

Topic: Energy Resources and Energy Transfer

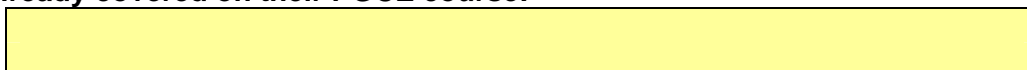
Prepared by: Kim Quigley and Mark Gutteridge

Issues tackled:

1. Key ideas, use of language and terminology - The resources and different forms of energy.
2. Misconceptions – Common misconceptions about energy and its transfer.
3. Practical work – Demonstrations and experiments to show energy transfer.
4. Differentiation and SEN – Differentiating lessons about heat transfer.

Issue 1: Key ideas, use of language and terminology – The resources and different forms of energy

Trainees have already covered on their PGCE course:



Tasks for trainees:

Preparation for tutorial:

1. Draw a mind map of what you understand by the term energy and energy resources.
2. Prepare a plenary activity about the terms for the different forms of energy, e.g. card loop, mix and match, crossword.

Possible activities during tutorial:

1. Present the mind map and explain the links you have chosen.
2. Present the plenary activity, justify the choice of words used.

Mentor Input:

- Use the mind maps to pull out the differences between
Energy types - electrical, sound, heat, light, potential (gravitational, elastic), chemical, kinetic and....
Energy resources - coal, oil, gas, food, solar etc..
- Give out a card sort and get trainees to quickly sort into the groups of energy types and energy resources (see above).
- Going back to the energy types, discuss what pupils in year 7 will understand by the term. What examples of energy will they come up with? Introduce the idea of energy transfer or transformation, what does it mean?

Reading: Subject knowledge and understanding

Any physics text book at GCSE/A level. Possible books include:
Millar, R. (1989), **Understanding Physics**, Collins Education, London.

Dobson, K. Grace and Lovett, D. (2002 2nd edition), **Collins Advanced Science: Physics**, Collins Education, London.

Subject pedagogy

Millar, R. (2005). [Teaching About Energy](#). University of York website.

Millar, R. (2000), Energy, in Sang, D. (Ed), **Teaching Secondary Physics**, John Murray, London.

Useful websites and applications

Useful information and resources on wind Energy on the centre for Alternative technology site: www.cat.org.uk

The government White paper on “Our Energy Future” may be found at:
<http://www.dti.gov.uk/energy/whitepaper/index.shtml#wp>

Other web site resources include: www.natenergy.org.uk/educat.html

'Electricity for the Future' is part of Channel 4's science programmes and info is available at: <http://www.channel4.com/learning> Follow links to Science 11-14, Scientific eye, Physical Processes 3 , Electricity for the Future.

Resources: Mentor Input

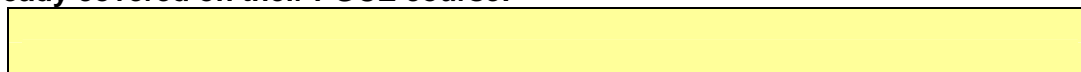
Card sort, required for the tutorial. See following page.

SUN	LIGHT
SOUND	COAL
FOOD	KINETIC
WIND	OIL
PETROL	ELECTRICAL
POTENTIAL	TURBINE

SUN	LIGHT
SOUND	COAL
FOOD	KINETIC
WIND	OIL
PETROL	ELECTRICAL
POTENTIAL	TURBINE

Issue 2: Misconceptions – Common misconceptions about energy and its transfer

Trainees have already covered on their PGCE course:



Tasks for trainees:

Preparation for tutorial:

1. Read the Key Stage 3 Strategy materials on misconceptions of energy and bring them to the tutorial.
2. Develop a lesson activity or set of questions to elicit misconceptions about energy from pupils.

Possible activities during tutorial:

1. Present the main misconceptions pupils hold about energy, discuss how they would find out if their pupils held these misconceptions
2. Demonstrate the activity or question strategy. Discuss which misconceptions it will elicit and whether it can be developed to help correct the misconception.

Mentor Input: • Discuss how to adapt the trainee's plans in the light of the misconceptions raised.

Reading: Subject knowledge and understanding

Subject pedagogy

Millar, R. (2000), Energy in Sang D. (Ed). **Teaching Secondary Physics**, John Murray, London.

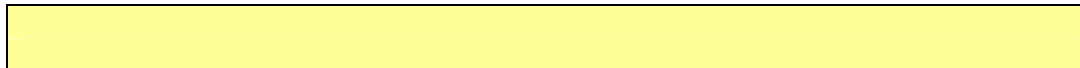
Useful websites and applications

Resources: Tasks 1 and 2

Millar, R. (2005). [Teaching About Energy](#). University of York website.

