

Medium Term Plan: Supporting Implementation of LTP/Progression Grid

Subject: Science
NC/PoS:

Year: UKS2 year A - Forces

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect

Prior Learning (what pupils already know and can do)

A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it move. A toy car travels further on a smooth surface compared to a carpet. The smoother the surface the further the car travels and the rougher the surface the quicker an object slows down. For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts. Like poles repel and opposite poles attract.

End Goals (what pupils MUST know and remember)

- Know that friction is the force between surfaces that are touching.
- Know rough surfaces, create lots of friction.
- Know smooth surfaces do not create much friction.
- Know friction produces heat.
- Know air resistance is the force that slows down moving objects as they move through air.
- Know objects, need to be streamlined to travel faster through the air and to travel slower through the air, you need a large surface area.
- Know water resistance is the force that slows down moving objects as they move through water.
- Know if you want to travel more quickly through water, the shape needs to be streamlined e.g. Dolphin has a streamlined body
- Know that buoyancy is an object's ability to float in water or air.
- Know that the force of gravity pulls objects towards the centre of the Earth regardless of where you are on the planet.
- Know that Sir Isaac Newton (a British scientist) devised the laws of gravity
- Know that the size of the gravitational force is more or less the same all over the Earth.
- Know that levers, gears, and pulleys are simple mechanisms that enable a small force to have a greater effect
- Know a lever is made from a long pole and pivot (fulcrum) examples are scissors, a wheelbarrow, and a stapler
- Know a pulley is a rope running through a wheel, examples are window blinds, a flagpole and a well
- Know gears are wheels with teeth that fit together. When one wheel is turned, the other wheel turns too but in the opposite direction.
- Know that a smaller gear will turn faster than a larger one

Key Vocabulary: contact, non-contact, force, push, pull, motion, speed up, slow down, change direction, surfaces, texture, contact, friction, gravity, Sir Isaac Newton, force meter, weight, mass, average, air resistance, parachutes, area, water resistance, streamlined, buoyancy, simple mechanism, pulley, lever, gears, clockwise, anticlockwise, load, exert

Session 1: review prior learning

Watch <http://www.bbc.co.uk/learningzone/clips/forces-in-action-no-narration/1601.html>
how are all the images in the video linked? (Everything was moving) What is a force?

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Most forces occur when there is contact e.g. wind blowing through the trees makes the tree move. Can you think of any other situations when there is a force?

Discuss the non-contact force – magnetism

Forces can make things speed up, slow down, change direction or stop

Introduce careers linked to forces:

Mechanical engineer https://www.youtube.com/watch?v=UrT1_TuvZmQ

Robotic technician <https://www.youtube.com/watch?v=IKIZw8XAsOc>

Vocabulary: contact, non-contact, force, push, pull, motion, speed up, slow down, change direction

Session 2: Recap: What can forces do?

Children learn that friction is the force between surfaces that are touching and rough surfaces, create lots of friction whilst smooth surfaces do not create much friction. Friction produces heat.

LO: to observe what happens as objects move across surfaces



Why is the boy finding it hard to pull the sledge?

Watch <https://www.youtube.com/watch?v=m9aJImtsEpM>

Friction - the resistance that one surface or object encounters when moving over another.

Children investigate an object moving across different surfaces explain what happens using term friction. Could use a force meter and a trainer/shoe on different surfaces

Vocabulary: surfaces, texture, contact, friction

Session 3: Recap: what is friction?

Children learn that the force of gravity pulls objects towards the centre of the Earth regardless of where you are on the planet. Sir Isaac Newton (a British scientist) devised the laws of gravity and that the size of the gravitational force is more or less the same all over the Earth.

LO: to understand the force of gravity

Watch <https://www.youtube.com/watch?v=2ydh7AShMzM>

<https://www.schoolsofkingedwardvi.co.uk/ks2-science-year-5-5b-forces-gravity/>

Gravity - the force by which a planet or other body draws objects toward its centre. The Earth's gravity is what keeps you on the ground and makes things fall.

Discuss a bouncy ball – ask children to watch as the ball falls to the ground – why does it do this? What is acting upon the ball? Etc.

Discuss mass and weight:

Weight is a measurement of the gravitational force on an object. The mass of an object is a measure of the matter in it. The basic unit of measurement for mass is the kilogram.

Investigate using a force meter: use a sandwich bag to hold different classroom objects and record the results

Vocabulary: gravity, Sir Isaac Newton, force meter, weight, mass

Session 4: What is gravity?

Children learn that air resistance is the force that slows down moving objects as they move through air and that objects need to be streamlined to travel faster through the air and to travel slower through the air, you need a large surface area.

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LO: to record and present data about air resistance

Air resistance - describes the forces that are in opposition to the motion of an object as it passes through the air thus slowing the object down.

<https://www.youtube.com/watch?v=Aoy3j9tbOk0> air resistance

Design or make a variety of parachutes carry out fair tests to determine which are the most effective. Take average readings

Vocabulary: average, air resistance, parachutes, area

Session 5: Recap: what is air resistance? How do you decrease air resistance?

Children learn water resistance is the force that slows down moving objects as they move through water and if you want to travel more quickly through water, the shape needs to be streamlined e.g. Dolphin has a streamlined body. Buoyancy is an object's ability to float in water or air.

LO: to observe how changing the shape affects the water resistance

<https://www.youtube.com/watch?v=a85Oepkt6J0>

<https://www.youtube.com/watch?v=yhcbqQGGQc4> explains experiment for teacher

Water resistance – A force that is caused by water with the force acting in the opposite direction to an object moving through the water.

Children record results, present data, and write a conclusion

Vocabulary: water resistance, streamlined

Session 6: what is water resistance? How do you decrease water resistance?

Children learn that levers, gears, and pulleys are simple mechanisms that enable a small force to have a greater effect. A lever is made from a long pole and pivot (fulcrum) examples are scissors, a wheelbarrow, and a stapler. A pulley is a rope running through a wheel, examples are window blinds, a flagpole and a well. Gears are wheels with teeth that fit together. When one wheel is turned, the other wheel turns too but in the opposite direction. A smaller gear will turn faster than a larger one.

LO: To recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect

<https://www.bbc.co.uk/bitesize/clips/zrp6n39>

<https://www.schoolsofkingedwardvi.co.uk/ks2-science-year-5-5c-forces-simple-machines/>

Explore:

- Levers – make catapults with lollipop sticks and elastic bands (move the fulcrum)
- Gears – use card gears to see the movement
- Pulleys – attach pulleys to cereal boxes and lift objects

Vocabulary: simple mechanism, pulley, lever, gears, clockwise, anticlockwise, load, exert

Link to career:

Automotive engineer, civil engineer

Mechanical engineer https://www.youtube.com/watch?v=UrT1_TuvZmQ

Robotic technician <https://www.youtube.com/watch?v=IKIZw8XAsOc>

Scientists who have helped develop understanding in this field: Sir Isaac Newton

<https://www.youtube.com/watch?v=2ydh7AShMzM> Archimedes buoyancy theory