done have them mixed until the flour is converted into a stiff paste or dough, followed by baking the dough into a loaf.

This curriculum unit delves into the rich tapestry of two distinct cultures, Native American and Filipino, through the lens of a seemingly simple yet culturally significant aspect of their cuisines: fry bread and the Filipino *pandesal*. Fry bread, a staple in Native American cuisine, and Filipino *pandesal*, a popular snack in the Philippines, are both deep-fried dough-based treats. This curriculum unit explores the mathematical concept of fractions as a unique and insightful way to gain a deeper understanding of these cultures.

San Carlos Apache Reservation

It is believed that ‘Apache’ is the most famous name of any Native American people in the Grand Canyon State. ‘N’dee’ is their name for themselves – meaning ‘the People’. Encompassing 1.8 million acres, the San Carlos Apache Reservation spans Gila, Graham, and Pinal Counties – a landscape visitors find begins with panoramic views across saguaro-studded low desert, proceeding up through chaparral and high desert prairie – into thick forests of pine and fir trees above 6,000 feet.

The Apache tribe has a rich oral history. Its history has limited written accounts that are accessible to the community and to those who are outside the reservation. Their history is passed through word of mouth and looking at the situation of my students today, they have limited knowledge of who they are and have a narrow understanding of their culture. There is also a difficulty of finding of authentic Apache stories that are written that can be used in the classroom. Thus, it is one of the reasons of children forgetting their language and culture. Therefore, the passing of the history and culture of Apache among the different generations is forgotten overtime.

The rich culture of the Apache tribe is a part of their daily practices which include their language, sacred songs, dances, food, among others (Parezo, 2017).

The San Carlos Apache Reservation was established by executive order on November 9, 1871. Over one-third of the community's land is forested, which means covered with forest or reserved for growth of forests which is 175,000 acres, or wooded, area not classified as forest which is about 665,000 acres. Forest lands, with their jumbled topography, create a naturally superior habitat for many wildlife species causing elk, mule deer, turkeys, black bear and mountain lion to be at home on this reservation. A portion of the reservation is contiguous with the largest stand of ponderosa pines in the world.

The Apaches are descendent of the Athabascan family who migrated to the Southwest in the 10th century. Over time, many bands of Apache were relocated to the reservation from their traditional homelands, which once extended through Arizona and New Mexico.

Formerly nomadic, today's San Carlos Apaches continue their most ancient and sacred traditions – but have also found success with a telecommunications enterprise expanding off 'the Rez' to serve neighboring communities' high-tech needs. Known for its lakes, more than one-third is forest or woodland - drawing hunters, anglers, campers and hikers. Carefully managed logging continues in upper elevation ponderosa pine forests, a renewable source of income. Forestry here is carefully balanced with wildlife management to assure future generations of Apache hunters and visiting sportsman will find trophy elk, mule and Coues deer; Merriam's turkey, javelina, black bear and mountain lion – and all three species of quail: Gambel's, Scaled & Mearn's.

San Carlos Unified School District

The San Carlos Apache School District was established in the year 1965 and has around 1,550 students. It is one of the few districts in the state of Arizona that has a rich cultural heritage, which is essential to the way of life for the Apache.

The district lives with its mission to educate and empower students to become culturally responsive, global Nn'ee. Also, it is determined to be an effective student focused learning community graduating culturally confident citizens.

San Carlos Middle School

As a second-year 6th Grade Math teacher in San Carlos Middle School, I have seen that the administrators, teachers, and staff members contribute their best efforts to make San Carlos Middle School and the entire district a great place for Apache children to learn. The school is composed of 34 staff which includes the Principal, counsellor, teachers, paras, and custodians.

RATIONALE

I was a high school teacher for 19 years in my home country, the Philippines. I taught several subjects in which Mathematics was one of them. Like any other teacher teaching Mathematics, I encountered a lot of students who considered the subject as the most difficult among all the learning areas. It can be denied that there were students who were not able to meet the standards expected from them in their grade level. As a teacher, it was then imperative upon me to find interventions or different strategies to teach the subject in a manner that struggling students would

be able to cope with and eventually understand and master the subject matter. Fraction was one of those topics that students had problems to.

