5. TOPIC: SHELTER

Shelters keep us out of the rain
Shelters keep us from many a pain
Shelters could be houses or dens
In the city or in the fens
Shelters can be placed here and there
Shelters can be almost anywhere

Activity	Learning points	Curriculum Links
Introductory session After a brief topic introduction, health and safety precautions relevant to the activities are discussed. Students split into two groups: • Group 1 – Heavy weight house (using 'mock' bricks and thick insulation blocks) • Group 2 – Light weight house (using sticks and canvas)	A. Recognise that there are hazards with building materials and that action can be taken to reduce risks to themselves and others, in particular: • Lifting safely • Dangers of collapse • Pinching dangers • Poking with sticks.	A. Science/Breadth of study, 2b (health & safety)
Predicting 'house' performance Students measure outside air temperature and predict likely temperature inside house once built. The same is done for waterproof ness and drafts. (*Yes/no answers*).	A. See how they may determine the performance of structures, including the use of predictions B. Predicting in a group C. Use of suitable measuring instruments for task (thermometer) • Record keeping	A. Science/Sc1 Scientific Enquiry, 2a, 2b, 2c (Investigative skills) B. English/EN1 Speaking & Listening, 10b (Group discussion & interaction) C. Mathematics/ Ma3 Shape, space and measures, 4b (Understanding measures)
House construction Each group is provided with a building plan for their designated 'home'. The plans are easy to follow with minimum guidance from 'helpers'.	A. Use of simple materials & instructions to make a construction, with actions to control risks (following safety advice given at beginning) • Team working • Construction principles	A. Science/Sc1 Scientific Enquiry, 2e (Investigative skills)

Warmth by flame *(Group 2 only as their 'house' is quicker to erect)* Students collect firewood from a designated pile. Then they build a fire in a firebox. *(Only the supervisor lights the fire and feeds the fire.)*	A. Recognise the hazards of fires and that action can be taken to reduce risks to themselves and others. • Keep back from lit fire • Bucket of water and sand available. • Reasons for heating requirements	A. Science/Breadth of study, 2b (health & safety)
Measuring building performance (*Both groups*) Students enter their 'house' and measure temperatures immediately and then again after 3min. A bucket of water is thrown over the structures to test how waterproof they each are. A test of the draftiness of the shelters is also conducted.	A. Testing ideas using evidence from observation and measurement B. Use of observations and measurements to collect information C. That temperature is a measure of how hot or cold things are D. Use of suitable measuring instruments for tasks and that measurement is approximate. E. Estimating in a practical context and drawing inferences • Aspects of building type. E.g. What is waterproof? Which one is warm and why?	A. Science/Sc1 Scientific Enquiry, 1b (Ideas and evidence in science) B. Science/Sc1 Scientific Enquiry, 2g (Investigative skills) C. Science/Sc3 Materials and their properties, 2c (Changing materials) D. Mathematics/ Ma3 Shape, space and measures, 4b (Understanding measures) E. Mathematics/ Breadth of study, 1b,1d,1e
Evaluation and conclusions Each group of 'builders' explains to the other what went well and what didn't. Measurements are considered and the advantages and disadvantages of each structure discussed based on: • speed of construction • performance • likely cost • longevity • impact on environment • security • desirability	A. Thinking creatively to explain how things work B. Making comparisons between two sets of data results, and how these help to draw conclusions B. Differences between predictions and performance results and how these can be explained. C. How differences between building materials effect their usefulness C. Some materials are better thermal insulators than others D. Use of scientific language and terms to explain situation. E. Recognise that how and where people live affects the environment and quality of life for others • Sharing experiences (through verbal explanation) and learning from each other through reasoned discussion. What shelter needs are met and how well	A. Science/Sc1 Scientific Enquiry, 1a (Ideas and evidence in science) B. Science/Sc1 Scientific Enquiry, 2i,2j, 2k,2l (Investigative skills) C. Science/Sc3 Materials and their properties, 1a, 1b (Grouping and classifying materials) D. Science/Breadth of study, 2a E. Geography/ Knowledge, skills and understanding, 5a (Knowledge and understanding of environmental change & sustainable development) F. English/EN1 Speaking & Listening, 3a, 3b, 3c, 3d, 10c (Group discussion & interaction)
Further analysis If time permits prepared cards showing issues associated with house construction are ordered by students (e.g. quick to build, warm inside) in importance in meeting their needs.	A. Different aspects of building and 'development' - not everyone has the same view B. Contribute and listen to views in a group discussion before coming to conclusions • Which shelter needs are important to the group	A. Geography/ Knowledge, skills and understanding, 1d (Geographical enquiry and skills) B. English/EN1 Speaking & Listening, 3a, 3b, 3c, 3d (Group discussion & interaction)

5.TOPIC: SHELTER (PREPARATION)

Session length: 1 hour 15 min

Staff: One facilitator plus helper (helper needs to be briefed on methods used).

