

BBC LEARNING PRESENTS

## Terrific Scientific Forces – Live Lesson

**Date:** Monday, 19<sup>th</sup> June 2017

**Time:** 2:00pm

**Duration:** 30 minutes (approx.) + 30 minutes follow up Live Lessons EXTRA programme (this will be published on the website within the week)

**Location:** [bbc.co.uk/livelessons](http://bbc.co.uk/livelessons)

*(Note: if you can't watch the webcast live, you will be able to watch the recording on the Live Lessons website)*

### Curriculum links include:

#### England:

Working scientifically – Year 5 and 6

- Planning different types of science enquiries to answer questions, including recognising and controlling variables where necessary.
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanation of and degree of trust in results.

Forces – Year 5 (and reinforcing Forces for Year 6)

- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces

#### Scotland:

Science experiences and outcomes

- Develop the skills of scientific enquiry and investigation using practical techniques.
- Recognise the role of creativity and inventiveness in the development of the sciences.

Forces – 2<sup>nd</sup> Level

- Investigate how friction, including air resistance affects motion. Suggest ways to improve efficiency in moving objects.

#### Wales:

Skills – planning – Key Stage 2

- Decide upon the observations or measurements that need to be made.

Skills – developing/reflecting – Key Stage 2

- Check observations and measurements by repeating them in order to collect reliable data and information.
- Use some prior knowledge to explain links between cause and effect when concluding.

How things work – Key Stage 2

- Investigate the science behind forces of different kinds e.g. friction and air resistance.

#### Northern Ireland:

Movement and energy – Key Stage 2

- Examine and collect real data.
- Design and carry out fair tests.
- Explore the causes and effect of energy, forces and movement, e.g. how forces can affect the movement and distance objects can travel, how push and pull forces can make things start and stop moving and that different surfaces affect how easily things move over them

# Setup

## How much space and equipment is needed?

The lesson can be screened in a classroom with a large screen linked to a reliable broadband connection. Good audio equipment is not essential but will make the event more enjoyable.

Some of the activities involve writing so sitting at their tables in a classroom would be helpful or something to lean on to write.

Your students will also require copies of the following activity sheets for the live programme:

- **Live Lesson: Activity Sheet 1 – Forces acting on a car,**
- **Live Lesson: Activity Sheet 2 – Balloon-powered cars and**
- **Live Lesson: Activity Sheet 3 – Balanced and unbalanced forces**

## How many students can participate?

It's completely up to you how many students you have participating in the session. We want to get as many students as possible engaged in the Live Lesson. Space might be a consideration if you have a very large group.

# How to prepare for the Live Lesson

## Before the lesson

This Live Lesson is part of BBC Terrific Scientific – a new primary science campaign from the BBC. The lesson is themed around [Investigation 5 of the campaign: Forces](#). To find out more about Investigation 5 and access a collection of teaching resources, visit the BBC Terrific Scientific website at [bbc.co.uk/terrificscientific](http://bbc.co.uk/terrificscientific).

Send in any photos of your class planning – or conducting – their Wacky Sports Days to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk), and they could be featured on the live programme.

**Please note:** *If you are sending in any images or videos that feature children, please ensure that you have parental permission, as they may be shown during the Live Lesson and on our website. In the email, please confirm your official relationship to the child/children featured, e.g. teacher, Brownie group leader, sports coach etc. and confirm that you have sought prior parental consent. Please also ensure the material is not sensitive or controversial. Read our [Terms and Conditions](#) for more information.*

## Forces acting on a car

Early in the Live Lesson, we'll be asking students to put their existing knowledge about forces to the test by labelling the forces that act on a car while it is in forward motion.

You can find this activity on **Live Lesson: Activity Sheet 1 – Forces acting on a car**, on our website. They will be given a short time to do this in, so it might benefit them to have the activity sheets on hand and ready to go, or to carry out the activity before the lesson.

Our expert guest will reveal the answers during the Live Lesson.

## Introduction to forces

In this section of the Live Lesson, we'll be exploring different forces – push, pull and twist – and the size of forces.