It is said that many students find fraction hard. When children start to have difficulty in math, it often begins when they are introduced to fractions. Before fractions, they may have only known counting numbers and the relationship between them and the set of objects they represent. Once fractions are introduced, students may feel overwhelmed and unable to visualize what a fraction represents. This may lead to math anxiety and cause students to retreat and not want to continue learning (The Dropkick Math Team, 2021). However, when a subject is introduced in a manner of relating it to real-life situations, somehow it would interest the learners.

Fractions are an indispensable part of our life and without even realizing it, we constantly use fractions in our day-to-day tidings. Whether it is $\frac{1}{2}$ a dozen bananas in your shopping list or baking a yummy chocolate cake with $\frac{3}{4}$ th cup of flour and $\frac{1}{4}$ th cup of milk, everything around us involves fractions (Khan, 2021). Thus, in making a fry bread and a *pan de sal*, fraction is used. This curriculum unit intends to increase the knowledge of the 6th grade students on San Carlos Middle School about fraction by applying in real-life situations like in baking or making a Fry Bread. This also allows them to deepen their understanding on the relevance of fry bread to their culture, and at the same time knowing the Filipino culture through *pan de sal*.

Topic Summary

Pre-K–8 mathematics instruction should provide students with a strong sense of number. However, more than occasionally, schools and school districts limit their expectations for students to proficiency with whole numbers. Although I agree that such proficiency and deep understanding are absolutely essential, I believe that work with fractions is equally important (Fenell, 2007). Students need opportunities to work with a variety of representations of fractions, including set and region models. They need to develop a concrete realization of a fraction. Just as they use counters to help anchor a mental image of a whole number, they can use number lines to show how a fraction (or decimal or percent) can be inserted between any two fractions, Number lines allow comparisons of fractions, decimals, and percentages and also serve as measurement or iteration models for computation (Fenell, 2007). Having said that, it becomes one good strategy to incorporate fraction in baking of a fry bread and *pan de sal*.

Fenell (2007) further stated that:

“As students develop a sense of fractions, they will also recognize that they must approach the ordering of a set of fractions such as $\frac{7}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, and $\frac{9}{8}$ differently from a set such as $\frac{3}{5}$, $\frac{3}{7}$, $\frac{3}{4}$, and $\frac{3}{8}$. Such experiences provide students with the background that they need to begin finding common denominators, creating equivalent fractions, and adding and subtracting fractions. Students also need to understand what really happens when they multiply and divide fractions. Far too many students are adept at carrying out these procedures without understanding that products typically get smaller when they multiply fractions and that quotients get larger when they divide them. Experiences with rate and proportion provide middle-grades students with everyday situations that involve fractions as well as contextual links to algebra.”

In other words, proficiency with fractions is an important foundation for learning more advanced mathematics. Fractions are a student's first introduction to abstraction in mathematics and, as such, provide the best introduction to algebra in the elementary and middle school years. Time and emphasis are necessary for students to develop the links among fractions, decimals, and percentage, and solve problems involving their use (Fenell, 2007).

This curriculum unit has three primary objectives, namely: (1) develops mastery in solving problems involving fractions; (2) apply real-life applications in developing the skill in fraction through the use of fry bread and *pandesal*; and (3) deepen the students' understanding and appreciation of their culture through writing about their experiences in making and eating fry bread.

Aside from these objectives, this curriculum unit aims to foster among 6th grade students to engage in hands-on cooking exercises, honing their mathematical skills by precisely measuring ingredients using fractions. They will develop a practical understanding of how fractions are used to maintain consistency, texture, and flavor in these recipes. Also, students will meticulously examine the historical origins of Native American fry bread and Filipino *pandesal*, tracing their roots back to ancestral practices and exploring the unique cultural narratives that have contributed to their evolution. Lastly, through historical exploration and cultural analysis, students will appreciate the integral role these dishes play in the identities and traditions of Native American and Filipino communities. They will gain insight into how these foods are often intertwined with stories of resilience, survival, and adaptation.

Fractions are a fundamental mathematical concept, and their application in cooking is practical and widespread. By analyzing fractions within these recipes, this unit does not only bridge the gap between mathematics and culture but also demonstrates the real-world relevance of mathematical concepts.

This unit embodies an interdisciplinary approach, combining mathematics and cultural studies. By connecting seemingly unrelated fields, we can gain a more holistic understanding of both the mathematical precision and cultural importance of these dishes, fry bread and *pandesal*.

