

EVERYDAY MATERIALS

INTRODUCTION

In this module children further develop their knowledge and understanding of materials, achieving an in-depth knowledge of the properties of certain materials and how and why those specific properties make them suitable for particular uses. They explore familiar objects in detail and find out about accidental scientific discoveries, such as the 'non-sticky' glue developed by Spencer Silver and used in 'Post it' notes, and how properties of 'super absorbent powders' can make them useful in everyday life. Specific scientific and other vocabulary is used by children as they describe, explain and communicate their understanding of materials, succinctly and in ways appropriate to a science context.

When working scientifically, children plan and carry out comparative and fair tests to answer questions about how and why certain materials are selected and used because of their properties. They do this increasingly independently, recognising and controlling variables where necessary, so that they collect sufficient quality evidence to enable them to answer their science questions. Children take and record measurements using appropriate measuring equipment with increasing accuracy and use a variety of ways to report and present their data to an audience.

National Curriculum:

Give reasons, based on evidence from comparative and fair tests, for specific uses of everyday materials, including metals, wood and plastic

Working Scientifically:

Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

Planning different types of science enquiries to answer questions, including recognising and controlling variables where necessary

Taking measurements, using a wide range of scientific equipment, with increasing accuracy and precision, and taking repeat readings when appropriate

Identifying evidence that has been used to support or refute ideas or arguments

Scientific Enquiry:

Grouping and classifying

Carrying out comparative and fair tests

Observing changes over different periods of time

Key vocabulary:

properties, material, building, construction, structure, organic, natural, manufactured, man-made, weathering, decay, decompose, break down, brittle, fragile, metal, plastic, wood, ceramic, concrete, compare, contrast, group, organise, criteria, strong, strength, weakness, durability, wear, tear, stretch, flexible, flexibility, hardness, light, heavy, durable, durability, waterproof, washable, stain resistant, reusable, bicycle, suspension, brakes, tyre tread, saddle, weight, mass, criteria, ovenproof, heat, temperature, room temperature, thermal conductor, thermal insulator, insulate, insulation, viscosity, viscous, sticky, stickiness, tackiness, adhesive, glue, saturated, powder, particle, polymer, volume, quantity

FACT FILE:

Materials that children encounter in the world around them show signs of wear and tear over time. This may be due to weathering or regular use (or abuse). Organic materials, for example wood, will decompose once the surface seal or varnish is broken, whereas some plastics start to break down and can become brittle.

Particular materials and their properties

Plastics: This term encompasses a wide variety of common everyday materials, all with very different properties. Plastics are polymers: very large molecules made up of smaller units joined together, generally end-to-end, to create a long chain. The properties of particular plastics depend on how these chains combine. Plastics can be very different: rigid and inflexible in one form, for example a plastic container; malleable and highly flexible in another, for example cling film.

Ceramic and glass materials: These tend to be strong, stiff, brittle, chemically inert and poor conductors of heat and electricity. Metal is a very good thermal conductor (as well as a very good electrical conductor), becoming hot quickly, but losing heat at a very fast rate, for example, cooling to room temperature much more quickly than ceramic or glass.

Glue: For two surfaces to become glued together, two things must happen. Firstly, the liquid glue must find its way into all the nooks and crannies of the two surfaces being stuck together. Even surfaces that feel quite smooth will appear much rougher when examined under a microscope. Once the glue has been applied to the surfaces it must be able to turn into a solid, either by a setting or a drying process. This solid then holds the two surfaces together. If it cannot dry or set for some reason, it will not stick.

Insta-Snow®: The scientific name for Insta-Snow® is sodium polyacrylate. It is a polymer that takes the form of a 'super absorbent powder'. It is very similar to the powder used to fill babies' nappies, which was originally developed by NASA and used by astronauts on space flights. Scientists developed a version of that polymer that was far too fluffy when it absorbed water to make it suitable for a nappy – and it became Insta-Snow®. The version of the polymer inside a nappy turns to gel instead – altogether more appropriate!

Insta-Snow® absorbs water by osmosis and the molecules in the chain swell – but only so far. As the powder absorbs water, an exothermic reaction takes place and the changing powder feels warm to the touch. If salt is added to the Insta-Snow® at this point the polymer 'gives up' its water and releases it, making the mixture much wetter.

The powder eventually becomes saturated when it has absorbed as much water as it possibly can. If the water is allowed to evaporate, the powder can be used again – although the impurities from tap water seem to make it less effective if reused.

Thermal properties of materials

A thermal insulator is a material that provides high resistance to heat flow, for example, types of foamed plastics like polystyrene, wood, some fabrics and cork. Polystyrene is a very good thermal insulator and is able to keep cool things cool and hot things hot. It has the added advantage of being resistant to moisture, mould and mildew. It is frequently used in cool bags.