Locations: Ideally, construction will take place in the open away from other groups.

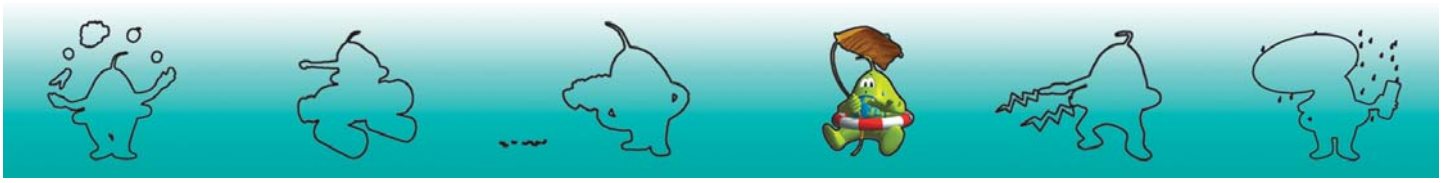
Specific Health & Safety issues: Lifting carefully; Use two or more people to lift heavy objects; bend knees not back. Avoid **collapse** of structures. Regard for **pinching** or **poking** hazards. Keep hands out from under the wood walls. **Fire** precautions and safe working practice.

Preparation: Assemble materials before start, including gloves.

Post activity actions: Dismantle structures, Collect gloves. Wash hands.

Method

Timing	Activity	Materials	Source of Materials/Notes
5 min (5)	**Introduction**	• Briefing sheets including "Needs and Problems"	Resource Pack
5 min (10)	**Predicting "house" performance**	• Building materials • Board and plans A4 • Pen and pencils	See below for prediction sheet and Plans.
35 min (45)	**House construction "The Build"** **Warmth by flame**	• House Plan on A4 • Insulation sheets • Ply with "brick" look • Waterproof cover • Door in casing • Tent Plan on A4 • Long poles • Cover material & rope • Ground sheet • Fire box & Matches • Dry kindling; Fire wood • Sand in bucket	Building materials can be purchased directly from merchants or via HHP. Sustainably grown ply can be obtained from The Timber Centre (Wolseley UK); http://www.buildcentertimber.co.uk Polystyrene insulation contact HHP. 01636 816902 hhp@hockerton.demon.co.uk
10 (55)	**Measurements**	• Thermometers • Two buckets of water • Prediction sheet	After temperature taken tip water over structure. See below for prediction sheet.
10 **(1hr 5)**	**Evaluation and conclusions (Presentations)**	• Areas adjacent to structures	Encourage and guide children to create an aural presentation of the work done and the important points.
10 (1hr 5)	**Recap**		Recap activities and sum up learning points



5.TOPIC : SHELTER

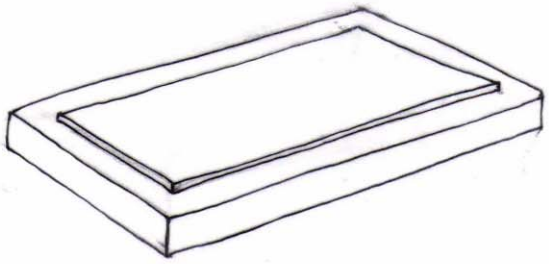
	PREDICTION	ACTUAL
HIGH MASS WELL INSULATED (BRICK)		
OUTSIDE AIR TEMPERATURE		
INSIDE AIR TEMPERATURE		
WATER PROOF		
DRAFT PROOF		
LOW MASS (TENT)		
OUTSIDE AIR TEMPERATURE		
INSIDE AIR TEMPERATURE		
WATER PROOF		
DRAFT PROOF		

5.TOPIC: SHELTER

"High Mass High Insulation"