Upon learning fractions through the use of fry bread and *pandesal*, the culture of Apache and Filipino are both given importance. Food is a universally relatable aspect of culture. It is beneficial to know the history of both fry bread and *pandesal*.

November 17 is National Homemade Bread Day, and bread is one food that knows no cultural bounds. However, this holiday is also a reminder of the darker history behind one of the breads that is typically recognized as a traditional Native food, Indian frybread. Frybread was created 155 years ago as a way to survive, and after three generations, a Native American food movement is gaining momentum to put this food in its proper place in history and shift its reputation as traditional Native food (Tapia, 2019).

Rafael Tapia, Jr. further states that frybread is typically made out of white flour mixed with water, baking powder or yeast and a sprinkle of salt, which is then deep-fried in oil or lard. It can be eaten alone or with powdered sugar, honey or other toppings. Frybread is also used in Indian tacos with

beef, and depending on the cook, a mixture of cheese, lettuce, and beans might be placed on top of the flat fried bread.

Most Americans consider frybread a traditional Native food, and while this may be true given its origins, it is not an accurate description of its historical roots. The Navajo created frybread in 1864 when the U.S. government initiated the reservation system and food commodities for the tribes after disrupting their way of life. At the time, the Navajo who had been living in Arizona were forced to make the “Long Walk” and relocated to Bosque Redondo, New Mexico — a treacherous 300-mile walk that led to hundreds dying. In fact, ethnic cleansing in the U.S. led to many tribes being removed from their ancestral homelands, and the history of frybread is directly linked to this trauma and the Native fight for survival. In later years, boarding schools adopted frybread as a part of the meals served to Native children, and it is even served in present day.

Such commodity “food” was unknown to the Navajo since their traditional foods consisted of fresh vegetables, fruits and lean meat such as venison. Processed foods were not consumed by the Navajo people, and therefore, conditions such as diabetes were not a factor in their lives. The consequences of a commodities diet include high rates of diabetes, cardiovascular, and other life-threatening health issues that can be traced back in U.S.-Native history. Ultimately, processed food was just one more method used in ethnic cleansing, yet the Native people were able to take this threat and instead use it to survive. This incredible story is one that should be remembered each time we bite into a freshly cooked piece of fluffy frybread topped with honey.

Just like the frybread, the Filipino *pandesal* has an interesting and long story, too. While the Philippines doesn't officially have a national bread, if it did, it would be *pandesal*. A soft and airy flour roll, *pandesal* which is sometimes spelled out as "*pan de sal*" is Spanish for "salt bread." However, contrary to its name, the bread is actually relatively sweet. The yeast-raised bread is similar to the Mexican bolillo, and is the breakfast bread of choice throughout the Philippines (Shah, 2016).

All Filipinos eat *pandesal*. It's not only a food for the poor. *Pandesal* is essentially a Philippines history lesson in bread form, though its origin stories are a bit murky. Until the Portuguese arrived in the Philippines, the indigenous diet was primarily focused on rice. Wheat isn't native to the country. The majority of Filipino historians agree that the earliest version of wheat-based bread was introduced by Portuguese explorers and early settlers in the 1500s.

Pandesal is typically consumed as part of the first, simpler meal Filipinos sit down to before a heartier breakfast known as *almusal*. During the earlier morning meal, *pandesal* is frequently consumed plain with a cup of black coffee or hot chocolate for dipping. Just like the fry bread which is usually topped with honey, the *pandesal* also lends itself well to a number of spreads, the most popular of which are coconut jam, peanut butter, and butter or margarine (often with a sprinkle of sugar).

By examining the fractions involved in making fry bread and Filipino *pandesal*, we can uncover hidden layers of cultural significance within these recipes. Understanding the mathematics behind these dishes can provide insights into the precision and heritage embedded in their preparation, much more in their history, relevance to the people and community in general.

Native American and Filipino cultures are rich and diverse, and their traditional cuisines are an essential part of their heritage. By delving into the fractions within these recipes, we contribute to the preservation and appreciation of these cultures, ensuring that their culinary traditions are passed down to future generations.

Educating the students about the significance of different cultures and their cuisines fosters tolerance, respect, and a sense of global interconnectedness. Exploring cultures through food and mathematics offers an engaging and accessible method for the Apache students to learn about and appreciate diversity.

By the end of this comprehensive curriculum unit, students will have a multifaceted understanding of the cultural, historical, culinary, and mathematical dimensions of Native American fry bread and Filipino *pandesal*, which they will apply to create a rich and nuanced narrative of these cultures.

