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ABSTRACT

The Heard Museum (Phoenix, Arizona) has developed and updated an integrated curriculum for use in grades K-3. The goals for this curriculum are to: (1) share museum resources with schools; (2) promote cross-cultural understanding through a focus on rain, a universal requirement for life; (3) help students understand that Native Americans are contemporary people maintaining identity and values in the modern world; (4) develop an awareness of the varied expressions of rain in the art, literature, and customs of the native people of the greater southwest; and (5) use culturally specific materials as a vehicle for developing essential skills, especially as they relate to the Arizona Student Assessment Program. The curriculum may be used in any order. This unit contains: (1) art prints of artifacts in the Heard Museum collection related to rain; (2) specific cultural information and materials relating to a particular Native American tribe or nation featured through the art prints this cultural information is the basis for some of the lessons in mathematics, science, and language skills; (3) mathematics lessons with a special emphasis on measuring and comparing; (4) science lessons, usually hands-on or observational units; (5) language skills, including reading, listening comprehension, writing, vocabulary, and poetry skills; and (6) art projects. (BT)

USING THE RAIN

After the Rain:

Heard Museum
2301 North Central Avenue
Phoenix, Arizona 85004-1323

http://www.heard.org/rain/rain_pdf_main.html

Updated 2001

Introduction

The Heard Museum has developed this integrated curriculum for use in schools in grades K through 3. The overriding goals for this program are to:

- 1. Share museum resources with schools;
- 2. Promote cross-cultural understanding through a focus on rain, a universal requirement for life on earth;
- 3. Help students to understand that Native Americans are contemporary people maintaining identity and values in the modern world;
- 4. Develop an awareness of the varied expressions of rain in the art, literature and customs of the native peoples of the Greater Southwest;
- 5. Use culturally specific materials as a vehicle for developing essential skills, especially as they relate to the Arizona Student Assessment Program.

This curriculum is divided into six units that can be used in any order.

Each unit contains:

- 1. **Art Prints** of artifacts in the Heard Museum collection related to rain. While these prints are used for art history and aesthetics lessons, these artifacts are also used to begin lessons in math, science and language skills.
- 2. **Specific cultural information and materials** relating to a particular Native American tribe or nation featured through the art prints. This information includes a map, text from the RAIN exhibit applicable to the people, and other information of special interest to children. This cultural information is the basis for some of the lessons in math, science and language skills.
- 3. **Math lessons** with a special emphasis on measuring and comparing.
- 4. **Science lessons**, usually hands-on or observational units.
- 5. **Language skills**, including reading, listening comprehension, writing, vocabulary and poetry skills.
- 6. **Art projects**

This K-3 curriculum was developed teachers by Arlene Old Elk (Dine') and Jackie Stoklas during a year-long residency at the Heard Museum, made possible by the Lila Wallace-Readers Digest Museum Accessibility Fund. Additional information was developed by the Heard Museum Education Department staff.

Rain

The Southwest United States and Northwest Mexico exist in a rain shadow cast by mountain ranges to the west. Rainfall is light and undependable. There are two rainy seasons: summer and winter. Often, summer rains are brief and highly localized, as clouds suddenly boil up from the south in the afternoon and early evening. Winter storms come from the Pacific Ocean and may arrive in waves, soaking the ground. In higher elevations, the rain becomes snow. In between these two seasons are dry periods, when great care must be taken to ensure life and growth until the next rain.

The indigenous people of the Southwest welcome rain into their lives and land, praying for the blessing of rain through a variety of ceremonies and creative expressions. Many expressions of rain and water focus on rain's connection to making life and growth possible. Expressions may be enduring, such as embroidered figures on a ceremonial garment. Some are intended to be temporary, such as body paint on a ceremonial participant or the pigments of a sand painting. Other expressions take the form of music, song, oratory, poetry, and prayer.

For all of the cultures in this exhibit, rain has deep meanings that reflect a culture's unique experience with the universe. This deep spiritual relationship is far from the stereotype of the "Indian Rain Dance", or feeble jokes suggesting a superficial and simplistic magic.

As you look at specific designs or symbols, please remember that they are part of a whole and have meaning as part of that whole. Expressions of rain span centuries. Some of the forms change, but the intent of people to bring the blessings that come from rain into their lives and the world remains unchanged.

ARTS

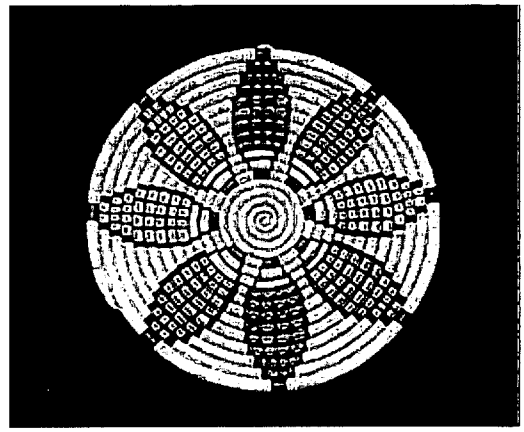
Make a Cornfield

Activity: Students in a class work together to create their own cornfield.

Focus Activity: Look at the growing corn in Coil Plaque by Lucinda Palevooyonma (Hopi).

Outcomes: Students will create their own cornfield with different types of corn.

Vocabulary: ears, stalks, cobs



Materials: copies of corn cobs, crayons or markers, scissors, upright sticks wrapped with green paper (for stalks), stapler or tape

Procedure:

1) Each child should color two ears of corn.

2) Children must make their ears different types of corn.

3) Just as on an actual plant, stalks should carry only one type of corn. Thus, all red ears are grouped together; all yellow ears are grouped together, all multi-colored corn is grouped together; etc..

4) After coloring, cut out each ear.

5) Staple or tape the ears to free-standing green sticks to make a field.

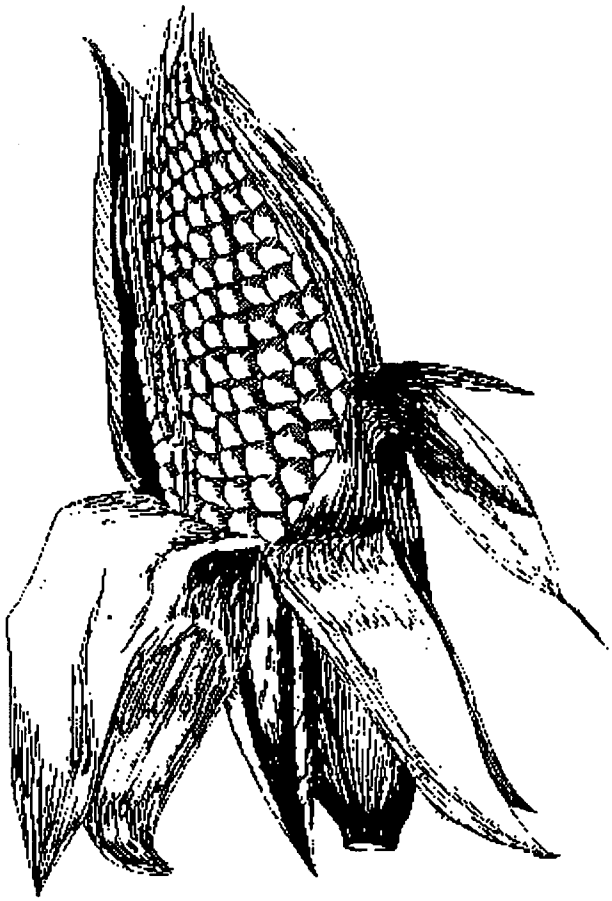
Assessment:

1) Do the students understand that the Hopi people use various colors of corn?

2) Do the students understand that all colors of corn are edible?

Extension:

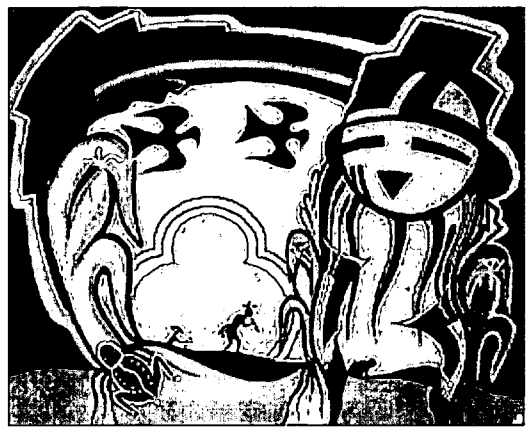
- Share recipes for various corn dishes



Cornhusk Doll

Activity: Children make a cornhusk doll.

Focus Activity: Look at the art print "Frog, Sun, Flute Player, and Bird" by Milland Lomakema (Hopi). Notice that the corn cob is surrounded by leaves or husks. In the picture, the husks are green. When the husk dries, it turns a golden yellow.



Outcomes: Students will make a doll out of cornhusks.

