Year 5 – Autumn 2 - Forces

NC Science - 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

I can identify and name different forces

https://vimeo.com/111261824 *Meteorite landing* Watch the above clip and tell the chn that after finishing their topic on Space, a meteorite has crash landed on earth – attracting attention from NHM. Recap over how things are kept in position in the Solar system – the force of the planets keeps their moons close by so they do not float away. **How did this meteorite escape the solar system? Introduce the chn to the new topic on Forces and watch the first 2 minutes of** https://www.youtube.com/watch?v=SiSqdZuvdI8

I can investigate the effects of air resistance

May have to change the parachute investigation depending on what chn want to follow or allow different groups to investigate different vairables Recap over the different forces looked at and how they work. Remind chn of the meteorite. NHM have said the only way to get into the remote region where the meteorite landed is via a parachute drop. Ask chn why they think the recovery team will need a parachute - they should remind you that the force of gravity from the Earth pulls things towards the ground. How do they think a parachute would change this and why? https://www.youtube.com/watch?v=SiSqdZuvdI8 watch from 5mins-8.20min
Tell the chn that today they will investigate which parachute will be best to use to get to the meteorite safely. Discuss what the chn will need to consider before investigating – **size, material, string length, height of drop, weight at end of string**. Pick 2 variables to keep constant and one to change and generate Q's
Generate a Pose Q: Which material will allow for a safe parachute landing?
Plan – Tell the chn that they will be changing the materials used – what else will they need?
Pick – Size, height of drop and shape will be constant but material will change

Use investigating levers sheet
Recap with the chn what gravity is and why it is needed. **Does gravity work alone?** Tell the chn that this week the recovery team need to try and lift the meteorite which is in a crater? What could be the best way to lift this mammoth weight – approx 200kg?
Tell the chn that they will be investigating how to lift this meteorite using a ruler/2 lollipop sticks, 100g weights and a cardboard tube (pivot).
What can you create from this?
https://www.youtube.com/watch?v=lueqFOlxl_yc (American! Stop at 1.55min)
After watching the clip tell the chn that they will be investigating how the positioning of the fulcrum (pivot) in a lever will help to lift the meteorite. Let the chn have a go at creating a lever, moving the fulcrum and observing what they can see happening. Pose a question for how the meteorite can be lifted: Where would be the best place to position a fulcrum to lift a heavy load? Plan – What will be needed to investigate this Q? Pick – The weight stays the same and the lever and height of the fulcrum. The distance of the fulcrum to the load will change. Predict – The closer the fulcrum to the load, the easier it is to lift or the load further away the fulcrum, the easier it is to lift?

I can identify how forces work in gears

Recap over what they concluded last lesson about levers. Tell the chn that the meteorite is now being transported but the staff are now on bikes with gears but unsure how to use these bikes. **What is the role of the gears on a bike? How do they work?** Watch till 4min 56 https://www.bbc.co.uk/teach/class-clips-video/science-physics-ks2-ks3-will-gears-let-children-pull-a-piano-uphill-with-their-bikes/zmcpy9q - TTYP - what is a gear? What is the difference between a low gear and a high gear? Which gear combination they think would result in slow and steady and which would result in fast and less controlled? Show the chn different gears with different number of teeth with a corresponding smaller gear to work out the ratio eg. 48:12 – 1:4 ratio. Chn to think about the question posed at the point of the clip being paused. **Which gear could be used to pull the piano? Does it matter if the piano is being pulled up/downhill and the surface of the road?** Watch the remaining of the clip. **Chn to record in books how gears work and which is the best gear to use when cycling up/down hill behind the meteorite.**
Chn to understand that *gears, allow a smaller force to have a greater effect.*

Recap over what forces the chn have looked at so far and what effects they have. Tell the chn that today the meteorite is almost at it's final destination faces a dilemma of which road to take as each one has a different surface. Today the chn will be investigating which surface will be the safest for the truck to take. Show chn the three paths and ask them for an initial assessment - what is it that makes them think one will be slippy, while another might be slow? Talk about friction and watch - https://www.bbc.co.uk/bitesize/topics/zsxxsbk/articles/zxqrdxs and https://www.bbc.co.uk/programmes/p019bh9c Recap if gears could be used to assist too in reducing/increasing friction too. Pose a question to investigate the friction that different surfaces can cause e.g. Which road surface would create the greatest friction? Plan: Chn will need a ramp, a car and 3 different surfaces – the ramp may already have different surfaces or to use a cardboard/plain ramp and to push the car down to different surfaces and to measure how far the car travels – take 3 measures to calculate an average.
Pick: The car stays the same but the surfaces change. Predict: The surfaces which are not smooth will provide the greatest friction therefore the car will travel the shortest distance.
Present: Chn to create a table of distances travelled, 3 times and then create an average. A bar chart could be used to present the average distance travelled by the car for each surface.
Provide – Chn to explain which surface would cause the most and least friction and why.

Ask the chn to recap what they know about friction and gravity. TTYP – Are these forces present in water?
How does it feel to walk through deep water? Think of some words and phrases to describe the feeling. Discuss how if they have ever walked through water, they will have felt the effects of **water resistance** pushing against them. So to keep moving forward in water, their own force/weight is used against the water resistance. How can water resistance and air resistance be minimised? Ask the chn to think about the shape of high speed trains and planes and even some of the fastest animals in the sea. Introduce the term streamlined
Tell the chn that today they will be investigating which shape has the most water resistance. They will be using plasticine to create 3 different shapes e.g. cube, sphere and pyramid and dropping them into a tall cylinder and timing how long it takes for each shape to drop. Again chn to drop the shapes 3 times to calculate an average time.
Chn to write their own Pose; Plan; Predict; Present and Provide – following the format that has been completed in previous week. For the Provide, chn to think about the effects of water resistance and gravity on the different shapes.

I can identify the effects of water resistance and gravity

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Can the chn pick out the forces from the clip? Can they name others, which are not seen in the clip? Using the Twinkl ppt go over the different forces present – how they change object, come in pairs and the pairs normally work opposite each other e.g. push and pull. Ensure that chn understand **gravity pulls ALL objects down to the ground** and **friction works against objects on the ground –provides the grip on the ground**! **Why do objects float in space?** Chn to identify and name the force on the images provided before identifying forces in and around the question/posing Q's about what they would like to find out further about forces. Can they turn them into investigative Q's e.g. **Why don't the clouds fall to the ground?** **Thinking ahead to next lesson – if the scientists want to investigate the meteorite, how will they get down to it if it's in a remote place?**

Predict – Can the chn predict which material will be ideal to use?
Present – Chn to make and test their parachutes. **Include the forces acting on the parachute in the diagram.** Table of results with times taken for the parachute to fall from set height.
Provide – Chn to look back at their present and decide which material was best for the parachute for a safe landing include **which force was working at which part on the parachute.**

Present – As a table and then line graph – distance of fulcrum from load. Chn to start off with the fulcrum 5cm (or 2cm) from the load and then move it further away by 5cm each time.
Provide – Chn to explain to the scientists the easiest way to move the meteorite using a lever.

I can explain and understand how levers work

I can identify the effects of friction between moving surfaces.

NC Working Scientifically (UKS2)
During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.