Teaching Strategies

Teaching math to 6th-grade students can be a dynamic and engaging experience when coupled with cultural exploration and real-world application. The curriculum unit "Frybread and Fractions - Exploring the Mathematics of Traditional Apache Culture" offers a fantastic opportunity to blend mathematical concepts with the rich heritage of the Apache people. To make this journey exciting and impactful, several strategies can be employed to cater to diverse learning styles and maximize student engagement.

1. *Cultural Immersion through Storytelling*: Introduce the unit by sharing traditional Apache stories that revolve around frybread and its cultural significance. This strategy helps create a connection between students and the cultural context while sparking their curiosity about the mathematical aspects of the topic.

Cultural immersion's goal is to create learning opportunities and facilitate deeper connection points between people who don't normally interact with one another. Its blend of learning and relationships serves as a missing link necessary to drive diversity, equity and inclusion forward (Wolff, 2023).

2. *Hands-On Fraction Activities*: Utilize tactile learning experiences to enhance understanding of fractions. Provide manipulatives like pizza slices or paper cutouts to physically demonstrate fractions as parts of a whole. Students can manipulate these objects to visualize and compare fractions, fostering a deeper grasp of the concept.

Understanding fractions is a critical foundation of math learning. But despite their daily frequency in our lives, fractions can be difficult to grasp. Not surprisingly, research shows that to master fractions, students need multiple opportunities to practice with many varied representations of fractions (Quick, 2023).

Using a recipe and well-marked measuring cups and spoons is a great introduction to fractions in the most practical way. For instance, in making fry bread or *pandesal*, or just simply knowing the exact amount of ingredients to be used is something that will motivate the students to get involved

in the process, and in the learning instruction. This kind of learning is the best—it's hands-on, and it's real.

3. *Virtual Field Trips and Guest Speakers:* Leverage technology to take students on virtual field trips to Apache reservations or cultural centers. Invite guest speakers, such as members of the Apache community or experts on Native American culture, to provide firsthand insights into the importance of frybread and its connection to fractions.

4. *Frybread-Making Demonstration:* Organize a frybread-making demonstration where students can witness the cooking process while discussing the fractions involved in ingredient measurements. This interactive experience bridges the gap between fractions in math and fractions in real-life cooking.

The word demonstration means to give demos or to perform the activity or concept. In the demonstration method, the teaching-learning process is carried in a systematic way. Demonstration often occurs when students have a hard time connecting theories to actual practice or when students are unable to understand applications of theories (Aqsam, 2020).

Aqsam (2020) further states that in order to make the success of the demonstration method, three things are necessary, namely: (1) The object being displayed during the demonstration should not be so small; (2) During the demonstration, clear language should be used so that pupils may understand the concept easily; and (3) The students should be able to question teachers in order to remove their difficulties.

5. *Collaborative Cooking Projects:* Divide students into small groups and challenge them to prepare frybread using recipes that involve fractions. This activity not only reinforces fraction concepts but also promotes teamwork, communication, and culinary skills.

As mentioned in the ClickView site:

“Subject or topic information can be more effective when it comes from peers. Collaborative learning encourages this social aspect of education and enhances student understanding. The group nature of collaborative learning also promotes interactions. Students are organized in flexible groupings, either at random or by the teacher, to reflect mixed academic ability or shared interests. By collaborating on and building a shared playlist of videos, for example, educators share inspiration to develop high-quality resources for their classes.”

6. *Problem-Solving with Frybread:* Present real-world scenarios related to sharing frybread among friends and family. Task students with solving these problems using fractions, encouraging them to think critically and creatively while applying mathematical concepts to practical situations.

Using problem solving as a teaching strategy can engage students in developing deep understanding of important concepts and principles, developing skills relevant to authentic future applications (Killen, 2009) despite the difficulty and time preparation involved in designing appropriate, relevant problems.

Active and purposeful engagement in learning is the result of effective use of problem solving. Students expand their ability to reason, analyze situations and make objective judgements. Problem solving develops critical thinking, and reflecting skills as students develop strategies for evaluating the problem and the effectiveness of their thinking when considering the problem (Michalewicz et al., 2012). Critical analysis establishes deeper understanding of multiple factors considerable when problem solving.