Vocabulary: husk

Materials: instruction sheet, cornhusks (available in the Mexican food section of the grocery store), yarn (cut into 5-6 inch lengths), warm water to soak the husks, scissors

Procedure:

1) Begin this activity by discussing the origins of this type of doll. Cornhusk dolls were **not** made by the Native American peoples of the Southwest. Cornhusk dolls were and still are made by the **Iroquois** people (**Mohawk, Oneida, Onondaga, Cayuga, Seneca and Tuscarora**) of northern New York state. This is an excellent time to explain that corn (along with beans and squash) was the most important food for the Native American farmers.

2) Soak the cornhusks in warm water until they are pliable (5 minutes)

3) Using the diagram, make a doll.

4) To make a boy, omit the shawl (steps 8 through 10). Instead:

8) Tie yarn under the arms to form a waist.

9) Separate the cornhusk below the "waist" into two bundles to form two legs. Tie yarn around each "ankle."

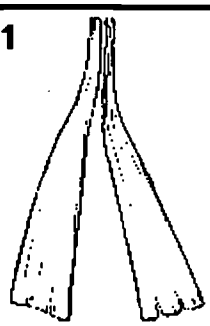
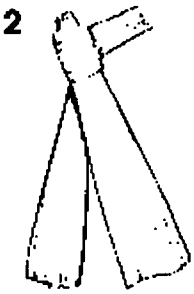
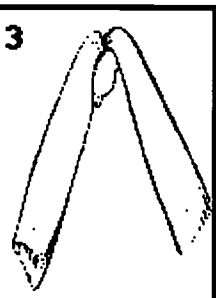
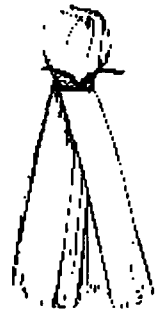
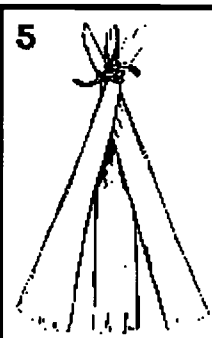
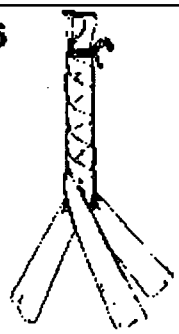
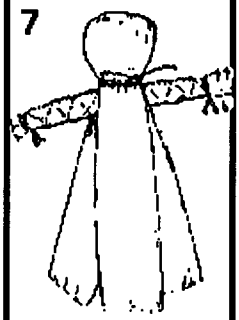
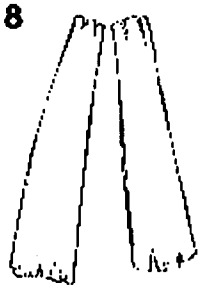
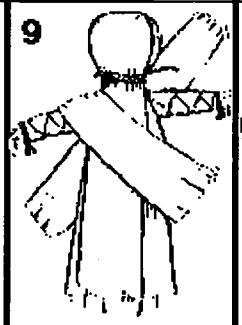
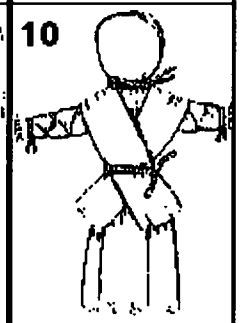
Assessment:

1) Could each student follow the instructions and make a doll?

Extension:

- Discuss some other uses for cornhusks (e.g., tamales).

How to make a cornhusk doll

1  Moisten cornhusks. Hold the ends of 2 cornhusks together.	2  Wrap another cornhusk around the ends to hold them together. Make a big lump when you do it.	3  Fold the husks down over the lump.	4  Tie the folds with a piece of yarn. This makes the doll's head.	5  Split a cornhusk into three parts. Tie the strips together at one end.
6  Braid the three strips together. Tie the other end to make the hands and arms.	7  Position the arms between the first two husks and under the head.	8  Split one more husk into two parts.	9  Fold one part over each shoulder.	10  Tie with yarn at the waist. This makes a belt for your doll's shirt.

Pottery

Activity: Students make a clay pot with a lid.

Focus Activity: Look at the Jar with Lid by Marianita Roybal (San Ildefonso). Identify the designs. Examine the shape. Discuss why a pot has a lid.

Outcomes: Children will make a decorated pot.

Vocabulary: pinch pot, kiln

Materials: Clay, paint brushes, paint

Procedure:

1) After discussing the art print, give each child some clay.

2) Using either the pinch method or the coil method, make a pot.

3) Remind students to also make a lid for their pot.

4) Set clay pot aside to dry. If necessary, fire the pot in a kiln to prevent it from falling apart.

5) Paint designs on the pot that are inspired by the rain, cloud, and rainbow designs that the children may have seen.

6) Make a display in the classroom or media center of the students' work. Write labels for each pot, explaining the meanings of the designs.

Assessment:

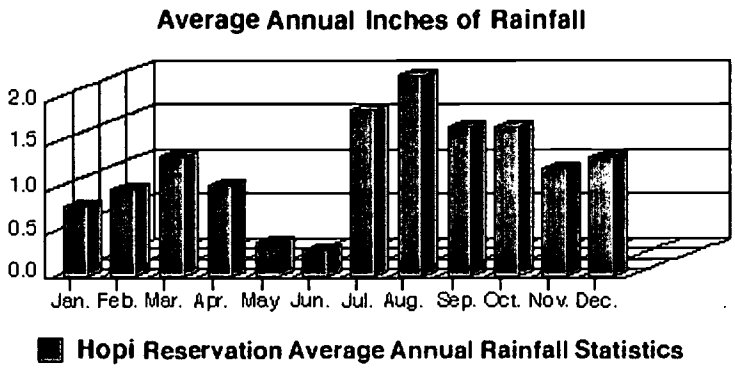
1) Did the students make a pot with a lid?

2) Did they use information from the art prints in their designs or did they draw other images?

CULTURAL

Rain in Life

The Hopi People live in the high mesa country of the Colorado Plateau in northern Arizona where about 10 to 13 inches of rain or snow fall in a year. These relatively few inches of precipitation are essential to bring fertility, growth, health, and well-being to the Hopi people. Agriculture, especially the growing of corn, has been important for centuries and remains important today as income from wage work increases in importance. Crops are planted in the spring, usually April, which can be a dry time between the winter snow and mid-summer thunderstorms. Through planting well-adapted crops in a variety of locations, Hopi farmers make the best use of available water.



Rain in Ceremony

Anything that Hopis do, it's for the rain; any kind of dances, even your social dances, they still have to pray for the rain or a good summer or good days ahead...It's all connected. The ceremonies are for all the people...throughout the world; not just for themselves; but throughout the world, for everybody...[to] live in harmony...that's what it's all about.

(*C. Lomahaftewa, Hopi*)

Many ceremonies involve the Kachinas. These are the spirit essences of all things in the natural world that come to the Hopi in the form of rain-bringing clouds. After death, a Hopi person continues a spiritual existence as a life-sustaining Kachina.

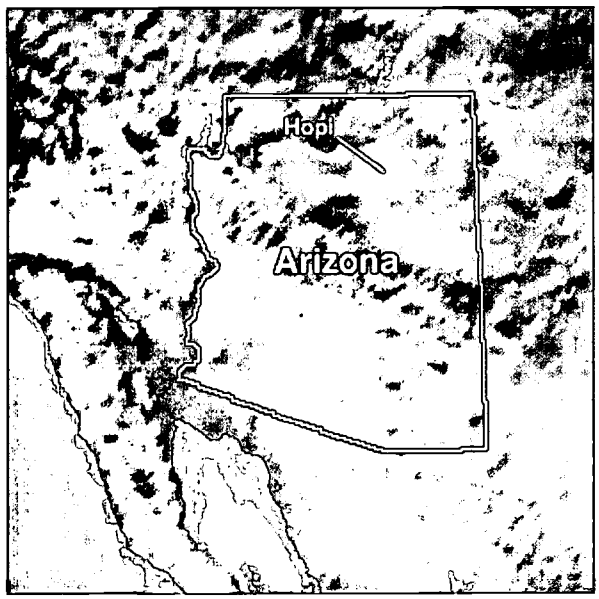
Expressions of Rain

Expressions of rain are found everywhere on things made by Hopi people. A wide variety of clouds: rain clouds, snow clouds, and blowing clouds are depicted, as are the rain-related phenomena of lightning and animals associated with rain and water. The representations are both realistic and abstract and are placed on things that are used in ceremony and daily life, and on items made for sale.

Often, when groups of clouds are painted, they are different colors. For Hopi elder Clifford Lomahaftewa, the different colors on clouds express the thought that Hopi ceremony is for all people, regardless of color.

The Hopi Today

The ancestors of the Hopi people have been living in northeastern Arizona for hundreds of years. Visitors can still see the ruins of ancient stone villages. They look very much like Hopi villages today.



