Chewed Paper and Sticky Stuff

Objective

Students will read about adhesives, what makes them work and the agricultural products used to make them. Students will experiment to find the materials that make the best adhesives and write recipes. Students will read about papier-mâché, make their own papier-mâché creations, write descriptions, create plays with papier-mâché characters and act out the plays.

Background

Materials like glue, tape, and paste are called "adhesives." Adhesives are used to make two things stick together. Adhesives stick to surfaces by getting into the tiny dents, holes, spaces, pores, and crevices that we normally cannot see without a microscope. The adhesive then hardens or gets tangled and caught in the tiny spaces of the material, causing the adhesive to stick.

Many agricultural products are used in the production of adhesives. A protein in milk called casein is used to make white school glue. The proteins found in the hoofs and bones of beef and swine are used to make glue and also to make the gelatin we eat for dessert. Flour and water paste is the adhesive used in papier-mâché, which has been used for hundreds of years and all over the world in art. The proteins in milk and gelatin and the starch in flour are chemicals that have good characteristics for stickiness.

Papier-mâché is made by combining natural adhesives with organic fibers. It was first developed in China and is one of the oldest art forms in history. Piñatas are made from papier-mâché as are many of the more elaborate floats used in large parades. Early doll and puppet heads were made from papier- mâché.

Papier-mâché is French for "chewed paper." In the 16th Century, French women bought paper waste from publishers and bookbinders and processed it by chewing on it. The resulting pulp could be shaped in whatever form was desired and then left to dry. Later, the French used papier-mâché for making furniture and decorative boxes. Doll makers used all sorts of materials as fillers, including rags, rice, potatoes and bread. In 1883 a British patent was granted to the firm of Johnson and Maloney to use broccoli, cabbage and cauliflower as a filler.

Science

1. Read and discuss background and vocabulary.
   —Students will brainstorm what common substances they could use to make their own adhesives, based on what they have learned from the background.
2. Adhesives stick to materials by getting into the tiny dents, holes, spaces, pores, crevices, nooks, and crannies of the material that we normally cannot see without a microscope.
   —Provide a variety of surfaces (paper, wooden cutting board, mirror, a stainless steel tray).
   —Students will predict which would provide the best surface for an adhesive.
   —Students will use microscopes to examine the surfaces.

Oklahoma Academic Standards

GRADE 2
Physical Science: 1-1,2,3 Visual Art History and Culture: 1; Expression: 1,2; Connections: 4 Speaking and Listening: R.1,2,3,4; W.1,2. Critical Writing: W.1. Research: R.1,2,3; W.1,2,3

GRADE 3
Visual Art History and Culture: 1; Expression: 1,2; Connections: 4Speaking and Listening: R.1,2,3,4; W.1,2. Critical Writing: W.1. Research: R.1,2,3,4; W.1,2,3

GRADE 4
Visual Art History and Culture: 1; Expression: 1,2; Connections: 4Speaking and Listening: R.1,2,3,4; W.1,2. Critical Writing: W.1. Research: R.1,2,3; W.1,2,3

GRADE 5
Physical Science: 1-4 Visual Art History and Culture: 1; Expression: 1,2; Connections: 4Speaking and Listening: R.1,2,3,4; W.1,2. Critical Writing: W.1. Research: R.1,2,3; W.1,2,4

Materials

FOR ADHESIVE EXPERIMENTS
wheat flour
water
milk
unflavored gelatin
syrup
jelly
peanut butter
plastic cups
plastic spoons
cotton swabs
32-ounce styrofoam cups
8-ounce styrofoam cups
rulers
string
small paper plates

FOR PAPIER-MÂCHÉ
balloons
flour
water
newspaper (torn in 1-inch wide strips)
fingerpaint or tempera paint
plastic water or soda bottle
golf tees
cardboard tubes
paper cone-shaped drinking cups
treats to place inside the piñata—packages of raisins, nuts, small toys, candy

—After examining the surfaces with microscopes students will again predict which would provide the best surface for an adhesive.

3. Divide students into groups of three or four. Provide unflavored gelatin, milk, wheat flour, syrup, jelly, and peanut butter.
   —Hold up two pieces of paper, and ask students which substance they think would work best for making the sheets of paper stick together.
   —Cover surfaces with newspaper, and provide plastic cups, plastic spoons and cotton swabs.
   —Each group will select three ingredients from the substances provided and to develop a substance that looks and feels like glue or paste.
   —Students will use the Scientific Method Format included with this lesson to plan their experiments and record observations.
   —After each group has developed its adhesive, students will test them by spreading a little on a piece of paper and sticking another piece of paper to it.
   —Students will allow the glue to dry overnight and test their adhesives by trying to pull the papers apart.
   —Students will test their adhesives on a variety of surfaces.
   —Students will write reports on the experiments and share them with the class.
   —Students will write recipes for the glues they have developed.