Developing deeper understanding of concepts challenges students to work within their zone of proximal development, Vygotsky's Social Development learning theory (Daniels, 2001;2005) suggesting children learn most effectively when challenged to work just beyond their current skill level. Appropriately challenging problems can encourage students to continue learning long after the formal lessons, and students learn to remember important ideas providing a foundation for students to transfer their knowledge and understanding of concepts and principles to other situations.

7. *Cultural Art Integration*: Combine art and math by having students create visual representations of frybread or *pandesal* and fractions. They could design fraction-based artwork inspired by Apache patterns and symbols, adding an artistic dimension to their learning.

8. *Fraction Games and Puzzles*: Design math games and puzzles centered around frybread fractions. This strategy makes learning engaging and enjoyable, while students challenge themselves to solve problems involving fractions in a fun context.

Puzzles and games have multiple uses in education. They provide an interactive and engaging way for students to learn and apply various skills and concepts. By incorporating puzzles and games into the curriculum, educators can promote critical thinking, problem-solving, and decision-making abilities. These activities also enhance memory retention and improve cognitive skills. Moreover, puzzles and games foster collaboration and teamwork among students, as they often require cooperation and communication. Additionally, puzzles and games can be tailored to specific subjects and learning objectives, making them versatile tools for teaching various topics. Overall, the use of puzzles and games in education not only makes learning enjoyable but also facilitates the development of essential skills in students (Simmons, 2023).

9. *Cross-Curricular Connections*: Integrate language arts by having students write short essays or a short reflection that explore the cultural significance of frybread. Social studies can be linked by discussing the broader context of Native American history and traditions.

Since this curriculum unit is also integrating ELA, particularly writing, the students are expected to write in few sentences their experiences about the relevance of fry bread in their personal lives. They could also write short stories about it.

10. *Culminating Cultural Fair*: Culminate the unit with a cultural fair where students present their projects, demonstrating what they've learned about frybread, fractions, and Apache culture. This fair can include visual displays, presentations, performances, and even a sampling of traditional foods.

11. *Reflection and Discussion*: Regularly engage students in discussions about their discoveries, insights, and connections made during the unit. This reflective practice encourages metacognition and solidifies their understanding of both mathematical and cultural concepts.

12. *Virtual Reality Exploration*: Utilize virtual reality (VR) technology to immerse students in a virtual Apache community where they can interact with historical artifacts, learn from virtual guides, and even virtually experience cooking frybread.

13. *Math Journaling*: Incorporate journaling as a reflective tool for students to document their learning journey, observations, questions, and personal connections between fractions and the Apache culture.

Journaling is the practice of recording on paper a collection of thoughts, understandings, and explanations about ideas or concepts, usually in a bound notebook. Teachers ask students to keep journals, with the understanding that students will share their journal with the teacher.

Teachers can use journaling as a kind of window into how students are thinking about what they are learning. Student journals can be an important source of information about learning difficulties, misconceptions, strengths and weaknesses, and metacognition. The act of transferring thoughts, ideas, and feelings into written words also encourages students to examine their own thought processes. It is a private record of students' thoughts that provides a safe way of communicating with the teacher, giving teachers insight into those thoughts (Teacher Vision, 2019).

14. *Family Involvement*: Encourage students to involve their families by sharing their experiences, projects, and newfound knowledge about frybread and fractions. This strategy fosters community engagement and reinforces learning beyond the classroom.

Vygotsky's theory of social development, which emphasizes culture, language, and internalization, arguably represents the most complete, original, and coherent view available. In Vygotsky's system, children's cognitive development is affected by culture in two ways. First, children acquire most of their knowledge (the contents of thought) through culture. In addition, not only does culture teach children what to think but also how to think. Intellectual growth emerges out of a dialectical process in which problem-solving experiences are shared with parents, teachers, siblings, peers, etc. Children can solve some problems by themselves, yet other more challenging problems require help from social agents (Science Direct, 2023). In other words, family involvement and the community as well is very essential in the student's acquisition of learning, most especially in understanding their culture, and in mastery of fraction.

15. *Guided Practice "I Do, We Do, You Do"*: The I do, we do, you do method provides four clear steps for guided practice. It can be used as the basis for lesson plans or a guide when teachers have a student struggling to understand a concept.