Legends tell of when the Hopi first came to their land, at a place called Sipapu (SEE-pah-puh). From there, small groups of people went to the north, south, east and west. They were searching exactly the right place to make their home. After a very long time, and after trying life in different places, the people began to return. The first village they built is called Shungopavi (shung-O-pah-vih). It means "Place by the spring where the tall reeds grow."

The small group of people who started this first village was the Bear Clan. Little by little, other groups returned from different directions. They asked the Bear Clan if they could make their home there, too. Each group that arrived was a different Hopi clan.

Since the Bear Clan people were the first, they became the leaders of the village. Each new clan that came took on a special job in the community. Some clans would perform an important ceremony for the benefit of everyone. Other clans were warriors. Still others guarded the fields. In this way, Shungopavi grew.

In later years, more Hopi villages were started. Today, there are twelve villages. Many others were built, but are now deserted. The clans that became the Hopi people still are very important in Hopi life. Every clan has a part to play in ceremonies or other community activities.

When Hopi children are born, they become members of the same clan as their mother. All their relatives on their mother's side of the family are part of that clan. [Although a child's maternal uncle is the same clan as the child, his children are not in his clan; they are members of his wife's clan.]

The Hopi have a ceremony called "Naming a Baby." For hundreds of years this ceremony has been practiced by the people. When a Hopi child is born, two perfect ears of corn are placed beside the baby for the next 19 days. These ears are called "Mother Corn." On the 20th day, the infant's grandmother gives the baby a name and places a pinch of cornmeal in the infant's mouth. She tells the baby: "I wish you a long life and happiness." A feast is given in honor of this special day. The women in the family, with the help of clan relatives, cook traditional Hopi food, such as *piiki* bread, cornmeal pudding, and hominy stew (*nuquavi*). All the people in the village are invited to this feast. that is how a Hopi child receives a name and is welcomed as the newest member of the village.

A child's clan relatives take care to see that the child grows up strong, healthy and well-behaved. They also teach the child to be a good member of the clan. The child must learn to carry on the ceremony or other task that clan owes the whole village.

Through the mother and her clan, Hopi children gain rights to a place to live and fields to tend. Through the mother and her clan, Hopi children gain a place in the community.

The Hopi Today 2

Growing corn is a very important part of Hopi life.

The Hopi village is a very busy place. From sun-up to sun-down, everyone has a job. Farming is an important activity and corn is the most important crop. Men and boys in particular spend a great deal of time in the fields. Once the land is cleared and ready for planting, they use a digging stick (a sturdy wedge-shaped stick) to make the deep hole for planting. Several kernels of corn are put in and then covered, first with moist soil and then with dry soil to trap the moisture in the soil. Hopi corn is uniquely adapted to the environment, sending out a tap root to reach water deep in the soil. Also, Hopi corn is not tall, but it is fruitful and yields a large harvest.

Hopi corn is not planted in close, continuous rows, but is spaced out over the field. The field is plotted out by the men and boys. One way of plotting a field is to have the older men stand evenly spaced at opposite ends of the field. A boy runs back and forth between the elders, creating the pattern for planting. The corn is planted in every third or fourth step the boy has taken. Elders call to the runner, telling him to run a straight line between them. After the corn has sprouted, the pattern the boy has run becomes clear.

Even after the planting, there is always work to do in the fields, such as cleaning away weeds, shooing birds, and checking for bugs and worms. Men and boys spend time on these tasks. Sometimes, the older men will even refer to the growing crops as their "children."

The Hopi use all varieties of corn: yellow, white, red, and blue. Multicolored corn is also eaten or used for decoration. Once the corn is harvested (a task that involves the whole family), it is dried and stacked up in the storage room, ready for use. It is the job of women and girls to grind the corn into flour for use. Today, ladies use mechanical and electric grinders for everyday meals. But for special times, they still grind the corn with the stone metate and mano (hand stone).

Blue corn is one of the most important varieties for the Hopi. It is made into a paper-thin bread called piiki. Today, you can find blue corn chips, popcorn, and blue corn flour in the grocery stores, since blue corn products are now becoming popular with other people too.

In earlier times, men and boys hunted for meat. They used a bow and arrow to hunt deer. Rabbits were also hunted. The men beat the bushes to flush the rabbits into the open and then used a special stick, called a rabbit stick, to kill the game. Although the rabbit stick looks like a boomerang, it does not return to the thrower. The stick was thrown at the rabbit, catching it in the head or neck, and stunning the animal. The hunter then killed the animal by snapping its neck. Today, cattle and sheep are kept by some men. These animals are used for food on special occasions, but generally meat is bought in the store.

The Hopi Today 3

Hopi women make baskets and pottery for use at home as well as for sale.

Hopi girls grow up watching their mothers and grandmothers weave baskets, make pots, prepare foods, and organize their families. As the children grow older and show interest, they are taught the traditional tasks of basket-making or pottery.

Hopi women make sifter baskets of yucca to sift, sort, and wash grain. They make wicker trays to hold stacks of piiki. The coiled yucca plaques are made for special occasions or ceremonies. The bride-to-be and the other women in her family make special plaques from either yucca or wicker for the bridegroom and his family that are given as a part of the ceremony. The women of Second Mesa specialize in coil plaques and those of Third Mesa make wicker plaques. Many baskets are also made for sale to other people. Both coil and wicker baskets have beautiful colored designs: some women still use the old-fashioned natural dyes, while other weavers use modern commercial dyes to color the yucca and wicker.

Pottery was originally made only for home use. Pots were used for storage, cooking, and serving. As trade goods became available, metal pots, pans, and storage bins began to replace utilitarian pottery. Around the turn of the century, a Hopi woman named Nampeyo revived the prehistoric Sikyatki pottery found in the area. This style of pottery became so popular that it is now recognized as Hopi pottery. Many of Nampeyo's grandchildren and great-grandchildren are potters today using designs recreated by her. Making pottery for sale is the specialty of the people of First Mesa.

Hopi girls learn to make pottery and baskets when they are young. Women do not spend a great deal of time making these items because they are busy taking care of their families. Pots or baskets are only made for ceremonies or special occasions. Today, however, because a good artist can earn a living making baskets or pots, younger women are spending time making material for sale.

Traditionally, Hopi men helped the women by digging the clay and painting the designs. Today, there are Hopi men who are potters and earn their living making pieces for sale.

The Hopi Today 4

Kachina dolls are gifts given to Hopi girls by the Kachinas to teach them about Hopi beliefs.

The Hopi people recognize and respect hundreds of spiritual beings whom they call Kachinas. There is no literal translation of the word, but "friend" is often used. These spiritual helpers live on the San Francisco Peaks, but visit the Hopi people between the times of the winter solstice and the summer solstice. When they are visiting the Hopi villages, the Kachinas bring Kachina dolls for little girls and bows and arrows or moccasins for little boys.

The Kachinas themselves are the spiritual essence of everything in the world and are the friends of the Hopi people. Their presence in the villages brings good things to all people, and they carry the Hopis request for rain, bountiful harvests, and good things in life to the Creator.

Some Kachina dolls are flat pieces with only the head shown in detail. These are called *putsqatihu* or Cradle Kachina dolls and are given to baby girls. As the children grow older, the dolls they receive are more fully carved, with arms and legs.

The figure is made from the dried root of the cottonwood tree and today, many hours are spent carving each detail on the figure. Often, the doll is painted and decorated with cloth, feathers, and tiny pieces of jewelry.

Katsina Dolls and Art Projects

Teachers and Parents

Here are some art projects that you can do with young people:

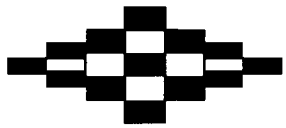
Colors are used by the Hopi people to indicate direction. Being able to understand the color references is important in identifying the Katsinas. For the Hopi, yellow is for the north; red is for the south; white is for the east; blue-green or turquoise is for the west; black is for up; and all colors are for down. Children can work with these colors to create drawings.

As a comparative exercise, discuss colors and their meanings in American society. Most children will also be able to name colors and associate meaning with them from their own experience: red for "stop;" green for "go;" red and green for Christmas; orange and black for Halloween. Children can create drawings. If there are children from other countries in your class, ask them to share some colors from their culture.

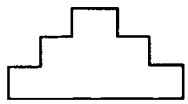
Using the Rain

The Katsinas visit the Hopi villages on a seasonal round. Children can draw the villages at different times of the year. Issues of Arizona Highways magazine are a good source of photographs of Hopi villages.

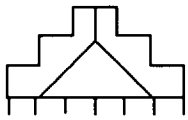
When examining dolls, the children can learn to recognize many designs: rain clouds, snow clouds, falling rain, corn, flowers, sun shining through the rain, a sign of friendship and rainbows. Some of these designs appear below. Create scenes using these designs.

