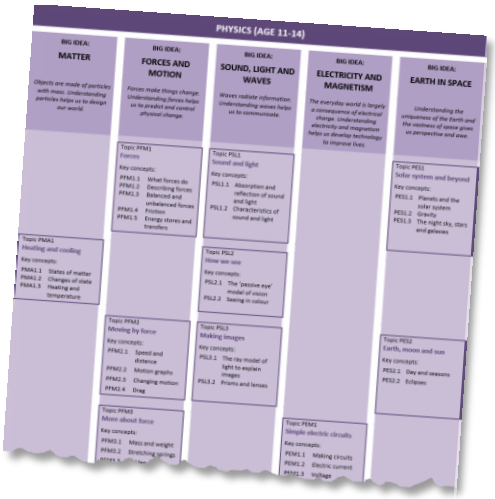
Physics

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.

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PHYSICS (AGE 11-14)

BIG IDEA: MATTER	BIG IDEA: FORCES AND MOTION	BIG IDEA: SOUND, LIGHT AND WAVES	BIG IDEA: ELECTRICITY AND MAGNETISM	BIG IDEA: EARTH IN SPACE
Objects are made of particles with mass. Understanding particles helps us to design our world.	*Forces make things change. Understanding forces helps us to predict and control physical change.*	*Waves radiate information. Understanding waves helps us to communicate.*	*The everyday world is largely a consequence of electrical charge. Understanding electricity and magnetism helps us develop technology to improve lives.*	*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 Production and transmission of sound PSL1.2 Characteristics of 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 PFM2
Moving by force

Key concepts:

PFM2.1	Describing speed
PFM2.2	Motion graphs
PFM2.3	Changing motion
PFM2.4	Drag

Topic PFM3
More about force

Key concepts:

PFM3.1	Mass and weight
PFM3.2	Hidden forces
PFM3.3	Turning effects

Topic PSL2
How we see

Key concepts:

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

Topic PSL3
Making images

Key concepts:

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

Topic PEM1
Simple electric circuits

Key concepts:

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

Topic PES2
Earth and sun

Key concepts:

PES2.1	Days and seasons

Topic PSL4
Waves

Key concepts:

PSL4.1	Waves on water and ropes
PSL4.2	A wave model of sound

Topic PEM2
More electric circuits

Key concepts:

PEM2.1	Resistance
PEM2.2	Parallel circuits

Topic PMA2
Floating and sinking

Key concepts:

PMA2.1	Floating, sinking and density
PMA2.2	Pressure in fluids
PMA2.3	Convection

Topic PEM3
Magnets and electromagnets

Key concepts:

PEM3.1	Magnetic fields
PEM3.2	Electromagnets

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://supportingphysicsteaching.net/EnHome.html