The first step is "I Do" or modelled instruction. Modelling gives learners the opportunity to understand the task and gather initial details about how it would be performed. Learners are not necessarily passive in this stage. Learners should be reflecting and actively thinking while they watch the teacher modelling the information. Leave time for students to ask questions at the end of each step in your modelling.

The second stage is the “We Do” wherein the students participate in ‘shared practice’. Students work in groups or pairs to support each other through the learning process. Often, this will involve re-doing the modelling stage (Step 1) while the teacher and teachers’ assistants work to elicit students’ input as much as possible.

At this stage, teachers might want to consider: (1) Asking students for their shared input on a plan for completing the task; (2) Asking students to recall and predict the next steps in the step-by-step process of completing a task; (3) Asking students to debate, discuss or question elements of the process, such as debating which approach is best way for completing a sub-task; and (4) Encouraging groups to practice through play-based learning.

The ‘you do’ stage (which is the last stage) of this gradual release of responsibility model is the first in which the individual student takes most of the control of the learning process. In this stage, the student does their best to complete the task on their own. However, the teacher is present to patiently support students’ learning. Teachers and assistants can walk around the classroom giving guidance to any students who need it.

The students should reach a point of independent practice where they are freely able to complete the task on their own. The teacher should have the students create a final product that they can display around the classroom; assign practice of the task or activity as a homework or study task; ask students to complete the task in a new environment or with a slightly different twist to promote competency across unfamiliar contexts; and encourage enjoyment of the task to promote motivation (Drew, 2023).

Thus, the teacher will use this teaching strategy not only the delivery of the learning instruction but more importantly in doing the tasks – problem-solving, hands-on activity, writing reflection as such.

By employing these strategies, the curriculum unit "Frybread and Fractions - Exploring the Mathematics of Traditional Apache Culture" can create a rich and multifaceted learning experience that not only enhances mathematical proficiency but also nurtures cultural awareness, critical thinking, and a lifelong appreciation for diverse traditions.

Classroom Activities

Engaging 6th-grade students in the curriculum unit "Frybread and Fractions - Exploring the Mathematics of Traditional Apache Culture" involves hands-on activities that combine math, culture, and real-world application. These activities are designed to make learning meaningful and memorable, fostering a deep understanding of fractions while immersing students in the rich heritage of the Apache people. Here are three specific classroom activities to enhance the learning experience:

Activity 1: "Frybread Fraction Feast" Cooking Challenge

Objective: To apply fraction concepts while preparing frybread, reinforcing the relationship between fractions and real-world scenarios.

Materials:

Frybread recipe and ingredients (flour, water, baking powder, salt, oil)

Measuring cups and spoons

Mixing bowls

Cooking utensils

Instructions:

1. Begin by introducing the activity and discussing the cultural significance of frybread in the Apache community.
2. Divide the students into small groups and provide each group with the frybread recipe and ingredients.
3. Have each group work together to measure and mix the ingredients, paying attention to the fractions involved in the recipe. Guide them to discuss concepts like $\frac{1}{2}$ cup, $\frac{1}{4}$ teaspoon, etc.
4. While the frybread dough is being prepared, engage the students in a discussion about fractions in cooking. Ask questions like, "How can we divide the dough into equal parts?" or "If we have to make multiple batches of frybread, how can we scale the recipe using fractions?"
5. Once the dough is ready, guide each group to shape and fry their frybread. Emphasize the importance of even sizes to ensure fair sharing.
6. As the frybread cooks, challenge the students with scenarios like, "If you have 8 pieces of frybread and you want to share them equally among 4 friends, how much will each person get?"
7. After cooking, allow the students to enjoy the fruits of their labor while discussing their experiences with fractions and cooking.

Activity 2: "Frybread Fraction Problem-Solving"

Objective: To practice problem-solving skills by using fractions to solve real-world scenarios related to frybread sharing.

Materials:

Frybread images or cutouts (divided into fractions)

Problem-solving scenarios (worksheet or projected on the board)

Instructions:

1. Begin by reviewing the concept of fractions and their relevance to cooking and sharing.
2. Provide each student with images or cutouts of frybread that are divided into various fractions (e.g., halves, quarters, eighths).
3. Introduce a series of problem-solving scenarios, such as: "You have $\frac{2}{3}$ of a frybread. If you want to share it equally with a friend, how much will each of you get?"
4. Have students work individually or in pairs to solve these scenarios using the frybread visuals. Encourage them to draw, shade, or label the fractions to represent their solutions.