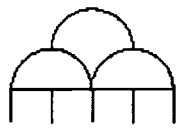


Snow cloud



Cloud





Clouds with rain

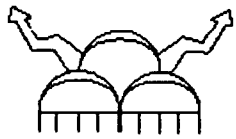
Using the above designs, make a stamp (using rubber or a potato). Print cards, napkins, placemats, etc.. using the stamp. Use the stamp to decorate book covers or make book plates.

The Hopi people carefully observe the changing seasons. The Katsinas visit the people starting around the time of the winter solstice and return home to the San Francisco Peaks at the time of the summer solstice. Look at other calendars from around the world, and then make one of your own. Look at designs used by other people to indicate the changing seasons and incorporate these into a universal calendar.

Unfortunately, many popular art activities suggested to teachers fail to recognize the following:

- The Hopi Katsina religion is a system of beliefs, guaranteed by the U.S. Constitution, equal to the Jewish faith, Lutheran, Mormon, Roman Catholic faiths, etc..
- Katsina spirits are a part of other Native American religions of the Southwest and appropriate references to Katsinas are even more restricted than at Hopi.
- The word and concept of "mask" is never used in reference to the Katsinas. The Hopi say "friend." Using the term "mask" confuses the issue, since it implies play-acting with a sincere religious belief.
- There is a difference between Katsinas (supernatural beings) and Katsina dolls (the figures carved from the cottonwood root). Be specific in references to Katsina dolls and avoid calling them "Katsinas."
- **Only** an initiated Hopi adult has the appropriate knowledge and right to make an image of a Katsina or Katsina doll.

- Young, uninitiated Hopi children are not allowed to draw or otherwise represent a Katsina, even a color-by-number figure.
- Katsina dolls should only be carved by certain people. A non-Hopi person should not be encouraged to carve, draw, or make any image of a Katsina.
- Some suggested art projects in teacher manuals may include projects which have been created without asking Hopi people if they are appropriate. You can ask the Hopi Cultural Preservation office [520-734-2244] for advice on your projects.



Cloud with rain and lightning

Sun shining through rain

Friendship

LANGUAGE

Writing a Letter

Activity: Students will write a letter containing a re-telling of an event.

Focus Activity: Read "Field Mouse Goes to War." Discuss with the student how corn is central to the story. Discuss how corn is an important food for both the Dine' (Navajo) and Hopi.

Outcomes:

1. Students will summarize information and write a letter.

Materials:
"Field Mouse Goes to War", vocabulary list, paper, pencils

Procedure:

1. Read the story "Field Mouse Goes to War" on one day and discuss the story with the class. Talk about the important role Field Mouse played in the story and what he did.

2. On another day, ask the students to review the story and then write a letter to a friend telling him or her about Field Mouse.

4. Write a rough draft.

5. Read it to a partner.

6. Edit or re-write parts that were unclear.

7. Write a final copy on good paper.

Assessment:

- Were children able to summarize the story that they heard?
- Did they remember the main events, the order, and could they re-tell the story?

Extension:

- Write a letter to Field Mouse.

Vocabulary: "Turkey's Gift to the People"

Harmony - The People of the world lived and worked together in perfect **harmony**.

Horizon - Suddenly Crow saw something on the **horizon**.

Recede - We must wait in the hills for the flood water to **recede**.

Chamber - The inside **chamber** of the giant reeds are hollow.

Gnaw - Beaver began to **gnaw** an opening in the reed.

Anxiously - The people looked **anxiously** toward the water.

Swooped - Eagle **swooped** down in search of his friends.

Sealed - Wasp quickly **sealed** the opening so water couldn't get inside.

Blurted - The People **blurted** out, "What happened?"

Survive - The people would need seeds to **survive** after the flood waters receded.

Vocabulary: "Ma'ii and Cousin Horn Toad"

Bounty - My **bounty** I'll share...

Appetizer - "My, that was a good **appetizer**," he said.

Reluctance - With great **reluctance**, Ma'ii began to pull weeds.

Scorched - The flames licked his stomach and **scorched** his hair and skin.

Thank You! Toad and Turkey

Activity: Writing a "thank you" note or speech.

Focus Activity: Read "Toad Waters the Corn" and "Turkey's Gift to the People." Review the art prints and identify seeds, corn plants, and corn.

Outcomes:

1. Students will write a "thank you" letter or compose and give a speech.

Materials: "Toad Waters the Corn.", "Turkey's Gift to the People"

Procedure:

1. Read "Toad Waters the Corn." Discuss how clever toad is and what an important thing he and his sons did. Discuss why this was so important: what would have happened to the corn if there had been no rain? What would have happened to the people?

2. At another time, read "Turkey's Gift to the People." Discuss Turkey's gift and how clever he was. What would have happened if Turkey hadn't collected the seeds?

3. After reading both stories, have children decide whether they want to thank Toad or Turkey.

4. Have the children work on a rough draft of either a "thank you" letter or speech.

5. If they are working on a letter, let them give it to a friend to read. If they are working on a speech, let them give the speech to a friend.

6. Re-write or re-work the letter or speech.

7. Speeches are presented. Letters are written in final form on good paper.

Assessment:

- Did students understand the importance of Turkey's and toad's actions?
- Could students summarize the contributions and their own feelings?

Extension:

- Write a newspaper article summarizing the contributions of both Toad and Turkey.

Toad Waters the Corn

"Raven," Yuku shouted, "what are you trying to steal from us today?" Although he is blind, Yuku's hearing is excellent. He could not see what Raven was doing, but he knew that it was Raven he heard.

Raven did not answer, but filled his beak with corn seeds. He flew quickly out of Yuku's house and straight to his friends, the Yoeme.

He said, "Take a strong stick and poke a hole in the arroyo above the river. The women can follow behind you and put 3 or 4 corn seeds in each hole and then push dirt over them with their feet. Be sure there is enough sunlight and enough water, and the corn will bring you food."

The Yoeme brought water to the corn seeds and cleared away the weeds that blocked the sunlight. Soon plants began to grow. All would have been well, but Yuku was being stingy with rain. Soon there was no water for the corn plants.

Raven flew to Yuku and said, "Don't be stingy. The plants need rain. The people need food."

Yuku answered, "Don't worry. Go back to your plants, and I will follow you."

Raven hurried off toward the corn plants calling, "Kraak, kraak, kraak," so that Yuku could follow him. Yuku came with an angry wind and strong lightning bolts. He beat up Raven, and then returned to his home without giving the corn rain.

When Raven returned and told the Yoeme people what had happened, they called Roadrunner and said, "You are fast. Perhaps you can outrun Yuku with his wind and lightning."

Roadrunner flew up to Yuku. He said, "Don't be stingy. The plants need rain. The people need food."

Yuku replied, "Don't worry. Go back to your plants and I will follow you." Roadrunner hurried off towards the plants calling, "Coo,coo, coo, coo, coo, coo" so that Yuku could follow him to the corn plants.

Again Yuku followed with an angry wind and strong lightning bolts. He beat up Roadrunner, and then returned home without giving the people any rain.

When Roadrunner returned and told the Yoeme people what had happened, the people called toad. They said, "Toad, you are smart. Perhaps you can outsmart Yuku and bring us rain to water the corn."

Using the Rain

Toad called to his many sons. He said, "Follow me, and we will bring down the rain."

Toad spread his sons in a row along the path from the corn field all the way to Yuku's house. Only Toad was left to talk to Yuku.

Toad said, "Don't be stingy. The plants need rain. The people need food."

Yuku replied, "Go back to your people, and I will bring you rain."

Toad pretended to go back to the Yoeme, but instead he hid in the mud by Yuku's door. When Yuku came out of the door, Toad's First Son began to sing, "kowak, kowak, kowak."

Yuku with his wind and lightning raced on toward the sound, but as he neared, First Son stopped singing and Second Son began, "kowak, kowak, kowak."

Yuku with his wind and lightning raced toward the sound Second Son was making. As soon as he neared, Second Son stopped and Third Son began singing, "kowak, kowak, kowak."

Again, Yuku with his wind and lightning raced toward the sound Third Son made, but as he neared, Third Son stopped singing and Fourth Son began, "kowak, kowak, kowak."

Soon, Yuku reached the corn fields of the Yoeme. Confused, he returned home listening to the laughs of the little toads scattered along his path. Fortunately, Yuku left enough rain behind him to water the corn until it was loaded with ears of sweet corn. There was plenty of corn to feed all the Yoeme all year.

Writing Poetry

Activity: Students write poetry using the poem "Without Dreams" by Ramson Lomatewama (Hopi)

Focus Activity: Read the poem "Without Dreams" by Hopi poet Ramson Lomatewama. Discuss each of the three segments: talk about meaning and form.

