Forces – An introduction

Name_____ **Class**_____

What you will need for this lesson: a small plastic bottle with a sports drinking top, like a 'Fruit Shoot 'bottle, some vitamin C tablets like 'Berroca', a mug, kitchen roll or tissues and some water **OR** instead of the vitamin C tablets you could use bicarbonate of soda and vinegar. You will also need a pen, a pencil and if you have it, access to a computer or iPad.

LESSON STARTER

Look at the pictures below. Imagine the vehicles are moving, can you draw arrows to show the forces working upon them?

When you've finished, watch the video to see how many you got right.

Some clues for Y5 & Y6: Gravity, Thrust, Up-thrust, Air resistance and Drag

THE INVESTIGATION

Try and complete this investigation outside as it may make a bit of a mess!

Method 1

Remember to half fill your bottle with water and do not put the vitamin C tablets in the bottle until you're out and ready to start. You must remember to stand back from the bottle to keep yourself from getting hurt, then watch what happens.

Method 2

What we learned!

Before the experiment the force of gravity is keeping the bottle on the floor. As the vitamin tablets starts to bubble, they create a push force inside the bottle. This force builds up until it becomes greater than the force of gravity pulling down on the bottle and this means the bottle is pushed upwards. As the force of the bubbles start to weaken the bottle tilts and then as the pull of gravity becomes the bigger force acting on the bottle, it is pulled back down to the ground once more.

WORKING SCIENTIFICALLY

Our next focus is about working scientifically. All scientists apply these principles whenever they are investigating anything and we've divided them into different skill units.

Find the section your teacher has asked you to focus on and answer the questions in the relevant section.

A. Planning or

B. Presenting and analysing data or

C. Evaluation

A. PLANNING

Every scientist wants to solve a problem and so takes the following steps

1. **Decides on a question that needs answering.** e.g. Will the bottle go higher if I add more water?
2. **Decides what the independent variable (the thing that is changed) might be in order to work out the answer to the question** e.g. the thing we will change here is the amount of water
3. **Decides what the dependent variable might be (how to measure the differences in each different example**) e.g. we might measure how high the bottle travels
4. **Last of all decides what elements have to stay the same in order to make it a fair test** e.g. we might keep the number of tablets the same if we are testing whether the amount of water makes a difference.

Now using this knowledge, have a go at the questions below!

Give one example of a question you might want to find the answers to.

_____

Year 3, 4, 5, and 6 pupils - What might be the independent variable you would use in your investigation, in other words what would be the things that you would change to investigate your question?

_____

Year 4, 5 and 6 pupils - What would be your dependent variable, in other words what would you measure to record the difference?

_____

Year 5 & 6 pupils - What was your control variable, in other words what did you keep the same to make sure that it was a fair test?

_____

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B. PRESENTING & ANALYSING DATA

When scientists carry out investigations, it is really important that they capture data to make sure they can then answer the questions that they have set themselves.
The scientist on the video has asked you to complete the following:

Year 3 & 4 pupils – You are carrying out experiments to answer the following question:

Does the volume of water in the bottle affect the time it takes the bottle to launch?

What kind of data would you capture to show what happens and why?

Year 5 & 6 pupils – You are carrying out experiments to answer the following question:

Does the size of the tablet affect the height the fizzy rocket might go?

What kind of data would you capture to show what happens and why?

C. EVALUATION

Evaluating how an investigation went as well as the data that comes from a science experiment is a really important part of science. It may be that you feel your experiment could have been done better or more thoroughly and it is important to understand this.

Answer the question below and then explain why you came to this answer:

Year 3, 4, 5 & 6 pupils: Did your experiment work?

Year 3,4, 5 & 6 pupils: Why? Try and explain your answer using diagrams if it helps.

Year 5 & 6 pupils: Try and explain how you know it did or didn't work.

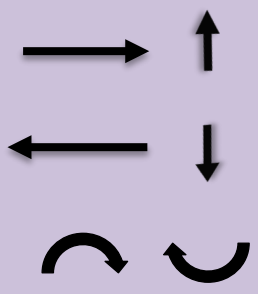
What we learned!

We know that there are 3 types of force and all can be illustrated by arrows.

The Push force is shown as a forward or upward arrow.
Examples of a push force are thrust and up-thrust.

The Pull force as a backward or downward arrow.
Examples of a pull force are gravity and drag.

The Twist force as a curved arrow.
Examples of a twist force is one when a can is opened.



Let's see what you remember!

Can you draw in the arrows on the pictures below to show what force is acting upon them? Write the names of the forces next to the arrows.

Research opportunity

Find out whatever you can about Sir Isaac Newton and create a fact file about him.

Where was he born?
When was he born?
Where did he study?
What did he study?
What important scientific knowledge did he find out and how?

What was your score?