5. Share and discuss the solutions as a class, allowing students to explain their thought processes and strategies.

Activity 3: "Apache Fraction Art and Culture Showcase"

Objective: To integrate art, cultural exploration, and fraction understanding through creative projects inspired by Apache patterns and traditions.

Materials:

Art supplies (paper, colored pencils, markers, paints)

Images of Apache patterns and symbols

Information about Apache culture and symbolism

Instructions:

1. Begin by discussing the significance of patterns and symbols in Apache culture, particularly in textiles and art.
2. Show students images of Apache patterns and symbols, explaining their meanings and cultural contexts.
3. Explain that students will create their own artwork inspired by Apache patterns, incorporating fractions as a central theme.
4. Provide art supplies and ask students to design their fraction-based artwork. For example, they could create a patterned background using different fractions of shapes and colors.
5. After completing their artwork, have students write a short explanation of the fractions they used and how these fractions contribute to the overall design.
6. Organize a classroom "Apache Fraction Art and Culture Showcase" where students display their artwork and explain their artistic choices and fraction usage to their peers.

These classroom activities enhance the learning experience by making the concepts of fractions tangible, applicable, and culturally enriched. By cooking frybread, solving real-world problems, and creating fraction-based artwork, students are actively engaged in exploring the connections between math and Apache traditions. These activities not only reinforce mathematical skills but also promote critical thinking, collaboration, and an appreciation for the diverse world around them.

Student Assessment Plan

Asking students to demonstrate their understanding of the subject matter is critical to the learning process; it is essential to evaluate whether the educational goals and standards of the lessons are being met.

Assessment is an integral part of instruction, as it determines whether or not the goals of education are being met. Assessment affects decisions about grades, placement, advancement, instructional needs, curriculum, and, in some cases, funding. Assessment inspire us to ask these hard questions: "Are we teaching what we think we are teaching?" "Are students learning what they are supposed to be learning?" "Is there a way to teach the subject better, thereby promoting better learning?"

Today's students need to know not only the basic reading and arithmetic skills, but also skills that will allow them to face a world that is continually changing. They must be able to think critically, to analyze, and to make inferences. Changes in the skills base and knowledge our students need require new learning goals; these new learning goals change the relationship between assessment and instruction. Teachers need to take an active role in making decisions about the purpose of assessment and the content that is being assessed (Edutopia, 2008).

By the end of this curriculum unit, students will have gained a deep understanding of the cultural, historical, culinary, and mathematical aspects of Native American fry bread and Filipino *pandesal*. The assessment plan aims to measure their knowledge and skills in these areas.

This unit considers the formative and summative types of assessment and also performance-based tasks.

Task: Analyze the fractional measurements used in either the fry bread or *pandesal* recipe.

Guidelines:

- Select one of the recipes and break down its ingredients and fractional measurements.
- Explain how each fraction contributes to the dish's taste, texture, and consistency.
- Reflect on the role of precision in using fractions in cooking.

Assessment Criteria:

- Thorough understanding of fractional measurements.
- Analysis of the impact of fractions on the dish.
- Reflection on the role of precision.

Culinary Workshop (Group - 20%) - In-class Activity:

Task: Students will participate in a culinary workshop where they will prepare both fry bread and *pandesal*, applying fractional measurements.

Guidelines:

- Work in assigned groups to prepare the dishes following the provided recipes.
- Use fractional measurements accurately and maintain precision throughout the cooking process.
- Document the experience, noting challenges and successes related to fractions in cooking.

Assessment Criteria:

- Accuracy in using fractions in the recipes.
- Successful preparation of both dishes.
- Documentation of the cooking experience.

Analysis (Individual - 15%) - 250 words:

Task: Compare and contrast the use of fractions in both fry bread and *pandesal* recipes.

Guidelines:

- Identify similarities and differences in the application of fractions.
- Discuss how cultural and culinary factors may influence these differences.
- Reflect on the significance of fractions in each dish.

Assessment Criteria:

- Insightful comparison and contrast of fractional use.
- Consideration of cultural and culinary influences.
- Reflection on the significance of fractions.

Culinary Showcase (Group - 20%) - In-class Presentation:

Task: Culminate the assessment by participating in a culinary showcase where students will present both fry bread and *pandesal* dishes.

