7. Designing safety wear

2.5 hours

Investigating types of protective equipment, and collecting data using data loggers. Designing new equipment using appropriate materials. This is a standalone activity and could be carried out at any point in the sequence, or completely independently.

OBJECTIVES

- To investigate materials for potential use in protective equipment.
- To collect sound, light and temperature data.
- To gather visual and other information to help develop ideas.
- To communicate design ideas effectively.

RESOURCES

(Per group of 4 children unless otherwise stated)

- Activity sheet 9
- 4-5 of one of the following:
    - Water proof and non-waterproof fabrics
    - Sound insulating materials
    - Thermal insulating materials
    - Range of coloured films (e.g. Quality Street wrappers)
- Sound source (e.g. a buzzer in a simple circuit)
- Light source (e.g. torch, angle poise lamp)
- Tray (e.g. Gratnell shallow tray or similar)
- Shoe box
- Cup of hot water (50-60°C)
- 330-500ml bottle filled with ice
- 10-100ml measuring cylinders
- Range of 4-5 colour shade cards (e.g. paint cards from DIY shops)
- Data loggers
- Thermometer (optional)
- Digital Camera

Safety note

Water should be below 60°C.

Note: If data loggers are not available, only subjective data can be collected for the sound insulation and light activities.

INTRODUCING THE ACTIVITY

Using Activity sheet 9, introduce the brief from the company asking for help to design new equipment for people flying to an offshore platform. The criteria include:

- New flight suit which needs to be waterproof
- Recommended materials for ear defenders, to protect against the noise during the flight
- Lens colour and design for sunglasses
- Recommended materials for insulated gloves.

MAIN ACTIVITY

Each group working in job roles decides which part of the design brief they will investigate. After exploring the materials available and planning an investigation, the groups find possible ways to solve the problems.

Investigations could include:

- Testing a range of fabrics to find one that is waterproof and durable, and using the chosen fabric to design a flight suit.
- Wrapping a sound source (e.g. buzzer in a simple circuit) in different materials in a shoe box to identify which is most effective in dampening the sound. Data loggers are used to measure the sound travelling through a material.
- Using a light sensor to record the amount of light travelling from a light source through different coloured films. Layers of films could be combined to make new colours (e.g. red and yellow) or to stop more light from coming through. If the eye protection is for the pilot, they will still need to be able to see the lights on the instrument panel.
- Exploring which materials slow down either the rate of hot water cooling or ice melting. This would lead to the design of insulated gloves. Data loggers or thermometers are used to measure temperature changes. The volume of melted ice over time can also be measured.

Results could be collected either electronically or on paper and displayed alongside their designs and samples of chosen materials.

PLENARY

Each group shows and explains their findings and designs to the rest of the class, including reasons for their chosen materials.

BACKGROUND INFORMATION

Flight suits are specially designed for use in helicopters, military planes and space travel. Historically these flight suits consisted of many pieces but modern suits are a single piece like a jump suit.

The first suits designed for World War 1 needed to keep their pilots warm so were heavily padded. At one point they were electrically heated as the cockpits were open and very cold. Gradually as airplane design changed, the suit design changed. The heavy padded fabrics have been replaced with lightweight fabrics, which are less bulky and can be tailored to allow ease of movement. These fabrics are nylon based with blended cottons and polyesters. This combination results in a durable and flexible fabric. Zippered pockets are often featured in these suits.

AMBASSADOR ROLE

An ambassador can attend the children's presentations of their findings, and offer constructive feedback on their ideas. They can bring a variety of protective equipment currently used on helicopter flights and industrial sites to highlight some of the important design features, and to reinforce some of the children's design ideas.