Outcomes:

1. Students will learn that poems are different than narrative writing.

2. Students will write a poem.

Materials: poem: "Without Dreams," paper, pencils

Procedure:

1. Read the poem "Without Dreams" by Ramson Lomatewama (Hopi) and discuss it.

2. Discuss the rules of poetry:

    a. Poems may not look like narratives.
    b. Poems make pictures with words.
    c. Poems share feelings

3. Read "Without Dreams" again.

4. Look closely at the first two units and encourage the children to use these as a model for writing:

    - Without Dreams
        - we would not....(action)
        - to/for/with....(noun)
        - ....(result)

5. Encourage each student to create several of these units. Then select each person's favorite to create a book for the class; a card for a parent or relative; etc..

Assessment:

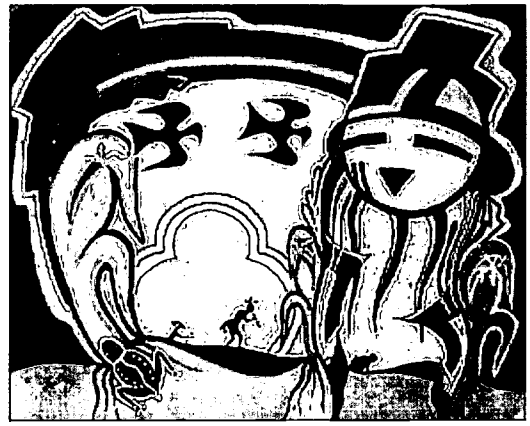
- Do students see the form of the poem?
- Do they use their imagination and feelings to create additional units?

MATH

Finding a Range

Activity: How many kernels?

Focus Activity: Look again at the "Frog, Sun, Flute Player, and Bird" by Milland Lomakema (Hopi). In both art prints, the children see ears of corn. If you harvest the ears and take the kernels off the cobs in order to put them in a stew, how many kernels would there be?



Outcomes:

1. Students will experience predicting and counting.

2. Students will find a range of predictions.

3. Students will determine whether their prediction was "less than" or "more then" the actual count. Second and Third graders can determine the exact difference between their prediction and the actual number.

Vocabulary: Kernel, range, estimate

Materials: Measuring cups, corn kernels, *copy of the predicting form "How Many Kernels?", pencils.

Procedure:

1. Select one of the measuring cups and fill it with corn.

2. Ask students to predict the number of kernels in the cup.

3. Work with the class to line up all the estimates, from highest to lowest. Explain to students that this is establishing the range.

4. Start to count the kernels. When you are about half-way through, give all the students the opportunity to make a second estimate.

5. Establish the new range with the students.

6. When you are approximately three-quarters of the way through the actual count, give students a last opportunity to revise their estimate. Establish the range for the last time.

7. Finish counting.

8. Compare the actual number with the estimates. Did the actual number fall within the range? Discuss with the students how they would discover the difference between their estimate and the actual number.

Assessment:

1. Do the students make more realistic estimates the next time they need to estimate?

2. Do students determine a range in other activities?

3. If appropriate to the grade level, do students determine the difference between the estimate and the actual number?

Extension:

1. Use other containers for estimating.

2. If you started this activity with a quarter-cup measuring cup, do the students understand that one-half a cup is double in quantity and use that information to arrive at a realistic estimate?

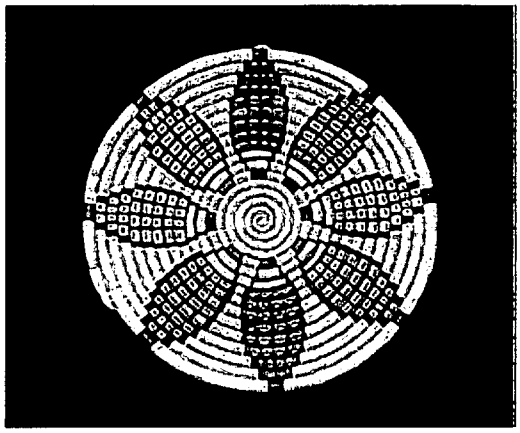
How Many Kernels?

My Guess 1		
Guesses	Highest	Lowest
My Guess 2		
Guesses	Highest	Lowest
My Guess 3		
Guesses	Highest	Lowest
Actual Number		
Difference		

Hopi Corn

Activity: Hopi Corn on the Cob (adapted from "Pumpkin Math" Math Their Way)

Focus Activity: Look closely at Lucinda Palevoyonma's (Hopi) Coil Plaque. She has shown each kernel on the cobs. Discuss that you can see just one side of the cobs. How many cobs are there?



Outcomes:

1. Students will gain experience with multiplication using manipulatives.

Vocabulary: Multiples

Materials: Art print of the Coil Plaque by Lucinda Palevoyonma (Hopi), paper, drawing materials, mask to cover all but one corn cob.

Procedure:

1. Put the mask over the printout so that only one ear of corn shows.

2. Have students discuss what information they need to determine how many kernels of corn are seen on the Hopi corn plaque. (They should decide that they need to know how many ears of corn there are, how many kernels are on one ear and if there are about the same number of kernels on each ear.

3. As a class, count the number of corn kernels on the ear of corn.

4. Using the information they think they need, have them determine the number of kernels of corn there are on the plaque.

5. When the students have come to a conclusion, have some students explain how they arrived at their answer

6. Remove the mask and count the kernels.

Assessment:

1. Did students use a strategy that showed an understanding of multiplication?

2. Could students explain their strategy?

3. If student estimates were inaccurate, could they determine what they should do to be more accurate in similar circumstances?

Extension:

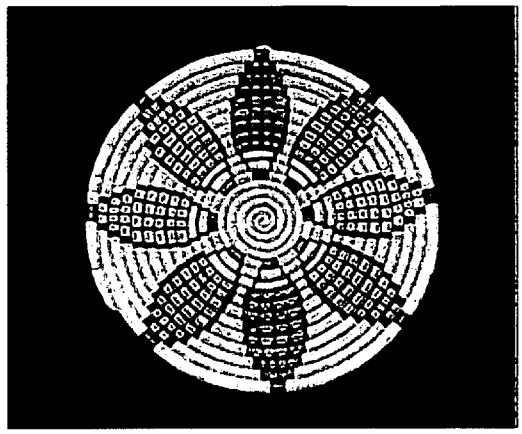
1. Wall paper samples and wrapping paper offer opportunities for the same activities (petals on flowers, legs on animals, windows on buildings, etc.).

2. Fruits or vegetables can be used in a similar way. Students can estimate the number of peas in five pods after determining the number in one pod; or the number of seeds in seven apples after determining the number of seeds in one apple.

Corn Kernels on the Cob

Activity: Corn kernels on the cob (adapted from "Activity 4 - Estimating Pumpkin Seeds", Carol A. Rommel, Integrating Beginning Math and Literature. Incentive Publications, Inc., Nashville, TN 1991)

Focus Activity: Look at Lucinda Palevoyonma's (Hopi) Coil Plaque. Notice how she has shown actual individual kernels on the cobs.



Outcomes:

1. Students will estimate corn kernels and compare the estimate with the actual number.

Vocabulary: Corn kernel, cob, ear of corn, estimate, compare, actual

Materials: An ear of corn, saran wrap for protecting the kernels while counting, marker, graph or individual sheets for recording the estimates.

Procedure:

1. Have students estimate the number of kernels on an actual ear of corn. These estimates can be on a graph or on individual recording sheets. If students are inexperienced in estimating, it is helpful to set a range.

2. Count the kernels placing a mark on each kernels as you count it. **Please** wrap the cob in saran wrap before you use a marker to count each kernel.

3. At some point stop and give all students an opportunity to make a new estimate. Have students give reasons for making their change.

4. Continue until you find the exact number of kernels.

5. Help students find the difference between their estimate and the actual number of kernels.

Assessment:

1. Were students able to use information gained by counting the first part to make a more accurate second estimate?

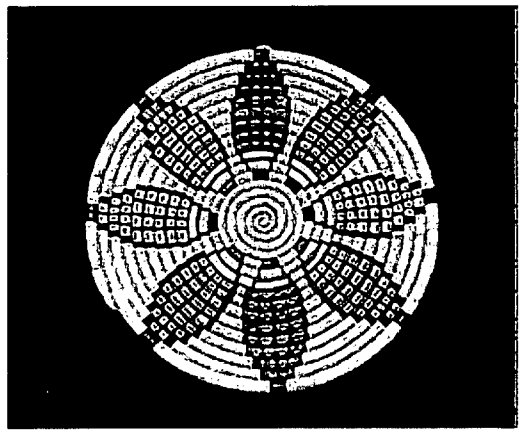
2. Can students explain a strategy for changing their estimates?

Extension:

1. This activity can be used with any plant containing seeds - peas, sunflowers, watermelons, or by placing seeds in a container.

Corn on the Mat

Activity: Corn on the Mat: One Way to Discover How to Write Number Sentences (adapted from "Handfuls", Ron Richart, Making Numbers Make Sense. Addison-Wesley, Menlo Park, California, p. 28-29.)



