4. Fundamental friction

2 hours

The children investigate the best materials to make conveyor belts to pass materials from one part of the recycling process to another.

OBJECTIVES

- Compare how things move on different surfaces
- Identify the effects of air resistance, water resistance and friction that act between moving surfaces
- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

RESOURCES

(Per group of 4 children unless otherwise stated)

- Activity sheets 5 and 12
- Newton meter (scale of 0.5 – 2N)
- Weighted object (e.g. a box containing 1kg weight)
- 3 samples of surface materials (e.g. vinyl flooring, carpet, polythene bag, etc.)

INTRODUCING THE ACTIVITY

Read the part of the e-mail (Activity sheet 5) that asks about suitable materials for the conveyor belt.

Explain to the children that a conveyor is a series of rollers, which move the belt along; see diagrams on Activity sheet 12. Remind the children that a surface with high friction has good grip. If the surface of the underside of the belt is too smooth, the rollers will not grip and move the belt, they will just turn around.

Ask the children to suggest surfaces with high and low friction, e.g. tyres on cars and bicycles have high friction to grip the road. A child's slide has low friction so that children slip smoothly down, but the clothes and shoes that they wear will affect the speed. Show the children how friction can be measured by pulling a heavy object over the surface using a force meter. The reading should be taken just as the object begins to move. The units used are Newtons.

MAIN ACTIVITY

Show the children a selection of different flexible surface materials, e.g. polythene (bin bag), both sides of carpet, vinyl tiles, etc. They could predict which they think has the highest and which has the lowest surface friction.

Each group could test a different surface and compare results at the end, or they could test all three.

Use Activity sheet 12 as a guide through the investigation; measuring the surface friction of each material to find which has the highest. Do this by dragging an object (e.g. a box containing a 1kg weight) using a force meter and recording the force. As one child pulls on the force meter attached to the object, a second child reads out the scale as it increases. A third child carefully watches the object to indicate when it first starts to move. The fourth child in the group listens to the scale readings to record the correct reading when the object started to move.

The children then draw a force diagram to show their box being dragged over different surfaces.

PLENARY

Collate the results on the board and discuss them. Draw a class conclusion about the best surface for the conveyor belt. Tell the children that many conveyor belts are made out of rubber sheeting. Discuss why this is a suitable material for a conveyor belt. It is durable, flexible and has high surface friction.

Ask the children to think of possible ways to increase the friction of the rollers (e.g. adding bumps or ridges).

Discuss the upper surface of the belt. Does this need to have high friction? A very slippery belt may cause items to slide when it stops moving. Ways of treating the surface to stop this from happening could be investigated as a possible extension.