

Whole Class Assembly/Presentation

Topic

Forces

For class size

20 to 40. In smaller classes some children will need to take more than one of the speaking parts.

Summary

The assembly begins with a look at what the word 'force' means when applied to our daily lives. We then consider what scientific forces are, ie. pushes or pulls. There follows practical demonstrations and explanations of gravity, up-thrust, friction, and air resistance. The class then perform a short drama/comedy which shows the devastating effect forces can have, in an adaptation of the ancient legend of Icarus. An optional prayer closes the assembly.

Duration

20 – 25 minutes

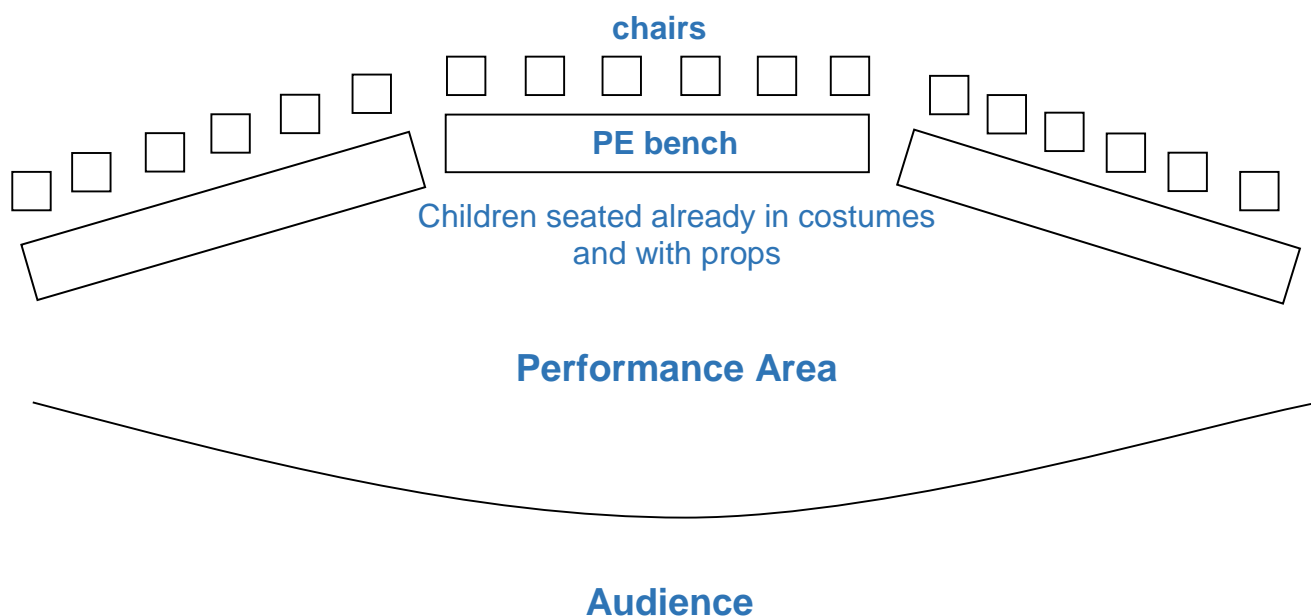
Props/costumes to make or collect

A toy Star Wars light sabre, a microphone, an army/RAF/navy hat and a school prospectus are needed for the opening.

For the second section you will need a PE kit, some chewing gum, a dog lead, three large cut-out arrows, a rope, a force meter and a tennis ball, a chair, a cardboard box, a pair of plimsolls, a sheet of paper, and pictures/paintings of; a bird flapping its wings, a helicopter, a person floating in water, a parachutist and a rocket.

The ancient legend characters could wear bed sheet togas, or white t-shirts (belted at the waist) and shorts. Two sets of card wings are needed for Icarus and Daedalus, a crown for the king and two spears for his guards.

Seating



(7 children stand in a line at the front of the performance area, facing the audience.)

Child 1 Good morning everyone, and welcome to our class assembly. To start with I'd like you to listen to these sentences and think about what they all have in common.

Child 2 *(brandishing light sabre)* May the force be with you!

Child 3 My mum is a force to be reckoned with!

Child 4 *(holding the microphone)* We've had force 10 gales battering the west coast of Scotland!

Child 5 *(Wearing military hat)* Our armed forces will be mobilised within 24 hours!

