

Chewed Paper and Sticky Stuff

Skills: Visual Arts, Science

Objective: Students will explore the adhesive qualities of a variety of common food substances and make flour paste for piñatas and other papier-mâché objects.

Background

Materials like glue, tape, and paste are called "adhesives." Adhesives are used to make two things stick together. 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. 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—a combination of organic fibers with natural adhesives— 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. Dollmakers 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.

P.A.S.S

Grade 5

Science Process—1.2;
3.1,2,3; 5.1,2,3,4
Visual Arts—2.2,3; 3.1;
4.1,2,3
Social Studies—7.1,2
Writing—2.1,2,6

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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

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Science

1. 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). Ask students which surface an adhesive would work best on. Provide microscopes, and have students examine the surfaces. Which would provide the best surface for an adhesive?
2. Bring unflavored gelatin, milk, and flour. 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. Have students experiment by mixing different amounts of the ingredients provided to make something that looks and feels like glue or paste. Have students test their inventions by spreading a little on a piece of paper and sticking another piece of paper to it. Allow the glue to dry overnight. Try pulling the papers apart the next day. Have students try using their adhesives on a variety of surfaces.

Visual Arts

Papier-Mâché

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 mâché (See 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, have students paint their own designs, using acrylic or poster paint.

Form to Make a Pig Shape:

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.

Form to Make a Sunburst Piñata:

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

Form to Make a Papier Mâché Self-Portrait:

Carefully mold heavy duty aluminum foil around student's face, being sure to press around the chin, eyes, forehead, and mouth. Stuff the inside of the mold with dry newspaper to give it support. Cover the

front of the "molded face" with papier mâché. Allow to dry and then have student paint and decorate with his/her likeness or any design.

Let your students experiment with sculpted papier mâché, using shredded office paper and flour paste. Soak the shredded paper in water overnight. Drain, then boil in clean water for about 30 minutes, until the fibres start to break up. Sieve the pulp and throw away the water. Beat or whisk to break up fibres. Mix the adhesive into the pulp until it forms a clay-like consistency. Give each student a small amount in a plastic cup to form as desired. After the sculptures are completely dry, provide paint for decorating.

Social Studies

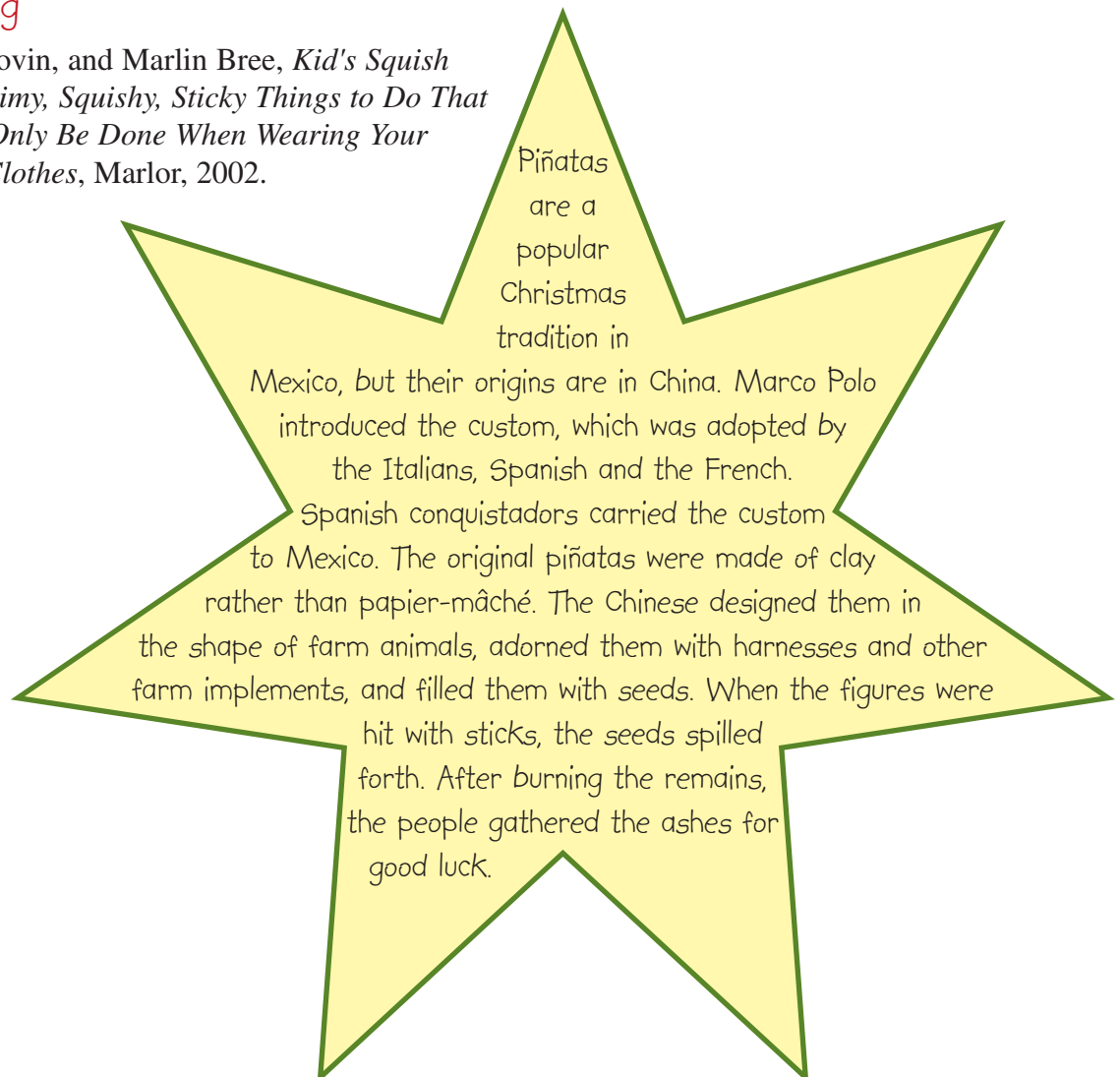
1. On a world map, have students trace the piñata from its origins in China, with Marco Polo to Italy, France, Spain and to Mexico and the US.
2. Have students research the use of papier-mâché in celebrations around the world.

Language Arts

1. Have students make papier-mâché masks and write a play, with the masks as characters.
2. Have students write recipes for the glues they have developed.
3. Have students write descriptions of or stories about the papier-mâché objects they have created.

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.



Vocabulary

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

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

adhesive—a substance that sticks

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

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"]

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

pore—a tiny opening or space.

Kindersley, Barnabas and Anabel, *Children Just Like Me: Celebrations*, DK, 1997.

Schwartz, Renee, *Papier-Mâché (Kids Can Do It)*, Kids Can, 2000.

Yerkow, Lila Perl, Bellinger, Victoria, and Ada Flor, *Piñatas and Paper Flowers / Piñatas y flores de papel: fiestas de las Américas en inglés y español*, Clarion, 1983.

Evaluation

Were students able to successfully conduct science experiments and draw conclusions about the adhesive qualities of common food products? Were students able to follow instructions for making papier-mâché items? Were students able to understand how agricultural products are used in adhesives and art objects?