



SOIL ART

Pigments and Chemistry

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Introduction

This issue investigates the properties of soils in interesting and creative ways with practical activities that make use of pigments found in soils as well as discovering the differences in soil acidity, i.e. their pH values. Both activities are very cross-curricular and whilst Key Stage 2 pupils will be fascinated by the pH testing, the art activities can be enjoyed by all ages.

SOIL PAINTING

Mineral pigments have been used since Neolithic man (about 8000-3000 BC) first made pictures on the rocks. Synthetic pigments have only been around since the nineteenth century. Before then colours were obtained from plants, insects, minerals and rocks. One of the most well known being ultra-marine blue made from the mineral lapis lazuli.

Soils vary in colour depending upon the mineral content of the underlying rock, the amount of organic matter present and changes in water content and have provided a ready medium for our ancestors to use for painting. Soil painting offers pupils a creative and fascinating opportunity to discover the various colours, properties and textures of soils. This is an art project, based on one of our workshops, which will capture their imaginations as well as teaching some fundamental properties of soil. When using soil as a pigment for painting you can also include aspects of art, history and science. Children will learn a lot about the soil when they have to select and prepare it to make the paint.

For soil painting, clay soils seem to be the best because of the small particle size, but sandier soils work too. Colours can vary through yellows, reds and browns; colours that blend with those of vegetation, sky, and water. Start by making a collection of different soils from around the school, then get children to collect from home or while on holiday. Gardeners, allotment holders and farmers may be able to help you obtain contrasting colours. Only small quantities are needed but care and sensible precautions should of course be taken when collecting soil samples. Always try to record the source of the soil sample. Discuss the colours and textures.

PREPARATIONS

Materials Required:

A variety of soil samples with differing colours and textures (dried in the air).

Re-sealable plastic freezer bags

Rolling pin or similar crushing tool

Sieves - three different mesh sizes (use those for separating soil in science lessons)

Paper plates

Plastic cups

Lolly sticks or similar for stirring

Water

*Medium (see over)

Paper (Water colour art paper works best because it is thicker than "normal" paper and withstands the wetness of the paint without deteriorating)

A range of paint brushes

Black felt tip marker may be used to enhance final picture (optional)

*A medium is a liquid carrier for the soil pigment, enabling it to be painted. As the medium dries in the air it fixes the pigment to the paper. Vegetable oil, PVA glue or just plain water can be used. Honey mixed with gum Arabic and glycerine is used in watercolour paint boxes. There is some archaeological evidence that one of the first mediums used to carry the pigment was animal fat. (So don't throw out the bacon fat). If you can obtain it from an art shop, clear acrylic medium is recommended, but for school use a watered down PVA glue (about 50:50) is perfectly acceptable.

Tip: If the paint does not flow from the brush, add one drop of washing up liquid to the mix.

Preparing your Paint

Collect samples of soils with different colours and textures.

Remove any unwanted elements from the samples you collect, e.g. grass, rocks, roots, bugs.

Air dry the soil samples.

Once dried, place the soil samples in re-sealable freezer bags - one for each type/colour of soil.

Use the rolling pin to break down the large lumps in each sample.

Pour the contents of one bag into the sieve with the largest mesh.

Sift the soil onto a paper plate and discard the large particles that separate out during sifting (or store for later use to add texture to collage work).

Repeat through the medium and fine sieves.

Sieve each colour sample in the same way.

Put samples in paper cups.

Add enough medium to each cup to make a mix the consistency of a whipped cream. Stir until combined.

Be careful to add the liquids sparingly and gradually. If you add too much it may dilute the soil too much so that the colour does not come through well in paintings.

THE PAINTING PROCESS

“Traditional” Brush Painting

Soil paint can be used like “normal” artist's paint by applying it with a brush. The thicker paste can be used like oil or acrylic paint, the thinner, like watercolour. The more viscous mixtures need stiffer brushes but can be used to build up deep textures. Smaller, softer brushes should be used for the detail. Try different papers and experiment with wet or dry surfaces.

Younger children could start with one colour and progress to a wider palette of more colours.

Quite complex pictures can be painted with only two or three colours or shades. Like any other paint the colours can be mixed. If you have difficulty getting dark colours, mix in some crushed charcoal. Start with natural subjects such as landscapes and trees. Part of the drawing could be done in advance with the pupil completing the detail and colouring. Final detailing could be done with a black felt tipped pen.

Your pictures may need fixing on the paper, especially if you have used only water as a medium. Professional artist's sprays can be purchased but a cheap hairspray will do almost as well. Alternatively pictures can be laminated.