Child 6 *(reading school prospectus)* A new school rule about uniform will come into force next term!

Child 7 *(looking sheepish)* It wasn't my idea to let down the headteacher's tyres. My so-called friend forced me to do it!

Child 1 That's right. They all contain the word 'force'. As you can tell by the way the word was used, 'force' has a lot to do with power and strength, and in the scientific world this is also the case.

Child 2 But what do we mean *exactly* when we talk about forces in science. Well, a force is either a push or a pull.

(Child 2 shoves and pulls child 3)

Child 3 Oi! Get off! These pushes and pulls are done to an object, any object. In this case it was me! The object then changes in a particular way. The change in me is that I'm angry with him/her!

Child 4 But seriously, a push or pull can speed up a slower moving object, like this.

(A staggering, panting child in PE kit is pushed to the front by a PE instructor.)

Instructor MOVE YOURSELF YOU LAZY TOERAG. WHAT IS THE MATTER WITH YOU? I SAID GET A MOVE ON!

(They exit)

Child 5 Or a pull can slow an object down, like this.

(A girl struggles on with a boy desperately pulling at her ankle.)

Boy OH PLEASE DON'T GO! DON'T LEAVE ME! I PROMISE I'LL CHANGE!

(She slowly exits, still dragging him.)

Child 6 *(taking chewing gum from mouth)* Pulling and pushing an object can change its shape.

(He/she stretches the gum in different ways, rolls it up and puts it back in mouth)

All Eurgh!

Child 7 A push or pull can change the direction in which something is moving.

(A child acting as a dog, wearing a lead, drags on another child - the handler - moving in different directions.)

Handler SPOT! SPOT! WILL YOU MAKE YOU MIND UP WHERE YOU'RE GOING!

(They exit.)

Child 1 So there you have it. Forces are.....

All ...pushes or pulls.....

Child 1 ...to an object that can.....

All ...speed it up, slow it down, change its direction or change its shape.

(The largest and the smallest child in the class pick up either end of a skipping rope and pull against each other. A large cut-out arrow is held over the large child's head to show the direction of his/her pull, while a smaller arrow is held over the small child's head to show the direction of his/her pull.)

Child 2 If two forces push or pull against each other, like these two having a tug-o'-war, and one force is larger, then the object, in this case the rope, will move in the direction of the largest force.

(The smaller child is pulled over and the larger child celebrates. A second large child sitting at the back addresses the first.)

2nd large child Oi! Pick on someone your own size.

(The two large children then pull on either end of the rope. Neither moves the other. Again a large cut-out arrow is held over the first large child's head to show the direction of his/her pull, while an equally large arrow is held over the second large child's head to show the direction of his/her pull. They strain but neither budes.)

Child 2 If, however, two equal forces pull or push against each other, like these two pulling the rope, they are said to be balanced forces, and the object won't move.

Child 3 *(holding up the force meter)* Scientists measure these pushes and pulls using one of these – a forcemeter or Newton meter. This is just a spring which resists a force, and this resistance is measured in newtons, which are read from a scale on the side. The more newtons it reads the

greater the force. And yes, newtons take their name from the man who first studied the force of gravity after an apple fell on his head – Sir Isaac Newton.

(The 7 children sit down and are 5 more take their places.)

- Child 8** So forces are pushes or pulls, but each different push and pull has its own specific name. Let's look at these different forces that we feel the effects of in our daily lives.
- Child 9** *(throwing up and catching a tennis ball)* What goes up must come down. Why? Because of the pulling force called gravity. The centre of our earth pulls everything towards it, whether those things are on the ground, in the air or in water.
- Child 10** It's impossible to beat gravity in the air, unless you are a bird or in a machine that can create a stronger opposite force. *(holding up picture of a bird)* Birds flap their wings against the air to produce an upward force, while planes and helicopters *(holding up picture of a helicopter)* use powerful engines to do the same thing and beat gravity.
- Child 11** *(holding up picture of a floating person)* It is easy to beat gravity in water, because water provides an opposite force called 'up-thrust'. If we lie in a certain position in the water the up-thrust matches the gravity and we float.
- Child 12** *(standing on a chair, with a cardboard box on the floor)* Solid surfaces also give us up-thrust which works against gravity. The solid ground prevents us from being pulled to the centre of the earth. This chair is sturdy enough to provide and up-thrust that stops me being pulled to the floor. The cardboard box, however, isn't. *(S/he jumps down onto the box which will crumple and collapse!)* Gravity – it's a bit of a downer but at least it keeps your feet on the ground!

