5. A fragile parcel

1½ hours activity

Children devise their own investigations to observe and measure the shock-absorbing properties of a variety of materials used in packaging.

OBJECTIVES

- Compare, sort and group everyday materials on the basis of their properties, including shock absorbtion
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

RESOURCES

(per group)

- A packaging display is required and could include:
  - Jiffy bag - postal
  - Expanded polystyrene packaging - for televisions, video-players, etc.
  - Card, polystyrene and expanded polystyrene egg boxes
  - Bubble packing
  - Tissue paper
  - Easter egg and chocolate boxes
  - Blister packaging - as seen when moulded over items
  - Expanded polystyrene pellets (not the small variety, in case children inhale them) Shredded or whole newspaper
  - Sawdust or wood shavings
  - Cotton-wool
  - Hay or straw
- Food bags and ties
- Metre rulers
- Fragile items (crisps, meringues, etc.), up to 3 will be needed. Activity Sheet A5
- List of Royal Mail parcel charges
- Activity sheet A5

DISPLAY DISCUSSION QUESTIONS

- What types of things would be wrapped or put into each packaging? (E.g. eggs, television, etc.)
- Can you think of some words that describe what the packaging is like? (E.g. soft, spongy, specially shaped or formed, air inside, etc.)
- Can the packaging be used for only one thing or lots of things? Why? (E.g. some packaging will be moulded for a specific purpose and others will be produced for more general use.)

CARRYING OUT THE ACTIVITY

Three of the packaging types are chosen from the display to investigate their effectiveness at protecting fragile objects. Children can be asked to choose one material they think will be very good, one material that will be average, and one material they think will be poor. They are asked to give give reasons for their choices (see activity sheet A5).

The 'fragile parcel' could be a meringue, popadoms, stacker crisps, a blown egg, or an item of the children's choice. Children should check their choice with the teacher before starting their investigation.

Children should decide on the best way of testing the materials, e.g. dropping the parcel from increasing heights, dropping an increasingly large mass on the parcel, dropping the same mass from increasing heights on the parcel, etc.

Fair testing may be discussed, e.g. thickness, weight, volume and number of layers of wrapping; the heights and/or masses used.

The fragile item is wrapped in each type of packaging and can be held together in a plastic food bag and tied before carrying out the chosen test. The fragile item is then carefully checked for any signs of damage. The height or mass is increased in even steps until damage occurs or a specified maximum height or weight is reached. The results can be recorded on activity sheet A5.

BACKGROUND

The ability for a material to absorb shock can be explained as its 'squashiness'. Shock travels through a material and some of the energy from impact is absorbed on its journey through the material. Good shock-absorbers absorb much of the impact energy so it does not get transmitted to the other side. This energy is used in the collapsing of the structure of the material and/or in the compressing of air present in the material. In the case of expanded polystyrene both of these things occur. Thus it is a good shock-absorber.

The results may show that heavy packaging such as cotton-wool is as good at absorbing shock as bubble-packing. Discussion could include the importance of packaging being lightweight as well as shock absorbant, so as to reduce transportation charges. The air in the bubble packing and the expanded polystyrene helps make these packaging materials effectively lighter and shock-absorbing, so both are ideal for protecting fragile items in transit. Adding air to a material does not make it lighter but less dense, allowing less material to be required to protect the contents of a parcel.

EXTENSION

The children could investigate the weights of the packaging if this has not been chosen as a criterion for fair testing. A food bag of newspaper or cotton-wool weighs approximately 4 or 5 times more than the same volume of bubble packing or expanded polystyrene pellets. Children could record the weight of the packaging in grams, or roll balls of plasticine the same weight as each package for a visual comparison.

Discussing transportation of parcels would link this activity with the mini-enterprise to follow. The teacher could ask which packing the children might choose for sending a thousand fragile parcels by road on a long journey. A very heavy load will increase the amount of fuel needed for transport and therefore increase costs. If the transportation costs are increased then the cost of the product will also be increased. Using a list of Royal Mail parcel charges, the link between cost and weight can be shown and some maths work carried out using this relationship.