Visual Art

1. Students will make papier mâchè, as follows:
   —Mix two cups flour and two cups water in a large bowl until it makes a smooth paste.
   —Dip in newspaper strips (torn in one-inch wide strips), one at a time, remove the excess paste from your fingers and lay the coated newspaper on the form to be papier mâchèd (See suggestions below).
   —Smooth out the wrinkles, and continue to place coated newspaper over the surface until it is completely covered.
   —When the surface has totally dried, students will paint their own designs, using acrylic or poster paint.

PIG SHAPE

1. Use a plastic water or soda bottle, poking in golf tees for legs, and taping on cutout triangles from a cardboard tube for ears. For the finishing touch, add a spring for the curly tail.

SUNBURST PIÑATA

1. Tape paper cone-shaped drinking cups around the circumference of an inflated balloon.
2. After the papier mâchè has dried, cut a slit in the back and stuff in the treats and trinkets.
3. Cover and tape the opening closed, then paint.

SELF-PORTRAIT:

1. Carefully mold heavy-duty aluminum foil around student's face, being sure to press around the chin, eyes, forehead, and mouth.

2. Stuff the inside of the mold with dry newspaper to give it support.
3. Cover the front of the "molded face" with papier mâchè.
4. Allow to dry. Each student will paint and decorate with his/her likeness or any design.

SCULPTED PAPIER MÂCHÈ

1. Provide shredded office paper and flour paste. Students will:
   —Soak the shredded paper in water overnight.
   —Drain, then boil in clean water for about 30 minutes, until the fibers start to break up.
   —Sieve the pulp and throw away the water.
   —Beat or whisk to break up fibers.
   —Mix the adhesive into the pulp until it forms a clay-like consistency.
   —Divide the pulp among students in plastic cups.
   —Students will form the pulp as desired.
   —After the sculptures are completely dry, provide paint for decorating.

Language Arts

1. Students will make papier-mâché masks and write a play, with the masks as characters.
2. Students will write descriptions of or stories about the papier-mâché objects they have created.
3. Read the following information about piñatas to your class:
   Piñatas are a popular Christmas tradition in Mexico, but their origins are in China. Marco Polo introduced the custom, which was adopted by the Italians, Spanish and the French. Spanish conquistadors carried the custom to Mexico. The original piñatas were made of clay rather than papier-mâché. The Chinese designed them in the shape of farm animals, adorned them with harnesses and other farm implements, and filled them with seeds. When the figures were hit with sticks, the seeds spilled forth. After burning the remains, the people gathered the ashes for good luck.
   —On a world map, students will follow the path of the piñata from its origins in Asia (China) to Europe (Italy, France, and Spain), to North America (Mexico and the US).
   —Students will use library or online resources to research the use of papier mâché in celebrations around the world. Students will report their findings in writing, with illustrations.

Extra Reading

Bree, Loris Theovin, and Marlin Bree, *Kid's Squish Book: Slimy, Squishy, Sticky Things to Do That Should Only Be Done When Wearing Your Oldest Clothes*, Marlor, 2002.

Henry, Sally, and Trevor Cook, *Papier Mâchè,* PowerKids, 2011.

Mora, Pat, and Magaly Morales, *A Piñata in a Pine Tree: A Latino Twelve Days of Christmas*, Clarion, 2009.

Rhatigan, Joe, and Rain Newcomb, *Kids' Crafts: Paper Fantastic: 50 Creative Projects to Fold, Cut, Glue, Paint & Weave,* Lark, 2006.

Vocabulary

adhesive—a substance that sticks

casein—a phosphorus-containing protein that is separated from milk especially by the action of acid that is used in making paints and adhesives

papier-mâché—a light strong molding material made of paper pulp mixed with glue and other substances [French, literally "chewed paper"]

piñata—a decorated container filled with candies, fruits, and gifts which is hung from the ceiling to be broken open with bats by blindfolded persons during festivities [Spanish, literally "pot"]

pore—a tiny opening or space

protein—any of numerous nitrogen-containing substances that consist of chains of amino acids, are important parts of all living cells, are a necessary part of the human diet, and are supplied especially by such foods as meat, milk, and eggs

starch—a white odorless tasteless carbohydrate that is the chief form in which carbohydrate is stored in plants, is an important food, and is used also in adhesives, in laundering, and in pharmacy and medicine