(These 5 children sit down and 4 more take their places.)

- Child 13** *(wearing no shoes, just socks)* Moving on, have you noticed how certain children will conveniently forget to put on their indoor shoes. This is because they can do this.... *(s/he runs and skids across the floor!)*....when they come into the hall! And who can blame them? Skidding is great fun.
- Child 14** *(holding a pair of plimsolls)* However, the party-poopers in charge, out of concern for our health and safety, insist that we wear shoes like this, with rubber soles. Why? Because they make use of another pulling force – friction. Friction occurs when two surfaces rub together. Let's watch this in a slow motion demonstration.

(Child 14 slowly pulls a crouching child 13 in a prolonged, steady skid along the floor, as child 15 speaks.)

Child 15 The two surfaces rubbing together are (child 13's name)'s socks and the shiny floor. Shiny surfaces and soft materials do not provide a lot of grip. (Child 14's name)'s pull is a strong force which means (child 13's name) slides along the floor. However the force of friction is acting in the opposite direction to this pull and will eventually bring the skid to an end.

Child 16 However, when s/he puts her/his indoor shoes on, as s/he should whenever s/he comes inside school, it's a different story. The rubber soles provide a strong force of friction when in contact with the floor. (*Child 13 puts on the plimsolls and attempts a skid*) There is now a lot of grip and a skid is impossible.

(These 4 children sit down and 5 more take their places.)

Child 17 Objects moving through the air also have a resistance force pulling on them, a bit similar to friction. This is called air-resistance and we can see its effects in many different ways.

Child 18 (*Holding a sheet of paper*) Take this sheet of paper for instance. The force of air resistance can affect its movement in an interesting way. If I drop it from head height watch what happens as it falls through the air.

(The paper is dropped and should 'meander' through the air as it falls.)

Child 19 (*Screwing another piece of the same type of paper into a ball*) If we screw a sheet of the same paper into a ball and drop it again from head height, watch how differently it falls through the air.

(The paper ball is dropped and should fall quickly to the floor. Both pieces are picked up.)

Child 18 Watch again as we drop them together at the same time.

Child 19 Did you notice the difference?

Child 20 You can see quite clearly that the ball falls quicker and more directly than the sheet. This is because the ball is more streamlined than the sheet, which is flatter. Objects which have larger, flatter surfaces trap air which generates the force of air resistance in the opposite direction, and this slows down the movement.

Child 21 (*Holding up pictures of a parachute and a rocket*) Things like parachutes provide lots of air resistance because of their surface area, and are ideal for slowing down movement through the air. Rockets on the other hand are smooth and streamlined and are designed to cut through the air with the minimum of resistance.

Child 20 Sorry for *forcing* you to sit through a science lesson. But fear not, entertainment is on the way. We'd like to demonstrate the effects of all these forces in a short story.

Child 21 It also has a serious message for all of you, which is 'listen to your parents or you could end up in very deep water'. So sit back and enjoy our version of the ancient tale of Daedalus and Icarus.

(The 5 children sit down and 5 narrators stand to one side. King Minos sits centrally, flanked by two guards with spears. He looks agitated.)

Narrator 1 Long ago, on the island of Crete, King Minos was the ruler. His wife had given birth to a hideous creature, the Minotaur, which was a man's body with the head of a bull. It needed to be hidden away, so the king summoned the craftsman Daedalus to help.

(Daedalus enters and kneels before Minos.)

Minos My wife's given birth to a hideous brute!
Man's body, bull's head – it sure ain't cute!
Like a madman I have been pacing about,
Afraid that the people are going to find out

Daedalus Fear not my king, I will build you a maze
To keep the creature from public gaze.
Of winding passages it will be full -
A fantastic structure, and that's no bull!

(Daedalus stands to one side miming the gruelling construction of the maze.)

Narrator 2 So Daedalus and his workmen struggled for a long time building the maze, which would be called the Labyrinth. They cut rock and stone and dragged it over rough ground.

(At the mention of this a child at the back holds up a sign reading 'FRICTION'.)

When it was finished King Minos was very pleased.

(Daedalus approaches Minos again, and kneels.)