We'll be conducting an experiment using balloon-powered cars to investigate how the size of the driving force affects the movement and speed of the car.

During the Live Lesson, students will be asked to think about how they could make the balloon-powered car move faster, and write down their answers on **Live Lesson: Activity Sheet 2 – Balloon-powered cars**.

Email your students' answers to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk) or use the hashtag **#bbclivelessons**, and they could be featured on the Live Lesson.

They can also learn to create their own balloon-powered car after the lesson, using **Live Lesson: Activity Sheet 2a – Balloon-powered cars (Follow-up activity)**.

## Balanced and unbalanced forces

In the middle section of the Live Lesson, we'll be investigating balanced and unbalanced forces and how we need to think about both the size and direction of forces.

As part of this, we'll be asking students to identify whether forces are balanced or unbalanced in **Live Lesson: Activity Sheet 3 – Balanced and unbalanced forces**.

Email your students' answers to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk) or use the hashtag **#bbclivelessons**, and they could be featured on the Live Lesson.

## Air resistance

For the final section of the Live Lesson, we'll be exploring air resistance and its affect on speed, in line with Terrific Scientific's Investigation 5.

As part of this, our expert will be providing feedback on the photos of your Wacky Sports Days that have been sent in to us, and how each costume helps to increase air resistance. We'll also be looking at how air resistance is investigated in a real world context, in particular, when it comes to designing cars.

## Live Q&A session

The Live Lesson will end with a live question and answer session with our expert guests.

If your students would like to pose any questions about forces to the experts, you can send them in to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk) or use the hashtag **#bbclivelessons** before and during the live programme.

We will try and answer as many as we can during the show.

## Contact us

You can email any questions or comments before and during the Live Lesson to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk), or by using the hashtag **#bbclivelessons**. We'll aim to answer as many of your questions as possible.

We'd also love to see examples of your students' work. If your classes have created any work or carried out any activities using the resources on our website, please do send it in to [live.lessons@bbc.co.uk](mailto:live.lessons@bbc.co.uk), and they could be showcased on the programme and on our website.

If you let us know if your school is planning to tune in on the day, your school name could also be featured on the programme.

Thank you for your interest in our Live Lesson, and we hope you'll join us on 19<sup>th</sup> June.

## **Live Lessons EXTRA**

For the first time, we will be featuring a follow up programme called **Live Lessons EXTRA**.

This will not be broadcast live but will be published on our website [bbc.co.uk/livelessons](http://bbc.co.uk/livelessons) a day or two after the live broadcast, and will build on the outcomes of the live programme.

### **Friction**

In the first part of the Live Lesson EXTRA programme, we'll be looking into surface friction, what it is, and how it impacts on movement.

We'll be seeing how friction can actually be useful and how we use friction in the design and engineering of car and bike tyres and brakes.

### **Weight and mass**

In the second section of the programme, we'll be exploring how weight and mass affect movement and speed.

We will be carrying out an investigation using a small car and a force meter to test how different weights affect the amount of force needed to pull the car.

Instructions showing how to prepare for this investigation, including how to build a cardboard buggy to carry out your own classroom investigations, can be found in **Live Lesson EXTRA: Activity Sheet 1 – Weight and Mass** available on our website.

Because the cardboard buggies are not designed to support very much mass, you can substitute the buggies with boxes containing different masses in order to allow a greater range of mass to be tested if you prefer. You can also complete this activity using elastic bands instead of force meters but this would mean that the size of the force can only be observed and not measured.

We will also be showing how weight and mass is a key factor in designing products for speed, by drawing comparisons between steel and lightweight carbon fibre.

### **Lubrication**

In the final part of the programme, we will explore how lubrication affects friction.

Through demonstrations and simulations, we'll be seeing how lubrication impacts on movement and speed, and in particular, the dangers that wet weather poses to vehicles on a road.

Students will be challenged to identify whether lubrication would be helpful or not in a number of different situations. This activity can be found on **Live Lesson EXTRA: Activity Sheet 2 – Lubrication**, available on our website.