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Erasmus+

Learning Scientific Skills Outside the Classroom

Scientific Skills

Measuring	Recording	Concluding Specific skill – explain their findings using scientific language
Country of Origin	Suggested Age Range	Suggested Theme
UK	9 - 11	Forces

Location outside the classroom	Benefits of using this location
Outside on playground	There needs to be a large space for the children to move around freely and build their levers with wood
Learning Objectives – Scientific Skills	**Learning Objectives – Knowledge**
To make accurate measurements in cm using a ruler or tape measure To record their results in a suitable table To explain what they have found out using relevant scientific language	To know that machines help make work easier To recognise that machines, including levers, allow a smaller force to have a greater effect

Key Vocabulary

Scientific skills vocabulary – measure, measuring, record, recording, table, results, conclude, concluding, variable, fair test
Knowledge vocabulary – force, machine, function, fulcrum, lever, load, effort, pulley

Resources / Equipment

- Equipment to make levers – piece of word or item to act as a fulcrum, planks of wood, objects to act as a load
- Equipment to measure accurately – ruler, tape measure
- Equipment to record results – paper, pencil, clipboards

Teaching Activities

Discuss - What is a machine?

Explain – A machine is something that makes work easier. We use machines every day without even thinking about it, examples of different types of a simple machine would be a lever, pulley, inclined plane, wedge, screw or wheel and axle. Almost all mechanical devices are machines.

Discuss – What examples of each type of simple machine can you think of? Examples you could discuss include:
Lever – has a fulcrum, load and effort e.g., scissors, pliers, staples, seesaw, wheelbarrow, tweezers
Pulley – has a rope and wheels with a groove e.g., a well, crane, flag pole, roller blind, lift
Inclined plane –uses a slope, e.g., roller coaster, dumper truck, slides, ramps, skateboard ramps
Wedge – has a pointed edge and can be driven into something to separate it e.g., a doorstop, an axe, a nail, knives
Screw – inclined plane wrapped around a pole e.g., screw, swivel chair, jar lid
Wheel and axle – a wheel has a rod/axle running through it e.g., bike wheel, car

Explain – They are going to be investigating one type of a simple machine – levers. Levers help us to lift a load with less effort.

Demonstrate – Show how levers work to reduce the effort required by drawing a diagram of a see-saw on a flipchart or board and labelling the different features (load, effort and fulcrum). You could demonstrate using an example of a see-saw by showing them a plank of wood (a long body) which is balanced on an object in the centre (the fulcrum) and using a book as the load. The fulcrum is the turning point.

Explain – There are different features on a machine which works as a lever. There is a fulcrum – the point at which the lever pivots, the body – the long body which rests on the fulcrum to form the base of the lever and the load – the object being lifted. To use a lever, you need to apply some effort. The effort is the force which is applied to make the object move. These three parts can occur in different orders. In a see-saw, the order is L, F and E. This is an example of a first-class lever.
When you push (effort) down one end of the lever, it makes the other end go up (load). Levers help to make work easier because they enable us to lift things, we would not be able to lift on our own; they reduce the effort needed.

Activity – Children look at some examples of levers within school and spend time thinking about how they work – some examples could be scissors, see-saw, stapler, wheelbarrows and bottle openers. Scissors and pliers are other examples of a first- class level (L, F and E). A wheelbarrow and nutcracker are examples of a second-class lever as the order is E, L and F. A fishing rod and tweezers are examples of third-class levers as the order is F, E and L.

Explain – They are going to investigate the question: 'What effect does it have if we move the position of the fulcrum along the length of the plank – but keep it in between the load and effort?' They will be provided with a long plank of wood for their lever and a second block of wood which will act as a fulcrum. Working in small groups, they will investigate the position of the fulcrum on the effort they need to use to lift the same load.

Demonstrate – Show them how to safely make and use a lever and also how to accurately measure the position of the fulcrum along the length of the plank.

Discuss – How will they make this test fair? Only one variable can be changed if the test is fair, what variable will they be changing? What variables will need to stay the same? How do they measure the effort they use to make the load move?

Activity – Children to investigate the question using a lever. They can choose what objects they would like to use as a load. Some children may change the order of the load, effort and fulcrum.

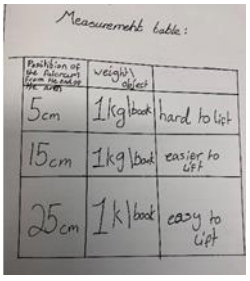
Measure and record – Children accurately measure in centimetres the position of the fulcrum in their lever and record their results in a table. They will draw an appropriate table thinking about the best way to record their results.
NB: Lower attainers can be provided with a pre-drawn table.

Discuss –What did they find out? Does moving the fulcrum affect the effort needed to lift a load? Did they notice any patterns in their results – was it the same regardless of what type of load they used? How do their findings relate to the use of real-life simple machines?

Conclude – Children to write a conclusion explaining what they found out, ensuring they have responded to the initial question: 'What effect does it have if we move the position of the fulcrum but always keep it in between the load and effort?' They need to explain how the distance between the load and the fulcrum effects the effort required to lift the load. Children must use appropriate scientific language in their conclusions.

Additional activity – Can they lift themselves or an adult with ease using their lever?

Examples of children's work and teacher comments from country of origin



The practical activity associated with the lesson enabled them to easily understand the concept of how levers work and the idea of a machine making work easier was confirmed by their ability to easily lift an adult or each other using their lever.