Neolithic-style Painting

Stone Age painters would place a hand on the cave side and spray a mouthful of paint over it, leaving an unpainted hand shape. The method can be modernised for schools by using a paper template of a child's hand and a stiff brush to splatter the paint. Template prints of any shape could be overlaid to produce a complex, multicoloured print. Set up a computer search for pictures of “Cave paintings” and let the pupils copy them or do a picture “in the style of...”

Collage

Soil can also be used to make a sort of collage by covering an area of the paper with PVA glue using a stencil and sprinkling sieved soil on to it then repeating with other shapes and other fractions or grades of the sieved soil. This process produces a variation of colour and texture. Sands, leaves, small stones or twigs could be combined in abstract or representational pictures. This is an ideal Autumn art activity.

Another idea for soil paint is to use it to paint plaster cast fossils. The mud formed by weathered limestone, when made into paint and painted on plaster casts of fossils ammonites or trilobites for instance, gives a very realistic finish.

A computer search for “soil painting” will not find any world famous artists but there are many artists who find it a suitable medium in which to work professionally. Recently soil paintings by World War I prisoners in Germany were featured on *The Antiques Roadshow*.

Investigation and Art Combined

By preparing the paints your pupils will get the chance to examine the colours, textures and constituents of the various soils and through the painting experience may relate the soils to the world around them. They will experience the scientific practices of examining, separating and mixing. They will learn the practical uses and restrictions of viscosity and the difference between solutions and mixtures. If we add a touch of human and art history we can see that Soil Painting is a very effective cross curricular project that children of all ages can enjoy.

SOIL CHEMISTRY - the pH scale

Because soil contains the five ingredients (organic material; living creatures; rocks/minerals; air and water) in varying proportions, not all soils are suitable for all plants. Too much of one ingredient could make the soil unsuitable to many plants. Gardeners and farmers need to know what type of soil they have before they can consider what seeds to sow. Just looking and feeling the soil will not give them the whole picture. It may help knowing whether the soils would drain easily or would hold water but they need more information than that. Any soil which is highly acidic would be poisonous to alkaline loving plants and vice versa. To measure the acidity or alkaline content of the soil they would use a pH meter or a pH kit.

The pH scale is an indication of the acidity of the soil.

- The scale runs from 1 – 14
- 7 being neutral
- 1 – 6 being acidic
- 8 – 14 being alkaline
- Most plants prefer soils around 6 – 7
- A few, like potatoes, prefer 4.5 – 6
- Hydrangea (4.0 – 5.0) like acid soil
- Rhododendrons (4.0 – 5.0) prefer acid soil

Acid soils usually contain a higher proportion of peat whereas alkaline soil contains a higher proportion of lime. In the past if the alkaline soil needed to be changed to more acid soil then peat would have been added, this is a practice which has fallen out of favour and to increase the acidity now it is recommended that sulphur is added. If, however, the soil is too acidic then powdered lime is added to the soil to increase the pH number.

There are a number of kits available from garden centres to test the pH of soil. These range from a small pocket sized tube which contains pH indicators to large industrial kits and electronic meters. The chemical indicators change colour when mixed in solution due to a chemical binding to existing hydrogen or hydroxide ions. The change alters the amount of light absorbed which changes the visible colour of the solution. Within the kits there is a colour comparison chart to match up to the changed colour of the solution. The colours shown will be green (alkaline) through to red (acid).

To demonstrate this effect, and do some real science, prepare three soil samples.

1. One needs to be very peaty
2. One needs to be very limey
3. One needs to be a 50-50 mix of the other two samples.

Using three test tubes from a pH kit

- Half fill a test tube with a soil sample
- Put in the indicator
- Add distilled water to make a solution of about three quarters of the tube
- Place the cap on the open end of the test tube
- Leave for about 2 minutes to allow the indicator to dissolve into the sample
- Shake the tube to mix the soil, water and the indicator
- Allow the sample to settle
- Check the colour against the indicator comparison chart and read off the pH number.

Repeat the test with the other two samples to see the colour changes which can be striking.

In addition to the prepared samples as described, use samples from around the school or from the pupils home gardens or window boxes, anywhere where plants are grown.

To obtain a soil sample from a garden, dig a hole about 10cm deep and take a small sample from the base of the hole. The reason for this is to ensure that it is the soil being tested and not pollutants from around the site. Again, hygiene should be considered and the usual sensible precautions taken when sourcing soil samples and should really be done under adult supervision.

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