Focus Activity: Look at Lucinda Palevoyonma's (Hopi) Coil Plaque. How many cobs are there? How many kernels? What happens when someone starts eating the corn?

Outcomes:

1. Students will be exposed to several strategies for finding differences.

2. Students will experience connecting manipulatives to number sentences (equations).

Vocabulary: Kernels, number sentence (equation)

Materials: Corn kernels, Copies of the "Corn Counting Mat" printout

Procedure:

1. Have students take a handful of corn kernels and place them on the counting mat, one in each square.

2. Tell the students: "Raise your hand if you have more than 10 kernels of corn."

3. Ask: "How many more than 10 kernels do you have?"

4. Ask the class: "If this person has x number of kernels more than 10, how many kernels does this person have?"

5. Have the student demonstrate on the board or an overhead projector counting mat. The student will need to explain the strategy used.

6. Have other students explain different possible strategies to find the same solution.

7. Have the first student write the appropriate number sentence on the board or on the overhead projector below the mat.

8. Repeat the procedure asking: "Who has fewer than 10 kernels of corn?"

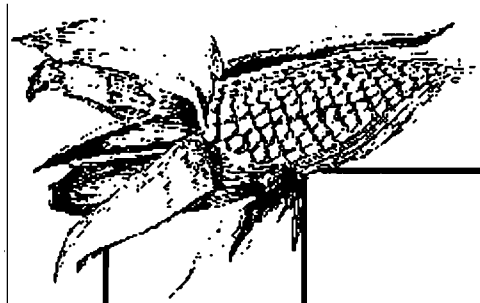
Assessment:

1. Does informal observation show improved ability to find the difference?

2. Can the students write the number sentence unaided?

Extension:

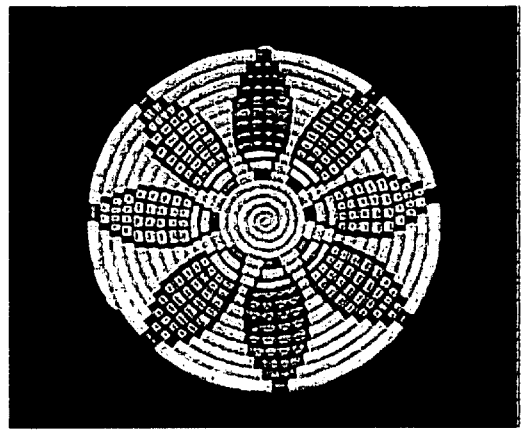
1. Find the difference for numbers other than 10.



Corn Counting Mat

1	2	3	4	5
6	7	8	9	10

Corn Under Your Hand



Activity: Corn Under Your Hand: Subtraction (Adapted from: National Council of Teachers of Mathematics, Curriculum and Evaluation Standards for School Mathematics. NCTM, Inc., 1989.)

Focus Activity: Look at Lucinda Palevoyonma's (Hopi) Coil Plaque. Talk about how to cook corn-on-the-cob. Talk about how eating corn will "take away" or "subtract" from the total number of kernels on the cob.

Outcomes:

1. Students will experience problem solving using subtraction.

Vocabulary: Subtraction

Materials: 13 kernels of corn per child

Procedure:

1. Give students 13 kernels of corn each.

2. Ask students to put all 13 kernels under one hand.

3. Tell students to remove 6 kernels with out looking.

4. Ask how many kernels are still under their hand.

5. Have students share strategies. They might mention using doubles, groups of ten, or counting on. If one of these strategies is not mentioned, the teacher should demonstrate it.

6. Have students place all of the kernels under their hand again. Let one of your students suggest a quantity of kernels to remove without looking.

7. Continue.

Assessment:

1. Can students explain more than one strategy for determining the number of kernels remaining?

2. Do students understand more than one strategy for determining the remaining kernels?

Extension:

1. This activity can be used with other quantities and other counters.

2. Students can work in pairs or small groups comparing responses and suggesting other quantities.

3. Students can write the appropriate number sentences (equations).

PRINTS

Jar with Lid

Artist: Marianita Roybal

Culture: Pueblo of San Ildefonso, New Mexico

Size: Height 9 7/16"; Diameter 5 11/16"

Media: Clay

Date: c.1900

Catalogue Number:NA-SW-SI-A3-1A; NA-SW-SI-A3-1B

Description:

Clouds-The soft pile of arches on the side of the jar represents clouds.

Rain-The dark arches below the cloud represent the rain in the distance.

Arches around the rim-This is a band of clouds.

Sprouting seeds-On the lid the artist painted seeds with tap roots growing from them.

Turkey tail feather-On the bottom band, the diamond that is stretched out is a turkey tail feather.

Seed-The oval with the dark spot in the center represents a seed.

Rain in the distance-Below the seed you see symbols that represent rain in the distance.

Vocabulary for discussion of Art Elements:

Line - Curved, round, arc

Shape - Organic, regular curving, symmetrical

Color - Earth tones

Space - There are three areas of design on this jar, the neck, the body and the bottom. Each area receives a different treatment. Possible vocabulary: outline, filled, enclosed.

Texture -Real, smooth, shiny

Art Principles:

Concept: Repetition

Ask: "What shape do you see repeated?" When focusing on the curved shapes, draw the students' attention to curves that are sideways and upside down as well.

Cultural Context:

Before 1880, it was difficult to travel to other states. People had to walk, ride horses, or ride in wagons pulled by animals when they went anywhere. This meant people seldom traveled far from their homes. The completion of the railroad in 1880 changed that. People could ride the train to far distant places faster and more comfortably.

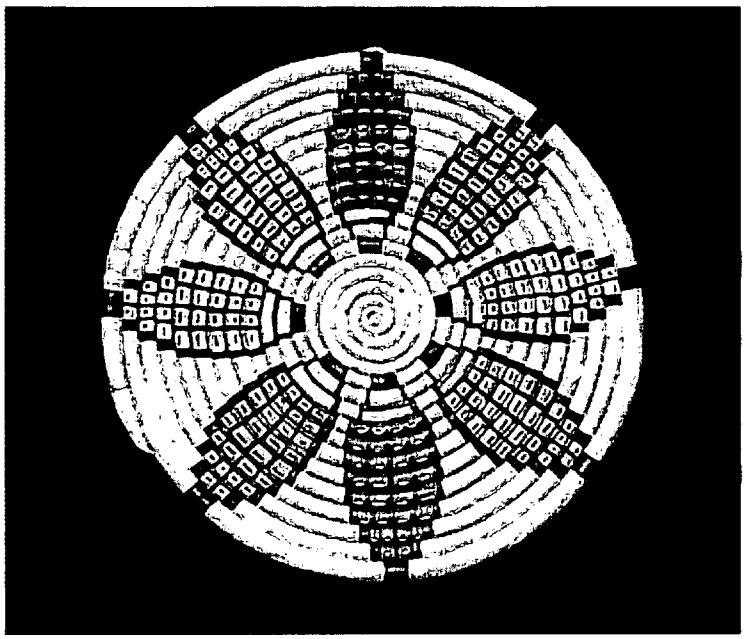
Beginning in the 1800s, the Fred Harvey Company made it even more comfortable for people from the east to travel west on the Santa Fe railroad. This company built hotels called "Harvey Houses" along the train routes. People could spend the day riding the train, seeing the plants, animals and landscape that were all very different from their homes in the East. At night they could have a warm meal and a bed to sleep in at a Harvey House. When the train stopped, they were able to buy things to take home. Often Native American artists sold their work directly to tourists. They would meet the train when it stopped and sell their artwork to the passengers. At other times, the artists sold their artwork to storekeepers who then sold it to tourists.

In the late 1800s, most potters did not sign their pieces. In a small village, everyone the style of each village potter, so there was no need for the potter to put her name on it. This water jar was not signed. Jonathon Batkin, an anthropologist and museum director, has studied Pueblo pottery. He recognized the style of this artist of this artist and told the curators at the Heard Museum where it was displayed, that it was

probably made by Marianita Roybal.

Today, airports around the world have shops like those at the Harvey Houses that sell artwork from local artists. Today's artists usually sign their work.

Coil Plaque



Artist: Lucinda Palevoyonma

Culture: Hopi

Size: Diameter 13 7/8"

Media: Hilaria grass, yucca, dyes

Date: 1970s

Catalog Number: NA-SW-HO-B-81

Description:

White corn - White corn is a major crop at Hopi

Red corn - At Hopi, red corn is parched. It was used for dye in earlier times.

Yellow corn - Yellow corn can be a substitute for white corn in both cooking and ceremonies.

Vocabulary for discussion of Art Elements:

Line - Radiating, short, continuous

Shape - Ovate, round

Color - Neutral, natural, warm, dyed

Space - Enclosed

Texture - Woven, smooth, ridged, bumpy

Art Principles:

Concept - Symmetry

Ask: What ways can you hold this so that it is symmetrical? What ways can you hold this so that it isn't symmetrical?