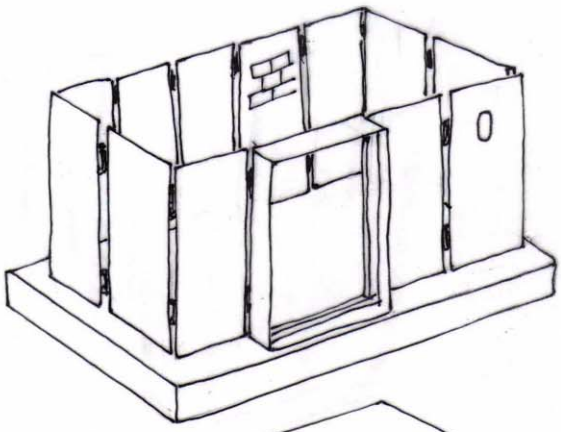
Step 1

Base



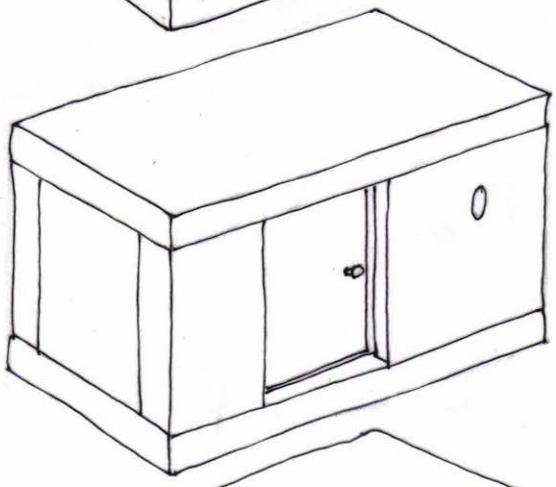
Step 2

Walls "High Mass"



