

Physics (age 11-14)

Subject map

Big ideas and key concepts

The **Best Evidence Science Teaching** resources can be used with your existing scheme of work, if desired. However, we have used research evidence on learning pathways and effective sequencing of ideas to develop subject maps for biology, chemistry, earth science and physics.

This subject map shows how five **big ideas** of physics education can be developed through a series of **key concepts**, organised into teaching topics.

Each key concept requires approximately 1-3 lessons' worth of teaching time.

The numbering in the subject map gives some guidance about teaching order based on our review of the research and teaching experience. In general, key concepts that appear earlier in the subject map need to be understood before progression to key concepts that appear later. However, the teaching order can be tailored for different classes as appropriate.

Publication of resources

Teaching and learning resources will be added on a topic-by-topic basis throughout 2018 and 2019.

The resources are being developed based on careful consideration of the best available research evidence on learning pathways, common student misunderstandings, and effective teaching approaches.

To find out when new topics have been published, please email uyseg@york.ac.uk and ask to subscribe to BEST project updates, or follow @BestEvSciTeach on Twitter.



This document last updated: December 2018

PHYSICS (AGE 11-14)

**BIG IDEA:
MATTER**

Objects are made of particles with mass. Understanding particles helps us to design our world.

**BIG IDEA:
FORCES AND
MOTION**

Forces make things change. Understanding forces helps us to predict and control physical change.

**BIG IDEA:
SOUND, LIGHT AND
WAVES**

Waves radiate information. Understanding waves helps us to communicate.

**BIG IDEA:
ELECTRICITY AND
MAGNETISM**

The everyday world is largely a consequence of electrical charge. Understanding electricity and magnetism helps us develop technology to improve lives.

**BIG IDEA:
EARTH IN SPACE**

Understanding the uniqueness of the Earth and the vastness of space gives us perspective and awe.

Topic PFM1
Forces

Key concepts:

- PFM1.1 What forces do
- PFM1.2 Describing forces
- PFM1.3 Balanced and unbalanced forces
- PFM1.4 Friction
- PFM1.5 Energy stores and transfers

Topic PSL1
Sound and light

Key concepts:

- PSL1.1 Absorption and reflection of sound and light
- PSL1.2 Characteristics of sound and light

Topic PES1
Solar system and beyond

Key concepts:

- PES1.1 Planets and the solar system
- PES1.2 Gravity
- PES1.3 The night sky, stars and galaxies

Topic PMA1
Heating and cooling

Key concepts:

- PMA1.1 Temperature
- PMA1.2 Heating and cooling
- PMA1.3 Thermal conduction
- PMA1.4 Thermal store of energy

Topic PSL2
How we see

Key concepts:

- PSL2.1 The 'passive eye' model of vision
- PSL2.2 Seeing in colour

Topic PFM2
Moving by force

Key concepts:

- PFM2.1 Speed and distance
- PFM2.2 Motion graphs
- PFM2.3 Changing motion
- PFM2.4 Drag

Topic PSL3
Making images

Key concepts:

- PSL3.1 The ray model of light to explain images
- PSL3.2 Prisms and lenses

Topic PES2
Earth, moon and sun

Key concepts:

- PES2.1 Day and seasons
- PES2.2 Eclipses

Topic PFM3
More about force

Key concepts:

- PFM3.1 Mass and weight
- PFM3.2 Stretching springs
- PFM3.3 Hidden forces
- PFM3.4 Turning forces

Topic PEM1
Simple electric circuits

Key concepts:

- PEM1.1 Making circuits
- PEM1.2 Electric current
- PEM1.3 Voltage
- PEM1.4 Static electricity

		<p>Topic PSL4 Waves</p> <p>Key concepts:</p> <p>PSL4.1 Waves on water and ropes</p> <p>PSL4.2 A wave model of sound</p> <p>PSL4.3 A wave model of light</p>	<p>Topic PEM2 More electric circuits</p> <p>Key concepts:</p> <p>PEM2.1 Resistance</p> <p>PEM2.2 Current affected by voltage and resistance</p> <p>PEM2.3 Series and parallel circuits</p>	
<p>Topic PMA2 Floating and sinking</p> <p>Key concepts:</p> <p>PMA2.1 Density</p> <p>PMA2.2 Pressure in fluids</p> <p>PMA2.3 Convection</p>			<p>Topic PEM3 Magnets and electromagnets</p> <p>Key concepts:</p> <p>PEM3.1 Magnetic fields</p> <p>PEM3.2 Electromagnets</p> <p>PEM3.3 Generating electricity</p> <p>PEM3.4 Paying for electricity</p>	

Where's energy?

Energy is an important idea in all of the sciences because it provides a way of looking at events and processes across a very wide range of contexts. Energy ideas can enable us to say whether something can happen, though not to predict it will happen, and to calculate specific outcomes of events. Energy ideas do not, however, help to explain how or why an event happens.

Energy features in each of the 'Big ideas' of Physics and ideas about energy are developed in each of them.

For further reading about the scientific model of energy that we are using see our 'Teaching energy' article on the BEST home page at www.BestEvidenceScienceTeaching.org and the Physics Narrative in SPT: Energy <http://supportingphysics.net/EnHome.html>