Cultural Context:

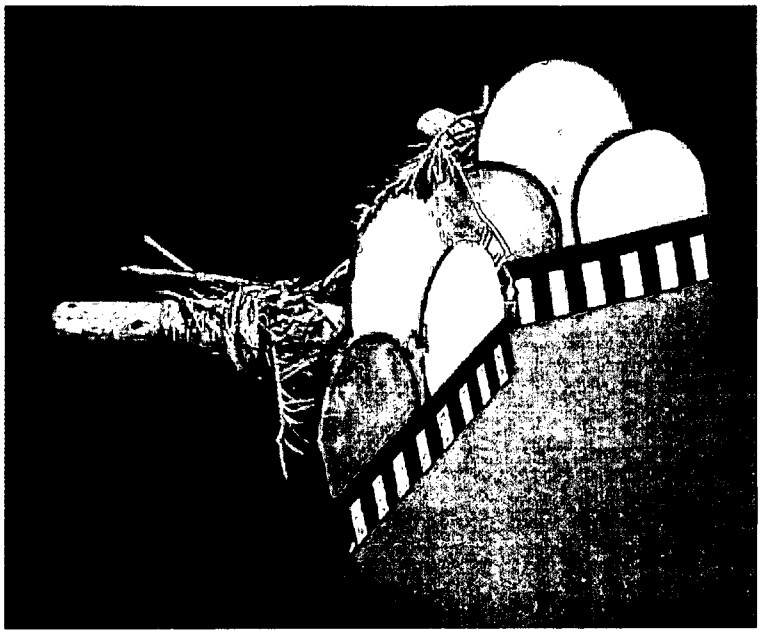
Corn means life to the Hopi. It is so important that, at an infant's naming ceremony, a taste of cornmeal is placed in the infant's mouth. Then the child is told, "This corn is your life's strength. Eat this and grow strong and have a long and happy life."

Corn is Hopi's most important food crop. Hopi corn is an ancient strain that can be planted as deep as 18 inches and still grow to the surface. This is important because Hopi farmers have very little water. They plant the corn seed deep in the ground where it is closer to the water under the ground. The Hopi farmer plants his corn in the flood plain of the river and in washes where the water underground is closer to the surface. He plants in many fields so that, if one field is washed away or hasn't enough water, another still has a chance to grow.

Question for discussion:

Why do you think the weaver didn't make all the corn yellow?

Ceremonial Hoes



Artist: Unknown

Culture: Hopi

Size: Height 5 7/16"; Width 7 7/16"

Media: Paint, wood, pine needles, cloth

Date: 1960s

Catalog Number: NA-SW-HO-I-87A & B

Description:

Half circles - These three circles form a cloud.

Red - Red is the color Hopis use to represent respect.

Yellow - Yellow is the color Hopis use to represent knowledge.

Blue - Blue is the color Hopis use to represent water.

Using the Rain

Vocabulary for discussion of Art Elements:

Line - Curved, straight

Shape - Man-made, even, precise, symmetrical, rounded, curving

Color - Primary

Texture - Scratchy, smooth, hard

Art Principles:

Concept -balance

Cultural Context:

These ceremonial hoes were made in the 1960s. They are part of a Hopi tradition that has been practiced for many generations.

During the spring and summer months, crops at Hopi are very dependent on rain for water. At these times, the Hopis hold ceremonies that include many different Kachinas. One Kachina is *Kuwan Heheya*. In the past, *Kuwan Heheya* carried a ceremonial hoe. More recently, this Kachina carries a knife-shaped tool. This is an example of how change is always present in living cultures.

Questions for discussion:

What would be different about these hoes if they were for use in the fields instead of ceremonies?

How can you tell that these hoes aren't new?

"Frog, Sun, Flute Player and Bird"

Artist: Milland Lomakema

Culture: Hopi

Size: Height 20 13/16", Width 25 1/4"

Media: Acrylic on illustration board

Date: 1968

Catalogue Number: IAC-411

Description:

Face - The face is a Hopi sun symbol. It is traditionally divided into three parts. All human, animal, and plant life is supported by the powers of the sun.

Birds - Bird feathers carry prayers of the Hopi into the sky.

Frog - Frogs are symbols of water and growth.

Corn - Corn is a very important source of food for the Hopi. It is planted in flood plains and is very dependent upon the right amount of rain at the right time.

Cloud - Rain and snow of spring and winter are the source of life.

Rainbow - The rainbow represents the beginning of life.

Flute Player - The flute player represents the beginning of lifting the summer months.

Figure with a cane - The crooked cane represents the steps to old age.

Vocabulary for the discussion of Art Elements:

Line - Curved, straight, continuing, sharp, graceful, precise, outline, highlight

Shape -Organic, natural, rounded, circular, curved, filled, simple

Color - Warm, cool, neutral

Space - Look at how Mr. Lomakema used space by looking from side-to-side and from top-to-bottom.

Look at the illusion of depth created by Mr. Lomakema in this painting. Discuss the actual size of the objects, the placement of the objects on the page, and what has been overlapped. Explain that these are tricks the artist uses to make a drawing or painting on a flat piece of paper appear to have depth.

Texture - Smooth, rough, thick, thin, surface

Art Principle:

Concept - Movement
Ask: When you look at this painting, do your eyes move smoothly from object to object or do they jump?

Concept - Unity
Ask: Mr. Lomakema has included many things in this painting. Does it feel like one painting or a lot of individual paintings? Do you see anything he did to make the painting feel like one painting? (If student don't mention the rainbow point out that it holds the painting together.)

Cultural Context:

Milland Lomakema was born in Shungopavi at Hopi in 1941. He signs his artwork DAWAKEMA which means House of the Sun.

It was early in the 1960s when Milland Lomakema began to be noticed as an artist. He was working for a detective agency in Phoenix, Arizona and showing his work throughout the country.

In 1968, Lomakema joined the Hopi Police Force. He continued to paint. That same year, he painted "Frog, Sun, Flute Player, and Bird." At around this time he also designed decals for the Hopi Police Force and the City of Winslow (Arizona).

In 1973, a group of artists formed, calling themselves Artists Hopid. they were artists with common goals and common concerns who felt they should use their talents to share their culture. Together they felt they were more effective in teaching about Hopi values and history.

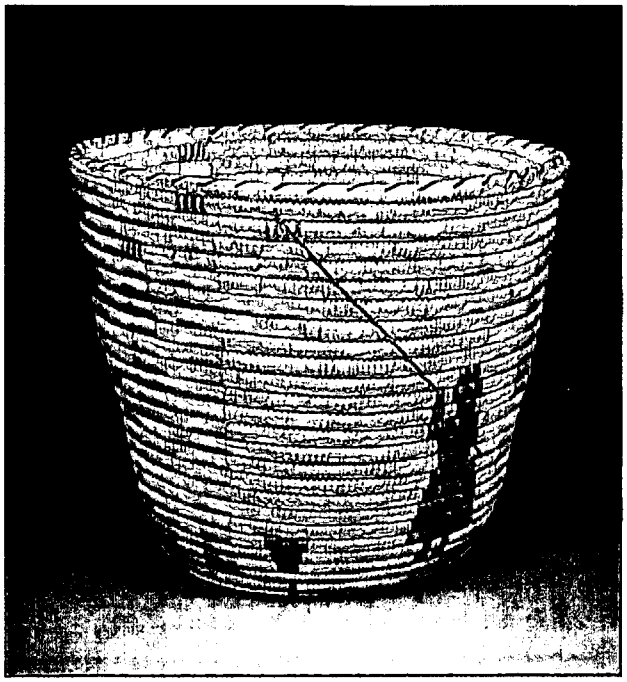
Questions for discussion:

Find the Hopi Sun Symbol. How do you think the sun feels about what it sees? Why?

There are many images in this painting that are symbols used by Hopis for many generations. Which images do you think are more realistic?

What time of day is it in this painting? Why do you think that? What time of year is it? How do you know?

Basket



Artist: Unknown

Culture: Tohono O'odham

Size: Height 12 3/8"; Width 14 3/8"

Media: Natural fibers

Date: 1960s

Catalogue Number: NA-SW-PG-B-45

Description:

Saguaro - In late June, the fruit at the top of the giant saguaro ripens.

Woman picking saguaro fruit - The Tohono O'odham call harvesting the saguaro fruit "pulling down the clouds."

Saguaro fruit-picking stick - This is a long saguaro rib with a cross piece tied to it.

Vocabulary for discussion of Art Elements:

Line - Horizontal, vertical, diagonal

Shape - Natural, symmetrical, thin, silhouette

Color - Neutral

Space - Positive, negative, cylinder

Texture - Woven

Art Principle:

Concept - Balance

Cultural Context:

The time of the summer solstice (June 21) is the beginning of the new year for the Tohono O'odham (formerly called "Papago", the people are now known by the name they call themselves, literally "Desert People"). It is the time to pick saguaro fruit, and the time that summer rains begin. It is a time of celebration.