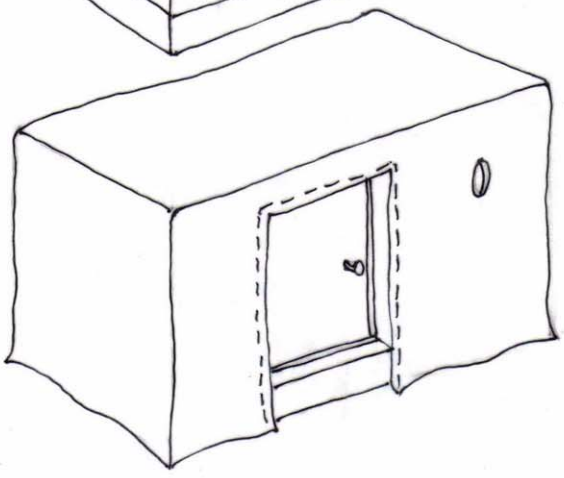
Step 3

Insulation and draft strip



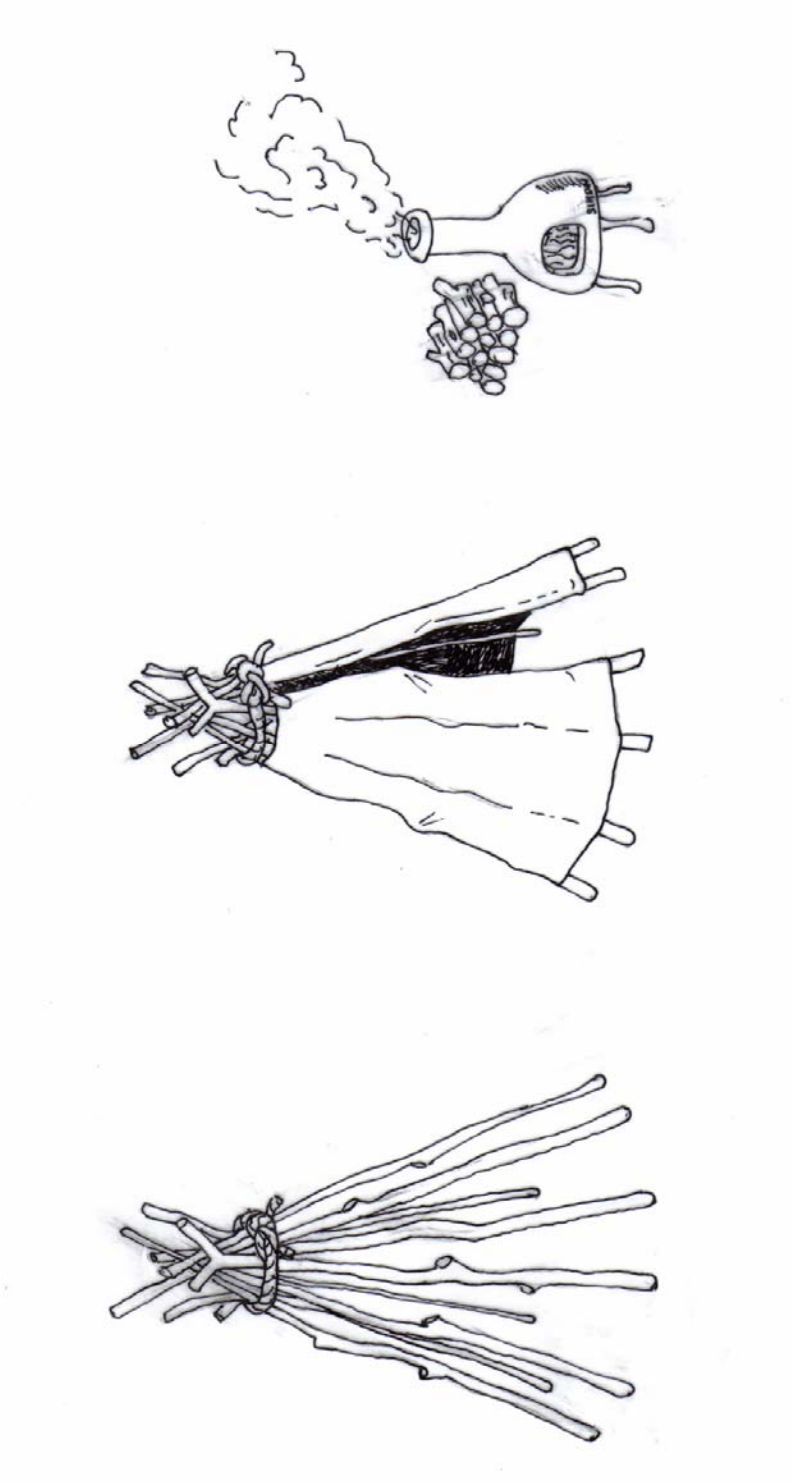
Step 4

Waterproof Cover



5.TOPIC: SHELTER

Tent "Low Mass and insulation" and Fire for heat



5. TOPIC: SHELTER

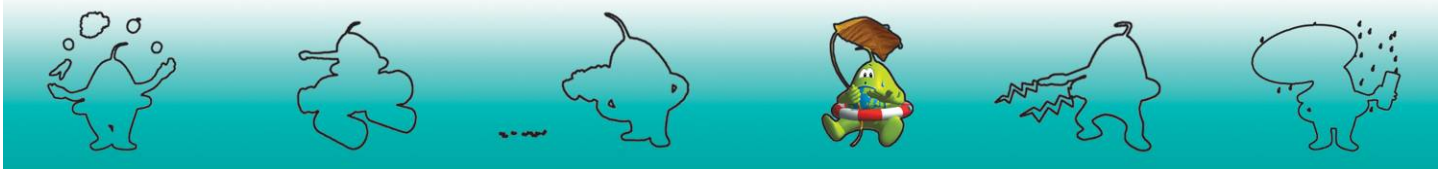
Problem Solvers Actions

What can you do with your parents or teacher at home and school?

- Stop all drafts; heat will be escaping through these
- Use curtains to reduce heat loss from windows
- Make sure lofts are well insulated (if already done, it might benefit from a top-up)
- If your house has cavity walls have them insulated if not already done so (best returns on efficiency and savings)
- Use materials that are less damaging to the environment (such as wood grown from sustainably managed forests – look for an 'FSC' label)
- Use reused or recycled materials (see 'waste' topic for more ideas) – these could include buying materials second-hand – there is an increasing number of organisations involved in reclaimed materials
- Avoid PVC where possible which can be very damaging to the environment during its manufacture – there are usually suitable alternatives
- Use eco-friendly paints and varnishes
- If building from new, choose an architect or designer with knowledge and enthusiasm for low energy design - it costs more to add energy efficiency measures later!