Issue 3: Practical work – Demonstrations and experiments to show energy transfer

Trainees have already covered on their PGCE course:



Tasks for trainees:

Preparation for tutorial:

1. Plan an attention grabbing (but safe) demonstration to show the transfer of energy from one form to another. Consider how you can 'show' the conservation of energy in your demonstration.
2. Use the SEP energy exchange kit or another energy transfer kit to plan some simple demonstrations. See websites below for information on the SEP kit.

Possible activities during tutorial:

- 1 and 2. Present the demonstrations planned. Describe the age group / ability group they are designed for. Discuss how the concepts of energy transfer and conservation can be illustrated by the demonstrations.

Mentor Input:

- Demonstrate the class experiments or demonstrations that you usually use to introduce energy transfer. Explain how it will help pupils understand the concept of energy transformation. What could be the pitfalls?
- Give ideas on how to use the energy transfer kit as a starter or plenary activity e.g. ask pupils to wire up something that allows light energy to be changed into sound energy.
- Check the trainee's understanding for various machines i.e. microphone vs loudspeaker, yo-yo, falling object. Think about the detail needed in an energy chain e.g. Loudspeaker - at year 7 is likely to be electrical to sound but in year 9 it is time to perhaps use electrical to kinetic to sound.
- Discuss how we can introduce the idea of conservation. What problems may occur? What terminology do we need to consider e.g. 'lost' energy versus wasted energy? What models could we use?

Reading: *Subject knowledge and understanding*

Key Stage 3 and 4 textbooks.

Subject pedagogy

www.sep.org.uk Follow links to resources; apparatus and materials then Energy Transfer kit. There is a useful booklet here about teaching energy transfer as well as practical information about the SEP kit.

Useful websites and applications

Cleminson, A. (ed.) (2003). **Brunel University Physics Materials** contains resources for trainees to use to improve their subject knowledge using a self taught approach in the [Energy changes and Energy Transfers](#) document.

The How stuff works website <http://science.howstuffworks.com/> gives interesting ideas of machines to use for energy transfers.

This link takes you to the Thinkquest index for sites to do with energy. The sites are best opened by selecting a topic by clicking with left button, and then right clicking on the new topic screen and then choosing "open in a new window".

http://www.thinkquest.org/library/cat_show.html?cat_id=118

Resources: Task 1

Equipment as requested by the trainee.

Task2 and Mentor Input

SEP Energy Transfer kit.

There is a useful booklet at the website about teaching energy transfer as well as practical information about the SEP kit.

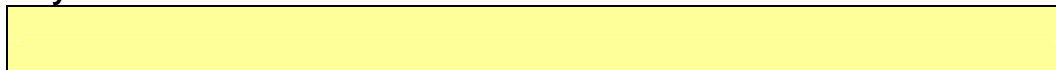
www.sep.org.uk

Follow links to resources; apparatus and materials then Energy Transfer kit.

1 set of the equipment for demonstrating and experimenting about energy transfer as used in the school scheme of work is needed for the mentor input.

Issue 4: Differentiation and SEN – Differentiating lessons about heat transfer

Trainees have already covered on their PGCE course:



Tasks for trainees:

Preparation for tutorial:

1. Plan a lesson to explain **conduction** to a level 4 pupil and another to a level 6 pupil. You will need to read the level descriptors and the QCA SoW unit 8I.
2. Plan a lesson to explain **convection** to a level 4 pupil and another to a level 6 pupil. You will need to read the level descriptors and the QCA SoW unit 8I.

Possible activities during tutorial:

- 1 and 2. Present and discuss the lessons planned.

Mentor Input:

- Ask the trainee to explain the main differences in their lesson plans. Why are there these differences? We want the trainee to appreciate that a level 6 pupil is capable of abstract thinking whereas a level 4 pupil will still be at the concrete stage e.g. a level 6 pupil will be able to link this to the particle model whereas a level 4 pupil could still be struggling with the idea of hot and cold.
- Introduce the thermocolour film. Discuss ideas to use it to support weaker pupils. E.g. cups, made of different materials, filled with hot water. Consider using the film with the more able also. E.g. design a thermometer, LCD display. How do they think it works?

Reading: *Subject knowledge and understanding*

Key Stage 4 text book on heat (thermal) transfer.

Subject pedagogy

Millar, R. (2005). [Teaching About Energy](#). University of York website.

Revell, M. (ed) (1995) **Northamptonshire Science Resources: The Differentiation Book**, NIAS, Northampton.

Useful websites and applications

The Science Enhancement Programme: Behaviour of thermocolour film and descriptions of experiments

<http://www.sep.org.uk/observingthermo1.htm>

Resources: **Tasks 1 and 2**

QCA Scheme of work

www.standards.dfee.gov.uk/schemes3 and select Science Key Stage 3, then unit 8I Heating and Cooling.

National Curriculum level Descriptions

www.ncaction.org.uk/subjects/science/levels.htm

Mentor Input

Thermocolour film, available from SEP at

www.sep.org.uk Then click on 'Resources', then on 'Equipment and materials, then on Thermocolour sheet'.