Minos Thanks old boy, you've calmed my fears.
This labyrinth should last for years.
So, here's you cash. But tell no-one,
Don't breathe a word of what you've done. *(All exit.)*

Narrator 3 But Daedalus did let slip the king's secret. When Minos found this out he imprisoned Daedalus and his son Icarus, in a high tower on the island.

(The guards bring on Daedalus and Icarus, and stand either side of them.)

Guard 1 Sorry lads, it's a long way down -
Thirty metres to the ground.
If you want 'out' you'll have to jump -
You'll land with one colossal bump!

(At the mention of this a child at the back holds up a sign reading 'GRAVITY'.)

Narrator 4 However, Daedalus and Icarus did escape. Daedalus was, after all, a skilled craftsman, so breaking out of a tower didn't prove too difficult. Yet without transport off the island of Crete they were soon captured.

(Daedalus and Icarus run round the space until they bump into the guards.)

Guard 2 'Ello, 'ello! What 'ave we 'ere?
You thought that you could disappear?
It isn't hard to track you down
On an island with sea all round!

(The guards push them back to the middle, as a child at the back holds up a sign reading 'PUSH'. The guards exit)

Narrator 5 So Daedalus and Icarus were again imprisoned, and their guard doubled so there was no way they could escape for a second time. Day after day they would look out from their window in the high tower, longing to be free.

Icarus I'm going bonkers locked in here!
I can't believe we came so near.
If it wasn't for the the sea.
You and I would now be free.
See the birds up in the air,
They beat their wings without a care.

(At the mention of this children at the back hold up a signs reading 'PUSH' and 'AIR RESISTANCE')

They move with freedom and such grace,
While we're stuck in this flippin' place!

Narrator 1 This got Daedalus thinking, and he came up with a plan. Over the next months he collected thousands of feathers from birds that flew in, out and around their prison tower. As Icarus lazily dreamed of freedom Daedalus spent hour after hour constructing two splendid pairs of wings.

Daedalus Icarus, take a look at these!
We'll fly from here upon the breeze
Wearing these magnificent things.
It's not just Red Bull which gives you wings!

Narrator 2 As father and son planned the finer details of their flight to freedom Daedalus gave a strong warning to Icarus. He had sealed the feathers with wax, which would melt if it got too hot.

Daedalus Do not fly too near the sun
Or else your wings will come undone.
Use your loaf, and really think.
If not you'll end up in the drink.

Narrator 3 Icarus assured his father he would be sensible and not fly too high. The moment came and the two got ready for their escape. They put on their wings, took a deep breath and pushed themselves off from the tower. (*'PUSH' sign*). They gripped their wings tightly (*'FRICTION' sign*) and to their relief soared through the sky to the coast (*'AIR RESISTANCE' sign*).

(Daedalus and Icarus 'fly' around the performance area. Icarus swoops high and low behind Daedalus, who looks worriedly over his shoulder.)

Narrator 4 As they flew out over the sea Icarus became confident – too confident! He soared high into the sky, and then he'd swoop down until the waves touched his toes.

Icarus Dad! Dad! Look at me!
This flying lark is so easy!
I'm just like a jumbo jet....

All They've not been invented yet!

Daedalus Don't be a complete nut case!
Calm down son, ease off the pace.
Hold a straight and steady line.
There's no rush, we've loads of time.

Narrator 5 But it was too late. Icarus had been thoughtless. The wax in his wings had been melted by the sun because he'd flown too high, and the sea's spray had clogged his feathers because he had flown too low. He fell from the sky like a stone!

(Icarus collapses as the 'GRAVITY' sign is held up.)

Icarus My future's looking pretty grim.
Still, it's a nice day for a swim!
And one thing that I've learned, of course,
Is gravity's a deadly force!

Narrator 1 Daedalus looked back, but all he saw were feathers floating on the sea.

(An 'UPTHRUST' sign is held up, and Daedalus 'flies' off.)

Narrator 2 In his despair he flew to freedom, cursing the fact that his silly son had ignored his warnings.

(Everyone but Narrator 2 goes back to their seat.)

Let us pray. Dear God, help us to respect the powerful forces in the world you have created. Keep us safe as we take to the skies and explore the deepest seas. Give us also the wisdom to listen to the advice of those who have greater experience of your world, so we may lead long and fulfilling lives. Amen

The End