Problem solvers Further Resources

- **Association for Environment Conscious Building** (www.aecb.net)- leading independent environmental building trade organisation in the UK that encourages greater environmental awareness within the UK construction industry. They also publish a quarterly magazine *'Building for a Future'* and provide a membership list of many environmentally aware building professionals.
- **Bestwood Country Park Rangers** (0115 927 3674) run a number of summer activities, including shelter building.
- **CABE education** – Have produced an excellent FREE teacher's guide to using the built environment at KS2 – Neighbourhood Journeys (education@cabe.org.uk)
- **Centre for Alternative Technology** (www.cat.org.uk) - CAT is a visitor centre where techniques for sustainable living are in use and on display. Their website includes a virtual tour of CAT, together with information about facilities, school visits, publications, other resources and courses.
- **Natural Building Technologies** (www.natural-building.co.uk) - An ecological building merchant
- **Low Impact Living Initiative** (www.lowimpact.org) – Provide advice and courses on sustainable alternatives



Problem solvers Further Resources (Cont'd)

Examples of different types of eco-housing:

- **Beddington Zero Energy Development** (see www.bioregional.com) – large scale eco-development in London
- **Brighton Earthship** (www.lowcarbon.co.uk) – Building made using waste car tyres!
- **Caer Llan Berm House** (www.caerllan.co.uk) – Large earth-covered building in Wales
- **The David Wilson Millennium Eco-Energy House** (www.nottingham.ac.uk/sbe/) – Based in the grounds of the University of Nottingham, this four bedroom house is used by researchers to test new environmental building technologies
- **The EcoHouse (Leicester)** (www.ecohouse.org.uk) – An environmental showhome demonstrating the environmental choices we can make in our homes and lifestyles.
- **Eco-Village Network** (www.ecovillages.org/uk/networks/) – Includes examples of low impact developments such as communities living in tipis and benders.
- **Millennium Green** , Notts (www.gustohomes.com) – Private commercial development of homes built to very high environmental standards
- **Nottingham Eco House** (www.msarch.co.uk/ecohouse) – Good example of how to renovate an older to house to a high environmental standard.

GLOBAL RELEVANCE OF SHELTER TOPIC

Worldwide new development is threatening species and habitats. In the UK new houses are often built on valuable agricultural land at the same time as the UK can't provide for itself nutritionally and has to buy 70% of its food from other countries. Recently the UK Government thinks that there will need to be an extra 3.8 million homes by 2021 due to more single-person households. It is hoped that many of these can be built on 'brownfeild' sites (one's that have been built on before, or previously used for industrial purposes).

A lot of energy and resources are used to build and keep a house or classroom running. The materials used can have serious impact on the environment both locally and much further away. Using imported timber may damage a rainforest in South America for example. A lot of energy is needed to make many building materials. Wasting heat from a building is likely to result in more fossil fuels being burnt and so more polluting carbon dioxide released to the atmosphere. Carbon dioxide causes global warming and climate change, such as higher winds, temperatures and increased flooding. Heating, lighting and cooking in homes is responsible for about 30% of the total UK energy demand. It is important therefore, to think about how houses are built and, once occupied, how we can best use and maintain them. Many other countries are doing better than the UK at building houses which have less of an impact on the environment.

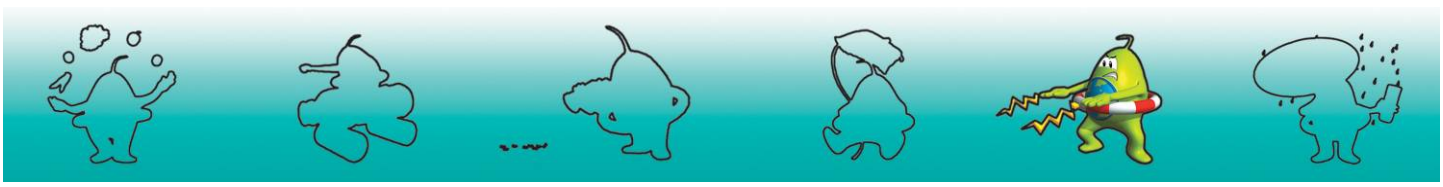
It does not have to be this way……..

An energy efficient well-built house is warm, comfortable and has low running costs.

6. TOPIC: ENERGY

Old coal, new wind
Black coal, green wind
It powers your Playstation and CD-ROM
But do you ever wonder where your energy comes from?