Guidelines:

- Work in groups to prepare and present the dishes.
- Explain the cultural and historical significance of each dish.
- Emphasize the role of fractions in maintaining precision and authenticity.
- Reflect on what has been learned about the cultures and fractions in cooking.

Assessment Criteria:

- Quality of the presentation.
- Precision in culinary preparation.
- Depth of cultural and historical insights.
- Reflection on cultural awareness and mathematical skills.

Self-Assessment and Reflection (Individual - 10%) - 200 words:

Task: Each student will write a reflection on their personal growth and learning throughout the curriculum unit.

Guidelines:

- Reflect on the cultural, historical, and mathematical aspects of the unit.
- Consider how your understanding of fractions in cooking has evolved.
- Discuss any challenges faced and how they were overcome.

Assessment Criteria:

- Depth of reflection and self-assessment.
- Demonstrated growth in understanding cultural, historical, and mathematical aspects.
- Insight into personal challenges and growth.

Overall Assessment:

Excellent (90-100%)

Good (70-89%)

Satisfactory (50-69%)

Unsatisfactory (<50%)

This comprehensive assessment plan combines individual and group work, written essays, practical cooking exercises, and presentations to ensure that students gain a deep and multifaceted understanding of the cultural and mathematical dimensions of Native American fry bread and Filipino *pandesal*. The inclusion of self-assessment and reflection encourages students to take ownership of their learning, fostering a deeper appreciation for cultural diversity and culinary traditions.

The assessment criteria have been designed to measure students' performance in research, analysis, culinary skills, and cultural awareness, providing a well-rounded evaluation of their knowledge and skills developed throughout the curriculum unit.

Alignment with Standards

This unit considers the standards that are aligned to the curriculum's objective. The use of the standards will be according to the content being discussed. However, one or more than one standard will be used in a content, considering that ELA is integrated. The learning standards are from the following sources: (a) Arizona Mathematics Standard 6th Grade; and (b) Arizona's English Language Arts Standards 6th Grade; and SCUSD Safety Nets Standard Mapping Guide.

Aligning The curriculum unit, "Exploring Exacting Cultures through Fractions in Fry Bread and Filipino *pandesal*," with Math standards is crucial to ensure that it meets educational objectives and aligns with established learning goals. Here, we will explore how the curriculum unit aligns with key math standards, emphasizing the mathematical concepts and skills students will acquire.

SCUSD Safety Nets Standard Mapping Guide

(6.NS.B.2, 3) Compute fluently with multi-digit numbers and find common factors and multiples; 2. Fluently divide multi-digit numbers using a standard algorithm; and 3. Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.

Arizona Mathematics Standard 6th Grade

(6.NS.A)Apply and extend previous understanding of multiplication and division to divide fractions by fractions.

Interpret and compute quotients of fractions to solve mathematical problems and problems in real-world context involving division of fractions by fractions using visual fraction models and equations to represent the problem. For example, create a story context for $\frac{2}{3} \div \frac{3}{4}$ and use a

visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $2/3 \div 3/4 = 8/9$ because $3/4$ of $8/9$ is $2/3$. In general, $a/b \div c/d = ad/bc$.

(6.NS.B) Compute fluently with multi-digit numbers and find common factors and multiples.

(6.NS.B.2) Fluently divide multi-digit numbers using a standard algorithm.

(6.NS.B.3) Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.

(6.NS.B.4) Use previous understanding of factors to find the greatest common factor and the least common multiple.

a. Find the greatest common factor of two whole numbers less than or equal to 100.

b. Find the least common multiple of two whole numbers less than or equal to 12.

c. Use the distributive property to express a sum of two whole numbers 1 to 100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9+2)$.

Arizona ELA Standards 6th Grade

(6.W.2) Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

a. Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate transitions to clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from the information or explanation presented.

(6.W.3) Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences.

a. Engage and orient the reader by establishing a context and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically.

- b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters.
- c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one-time frame or setting to another.
- d. Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events.
- e. Provide a conclusion that follows from the narrated experiences or events diverse cultures and culinary traditions.

(6.W.5) With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 6.)

As the More Knowledgeable Other, the teacher should be guiding the students in writing their narratives and reflections regarding their experiences with the frybread. Aside from mastery of fraction, their writing skill is also developed.

(6.W.6) Use technology, including the internet, to type and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to complete a writing task in a single sitting.

(6.W.8) Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

(6.W.10) Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Resources

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