Families go out into the desert to harvest the saguaro fruit. They are careful to treat giant saguaros with respect. Marquita Gila, a Tohono O'odham woman said, "The saguaro - They are Indians too. You don't EVER throw ANYTHING at them. You don't ever stick anything sharp in their skin either, or they will just dry up and die. You don't do anything to hurt them. They are Indians." (from "The Desert Smells Like Rain" by Gary Paul Nabham, North Point Press, San Francisco, 1987.)

Saguaro fruit is harvested using a long saguaro rib with a small cross piece tied to the end. The fruit is used to make cakes, wine and jelly.

After the harvest, the Tohono O'odham come together to sing rain songs and give speeches. According to Michael Chiago (Tohono O'odham artist), the custom is to cover the wine with song, and everyone who accepts a drink of wine recites a poem relating to rain.

Questions for discussion:

Discuss when most people in the United States celebrate a harvest feast (Thanksgiving). Talk about the difference between food production (farming) and food gathering.

SCIENCE

Seed Sprouting Sequence

Activity: Seed germination

Focus Activity: Look closely at the Jar with Lid, by Marianita Roybal (San Ildefonso). Identify the sprouting seeds. Note the first, strong, primary tap root.

Outcomes:

1) Students will observe the effect of moisture on seeds.

2) Students will record the sequence of seed germination.

Vocabulary: germinate, sprout, tap root, root hair, moisture

Materials: "The Tiny Seed" by Eric Carle, 2 zip lock bags, 2 corn seeds, 2 bean seeds, one dry paper towel, one wet paper towel. **NOTE:** If each child is doing his or her own experiment, you need each of the above for every child.

Procedure:

1) Read "The Tiny Seed" by Eric Carle
2) Show students several different kinds of seeds. Ask them what happens when a seed is placed under ground. Encourage as many different answers as possible. Truly creative answers may be used for creative writing later.
3) Tell students that we usually can't see what is happening because dirt hides the seed, but we're going to do an experiment to see if we can watch a seed sprout.
4) Place a wet paper towel flat in one plastic bag and a dry one in another. Place one corn and one bean seed on each paper towel and seal the bags.
5) Record what you see. This may be a class project or individual Science logs. (Remember this is a learning process, not a test. Model for your students how to decide what to write.)
6) Observe bags daily and record as needed.

Assessment:

- Are students aware of the need for moisture?
- Can students explain the sequence of events in order?

Extension:

- The technique can be used to germinate most seeds. A race of the seeds can be conducted: Which seed type will grow a 1 inch tap root first?
- Will other liquids cause the same results? Try soaking the paper towel in oil, shampoo, Kool-Aid, or other liquids that the students suggest.

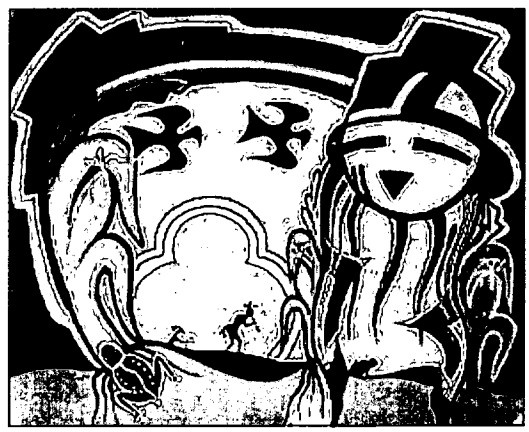
Corn, the Rain, and the Sun

Activity: To show the relations between plant life, the rain and the sun

Focus Activity: Look at the Jar and Lid, by Marianita Roybal (San Ildefonso). Identify the sprouting seeds. Look also at "Frog, Sun, Flute Player, and Birds" by Milland Lomakema (Hopi). Look at the maturing plants. Discuss the stages of growth that the plants have gone through. What does the plant need to grow? What does a child need to grow? Discuss how these are similar requirements. **Note:** This is also a time to view or recall the information in the video"Hopi: Corn is Life" which points out the parallel between man and plant life.

Read the story Yoeme (Yaqui) story "Toad Waters the Corn" to the students. Use the story to lead students into a discussion on why rain is important to Native American farmers.

Jar and Lid



"Frog, Sun, Flute Player, and Birds"

Outcomes:

1) Students will gain an awareness of the importance of the rain cycle and the corn growth.
2) Students will plant and observe corn seeds, making records of the growth rate.

Vocabulary: Yuku, Yoeme, roadrunner, stingy, arroyo, lightning bolts.

Materials: "Toad Waters the Corn", pitcher of water, recycled plastic cups, soil, corn seeds, graph paper, rulers and pencils

Procedure:

1) Put student's name on cup.

2) Partially fill each cup with soil.

3) Make a small hole in the soil.

4) Plant a seed in each cup.

5) Cover the seeds with soil and water--but don't drown them! It's a good idea to put drain holes in the bottom of the cups.

6) After the students have planted their seeds as demonstrated, place the cups near a window with adequate sun light.

7) Check the seedling every day. Keep the soil moist but not waterlogged.

Follow-up:
Students water the corn, record the number of days it takes for the seed to sprout, and observe the growth of the corn. The growth of the corn is recorded on a graph daily.
Note: Remember that not every seed may sprout.

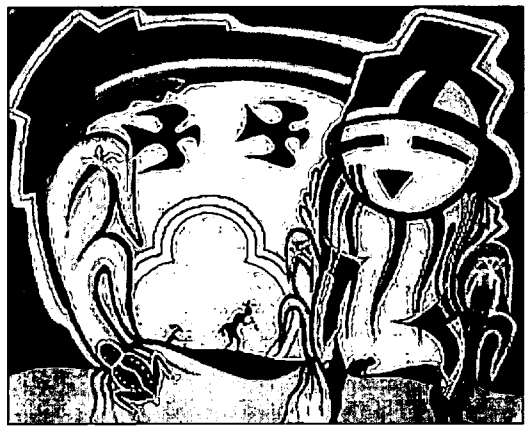
Assessment:

After a week or two, the students share the observations with the class and discuss what the corn needed to grow (rain, sun, and soil). The students used what they have observed and shared to write a short story about their planting of corn. Their stories will show their understanding of the relationship between the rain, sun, and plants.

Celery Experiment

Activity: Experimenting with celery.

Focus Activity: Look at the "Frog, Sun, Flute Player, and Bird", by Milland Lomakema (Hopi) and the Tohono O'odham basket. Discuss with the students how plants need to "drink'" water. Point out that even huge saguaro cacti, like the one on the basket, get water through their roots. Roots are clearly shown in Lomakema's painting. The roots take in the water, and then it is distributed to all parts of the plant.



"Frog, Sun, Flute Player, and Birds"

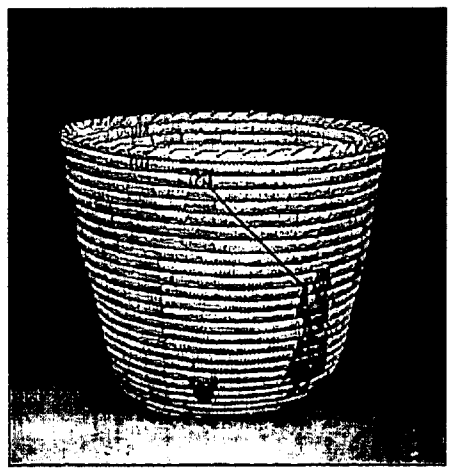
Outcomes:

1) Students will understand that a celery stalk is a stem.

2) Students will understand that the tubes carry water from the root.

Vocabulary: stem, stalk, tubes, nutrients, roots, leaves, veins

Materials: Several leafy celery stalks, red food coloring, blue food coloring, jars, water, knife



Tohono O'odham basket

Procedure:

The teacher will demonstrate the following, then the students will work in cooperative groups performing this experiment:

1) Cut at a slant across a leafy stalk of celery near the bottom. Make a lengthwise cut from the bottom to within an inch of where the leaves branch out.

2) Put a small amount of water and 1 teaspoon of blue food coloring in one glass.

3) Put a small amount of water and 1 teaspoon of red food coloring in the second glass.

4) Put each section of the celery stalk into a glass.

5) Place the glasses and the celery in a sunny spot in the classroom.

6) Look at the stalks after a few hours. Do the stalks look different?

7) Leave the stalk in the glasses overnight. In the morning, take the stalks out of the glasses and cut across each section. What colors are visible in the sections?

8) Point out to the students that the celery stalk is actually a stem. The strings are the tubes that carry the nutrient and the water the plant needs from the roots to the leaves.

9) Point out the veins in the leaves. The veins in the leaves connect with the tubes in the stems.

Assessment:

- Do students understand that a celery stalk is a stem?
- Do students understand that the tubes carry nutrients and water from the roots to the leaves?

Extension:

- Students can do independent experiments using the same procedure but with stems of different plants.

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