Activity	Learning points	Curriculum Links
Burning Match A match is burnt followed by discussion about the fuel source and what is seen when it burns, e.g. smoke, light, burnt wood, and smells. These are related to fossil fuel depletion	A. Links between cause and effects B. Burning wood results in formation of new materials that is not reversible • Pollution from fossil fuels • Finite resources	A. Science/Sc1 Scientific Enquiry, 1a (Ideas and evidence in science) B. Science/Sc3 Materials and their properties, 2g (Changing materials)
Hot Box Two cups of tea are made. Expectations and actual temperature of tea are recorded before storing two cups under different conditions: • a well-insulated box • in the room without insulation. Students then predict what the temperatures will be in one hour for both cups. The experiment is left in a safe place and returned to later. *(Before measurements taken, time is also spent investigating how a thermometer works and what it does.)*	A. Testing of ideas using evidence from measurement B. Dealing with questions that can be answered scientifically B. Predicting outcomes (temperature) B. How to make a fair test and comparison by changing one factor (thermal environment) and measuring the outcome B. Use of simple equipment and materials for a test C. That temperature is a measure of how hot or cold things are. D. Safety with hot tea and mercury thermometers E. Use of suitable measuring instrument (thermometer) for a task and recognition that measurement is approximate.	A. Science/Sc1 Scientific Enquiry, 1b (Ideas and evidence in science) B. Science/Sc1 Scientific Enquiry, 2a, 2c,2d,2e (Investigative skills) C. Science/Sc3 Materials and their properties, 2c (Changing materials) D. Science/Breadth of study, 2b (Health & safety) E. Mathematics/ Ma3 Shape, space and measures, 4b (Understanding measures)
PV* Cars A buzzer is attached to a PV panel to demonstrate energy produced from the PV's. What happens is discussed. Car kits (including mini-PV panels linked by wires to a small motor) are handed out and safety procedures talked about.	A. Construction of circuits, incorporating a power supply (PV's) to make an electrical device (buzzer/car motor) work A. Direction of flow of electricity in wires B. Light travels from a source	A. Science/Sc4 Physical processes, 1a (Electricity) B. Science/Sc4 Physical processes, 3a (Light) *Cont'd overleaf*



PV* Cars (cont'd) The students are guided step by step in the assembly of cars. The effects of swapping wires around are discussed. Completed cars are raced using a bright light if necessary. Adjustments are made and the race is re run.	C. Part science has played in the development of many practical and useful things such as PV's • Energy from the sun **PV=Photovoltaic = Photon (light) + voltaic (electricity) = electricity from light (sun)*	C. Science/ Breadth of study, 1b
Card Game This game assess whether a wind turbine meets the needs of HHP. Cards with different aspects of turbines are handed out (each relating to HHP's turbine). The students take turns to describe and explain what is on their card. These include: • Cheap to run • Expensive to buy (£26 000) • Affordable by five families • Noise from blades • Can see it • No smoke pollution • No fuel costs • Needs a tall tower to work well • Wind does not always blow The students order the cards into good and bad aspects. How well HHP's needs are met is discussed. The list is then recorded.	A. Consideration of different sources of information (both direct and indirect) to make comparisons and answer questions B. Part science has played in the development of many practical and useful things such as wind turbines C. Analyse evidence to draw conclusions C. Different aspects of wind energy - not everyone has the same view D. Recognise how decisions about places affect the future quality of people's lives E. Contribute and listen to views in a group discussion before coming to conclusions	A. Science/Sc1 Scientific Enquiry, 2b, 2i, 2j (Investigative skills) B. Science/ Breadth of study, 1b C. Geography/ Knowledge, skills and understanding, 1c, 1d (Geographical enquiry and skills) D. Geography/ Knowledge, skills and understanding, 5a (Knowledge and understanding of environmental change and sustainable development) E. English/EN1 Speaking & Listening, 3a, 3b, 3c, 3d, 10c (Group discussion & interaction)
Hot Box returns *(Approx 1 hour later)* After a recap of the earlier predictions a student measures the actual temperatures. Discussion that follows as to why the insulated cup remains warmer (less conduction through walls of cup, less convection of air away from surface) and the implications for the HHP homes and the way they are made.	A. Use of evidence from observation and measurement to test ideas A. Differences between predictions and performance results. A. Use of conclusions to understand and explain other situations (extrapolation to the way the homes work with high insulation) B. Some materials are better insulators than others C. Use of scientific language and terms to explain situations D. Estimating numbers in a practical context E. Contribute and listen to views in a group discussion before coming to conclusions	A. Science/Sc1 Scientific Enquiry, 2d, 2g, 2i, 2j, 2k ,2l (Investigative skills) B. Science/Sc3 Materials and their properties, 1b (Grouping and classifying materials) C. Science/Breadth of study, 2a D. Mathematics/ Breadth of study, 1b,1d,1e E. English/EN1 Speaking & Listening, 3a, 3b, 10b, 10c (Group discussion & interaction)

6. TOPIC: ENERGY (PREPARATION)

Session length: 1 hour 15 min

Staff: One facilitator plus helper.

Materials: As listed below plus an "inside venue".

Location: Tables /bench plus open flat "sunny" space to race cars.

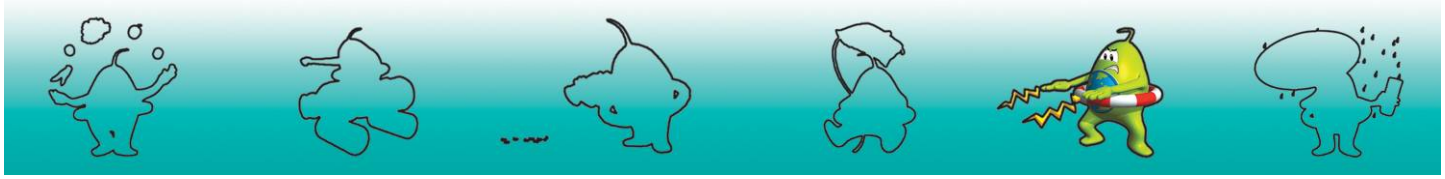
Specific Health and Safety issues: Only facilitator handles matches. Hot water scalds so instructions on hot-water safety, Children only involved with partially cooled water. Facilitator demonstrates safe assembly of cars (Note sharp axle ends, avoid palm of hand over axle). Close supervision by facilitator including instructions on safe-handling of other materials.

Preparation: Assemble materials before start, ensure cups are clean!

Post activity actions: Dismantle cars carefully and ensure all small part retrieved, All wash hands.

Method

Timing	Activity	Materials	Sources of Materials/Notes
5 (5)	**Introduction**	• Briefing sheets including "Needs and Problems"	Resource Pack
5 (10)	**Burning Match**	• Matches • Ash tray	
10 (20)	**Hot Box** Insulation of cups of tea.	• Insulated box • Thermometer • Tea pot • 2 cups • milk • water • tea bags • kettle • prediction sheet and pen	Avoid mercury if possible See below for sample sheet
35 (55)	**PV Cars**	• PV buzzer kits • PV car kits • Bright light 500W • Wood blocks • Masking tape	Schools Home Energy Education Project Tel 0114 2499 459 enquires@pluggingintothesun.org.uk www.pluggingintothesun.org.uk
10 **(1hr 5)**	**Card Game**	• Pre -prepared cards	See list above in "Card Game"
5 **(1hr 10)**	**Hot Box returns**	• As for hot box above	
5 **(1hr 15)**	**Recap**		Recap activities and sum up learning points



6.TOPIC : ENERGY

Prediction Sheet

	PREDICTION	ACTUAL
BEFORE		
ROOM TEMPERATURE		
TEA TEMPERATURE		
AFTER		
ROOM TEMPERATURE		
TEA TEMPERATURE Insulated cup		
Non Insulated cup		

6. TOPIC: ENERGY

Problem Solvers Actions

What can you do? - Be energy conservationists – e.g.

- Turn of all lights when not in use
- When making hot drinks only boil enough water for your needs
- Turn of all appliances that are not in use at the mains plug - it takes energy to make the light glow!
- Don't leave appliances on 'standby', particularly the TV
- Stop drafts and wasting heat from the classroom or home – Close doors and curtains at night.
- Don't put hot food in a fridge

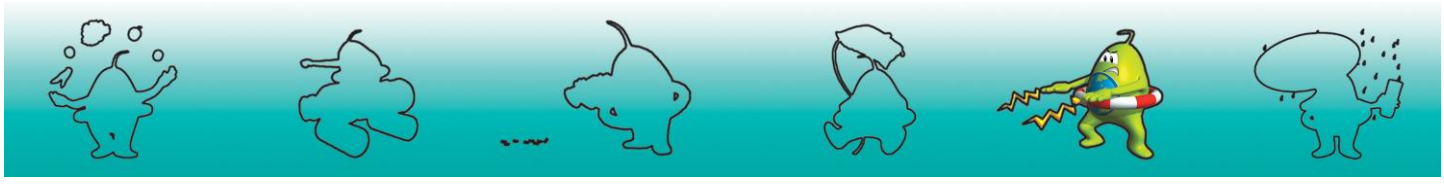
What can you do with your parents or teacher's at home or school?

- Buy or use appliances which consume low amounts of energy e.g. low energy light bulbs
- Use appliances not powered by fossil fuels e.g. a wind up radio, solar powered lights
- Get a bike, or better, encourage the whole family to get bikes, and save on car fuel, money & pollution
- Walk to school, preferably with some friends (see www.sustrans.org.uk to find out more about 'safe routes to school' initiatives)
- Save energy at school (check out www.4seasons.org.uk)
- Install a solar water heater (see www.lowimpact.org)
- Consider a small wind turbine to make clean energy for the school (see www.iskra.org.uk)

Problem solvers Further Resources

For problem solvers:

- **Cool Kids for a Cool Climate (http://www.coolkidsforacoolclimate.com/) -** Basic information about climate change and action that has been taken by young people to reduce its impact.
- **CREATE/Kids Zone** (http://www.create.org.uk/schools/kidszone.asp) – Lots of stuff for kids and teachers to find out more about energy related issues.
- **Funergy** (www.funergy.org.uk) is a site with interactive games to catch the energy wasting monkeys
- **Planet Energy, UK** (http://www.dti.gov.uk/energy/renewables/) -Aimed specifically at school children aged 7-11 & 11-16 – with some "boring grown up stuff". Take the Renewable Energy Trail in search of the "mysterious forces on our planet". The Energy Lords will award a certificate if you complete their quiz successfully.
- **Think Energy** (www.think-energy.co.uk) -FREE School and Home Packs to support a nationwide project. Think Energy is designed to get teachers, pupils and their families to think about the energy they use waste. Learning material for use in the classroom and at home is suitable for 8 - 12 year olds and covers key elements of the Maths, Science, Environmental Studies, Citizenship and ICT curricula.
- **Y.E.S** (www.gowild.org.uk/yes/home.htm) is the Young Energy Savers project to save energy. Why not get a teacher to join in?



Mainly for adults and teachers:

- **Association for Science Education** (http://www.ase.org.uk/) - Resources and web-links for all involved in teaching science, including energy, in schools and colleges.
- **EDUCATE** (http://www.educate.org.uk/cgi-bin/inetcgi/schoolsnet/home/educate.jsp) - Bags of support for primary teachers - Lesson plans in pdf format. Activities for children. Some cover energy topics.
- **Eco-Schools Award Scheme** (http://www.eco-schools.org.uk/) **-** This is a European-wide scheme for recognising schools that take steps to reduce their adverse environmental impact. Energy is one of the themes.
- **European Sustainable Energy Education Forum** (http://www.school4energy.net/) - ESEEF is helping teachers and students around Europe that work with renewable energy. The site contains information about interesting materials, places to visit, examples from education and links to information websites and relevant organisations.
- **Schools & Homes Energy Education Project (SHEEP), UK** (http://www.pluggingintothesun.org.uk/) - SHEEP provides educational resources, training and workshops, promoting efficient and sustainable energy use.

GLOBAL RELEVANCE OF ENERGY TOPIC

Over the next two decades, the global energy use is predicted to increase by as much as 60%. The main causes are population growth and industrial development of third world countries. Although this will bring improvements to the quality of lives of many more people around the world, it is also an environmental time bomb. Energy production using fossil fuels creates air pollutants including carbon dioxide, which rises into the air forming a kind of blanket over the earth trapping in the heat - this is the GREENHOUSE EFFECT. Several things are occurring because of this:

- Rising seas—smaller islands might be covered over
- Climate change—the world might get too hot or too cold (perhaps even an ice age)
- Bad weather—flooding could badly damage a town or city near a river or lake.

To make a difference, we all need to use less energy and receive more of our energy from clean, renewable sources, such as the wind and sun, which don't cause pollution. This is not just a problem to let others sort out – we all need to do our bit now! Our homes produce 25% of the carbon dioxide, and cars almost as much – so actions such as those above by you and I can make a real difference.

Solar panels on HHP homes generating power from the sun

HHP wind turbine generating power from the wind

Close up of wind turbine during maintenance work by HHP member