



The Power to Change





The Power to Change

Welcome



The Power to Change

Thank you for supporting SWEA in taking positive action towards minimising the effects of Carbon dioxide emissions in our environment. Through this project's investigations, games and activities you will be helping to create more aware and responsible citizens of the future, and hopefully enjoy the experience!

In taking part in this project you join a group of 130 schools from 13 European regions with whom you will be encouraged to share your experience through website forums and workshops. This project has support from the European Commission and the results of our work together will be disseminated far and wide.

In this file you will find outline projects that give an example of the three phases of work in the project. These projects are based upon the formats and ideas of QCA units of work to provide teachers with a familiar background for their planning. We have maintained the same objectives but adapted content and ideas in order to incorporate energy themes, in the same way teachers use QCA units in school as the basis of their own planning. We recommend that teachers still refer to the original QCA documents*.

Some schools may wish to just select one or two activities from the suggested resources for each project and use them in their own way in school rather than taking on a whole project. This is an acceptable way of integrating the project work but we recommend that schools follow fairly closely the Phase 2 project – Investigating the School's Energy situation.

This file will grow through SWEA's ongoing support of the project and with the adaptation and production of European resources at a local level.

Please be imaginative with projects and resources. For us there are two important values behind this project:

Firstly, we wish the emphasis to be on making these topics fun and useful for pupils and teachers.

Secondly, we would like the educational resources and activities to be evaluated by the schools using them so that we can continue to improve energy education.

We hope that you enjoy the project work!

*Please note that as this is just a pilot stage for this project no recommendations or acknowledgement has been sought from the QCA



The Power to Change

Who is Involved



The Power to Change

Severn Wye Energy Agency

Project materials adapted and presented by:
Rachel Close, Sustainable Energy Education Advisor

SWEA Director
Catrin Maby

Gloucestershire Steering Committee

Sue Clark – Primary CPSHE Consultant – GCC
Maggie Halsey – Head of Rodborough School – Stroud
Andrew Jarvis – Head of Corporate Building Services – GCC
Keith Lane - Principal Planning and Development officer for the Education Department – GCC
Sally Morely – The Wilderness Centre, Environmental Teacher
Mike Simpson – Energy, Water and Sustainability Officer – GCC
Peter Wiggins – Sustainability Officer – GCC

European Partners

ABEA - Brussels Energy Agency (Belgium)
GDE-Net – Dalarna’s Energy Agency (Sweden)
ARE Liguria – Liguria’s Energy Agency (Italy)
ELEECAC– East London Energy Efficiency Advice Centre (United Kingdom)
REAC – Regional Energy Agency of Heraklion (Greece)
EALP – Livorno Province Energy Agency (Italy)
AGENEAL – Municipality of Almada’s Energy Agency (Portugal)
APERe – Association for the Promotion of Renewable Energy Brussels (Belgium)
RAEE - Regional energy and environment agency of Rhone-Alpes (France)
SWEA – Severn Wye Energy Agency (United Kingdom)
Planète Sciences Méditerranée - Association to develop youth science and technology projects (France)
EBPB – Prenzlauer Berg Energy Agency (Germany)
SE-F - Society for Energy Economics and Environment (Slovenia)



The Power to Change

Contents



The Power to Change

	Page
Information Sheet	7
Outline of school Implementation	9
Project Planner	10
Phase 1	14
Making Wise Energy Choices	15
Phase 2	18
Investigating the School's Energy Situation	19
Developing the School's Energy Efficiency	28
Phase 3	31
Designing an Animal Transporter	32
Appendix 1 - About SWEA and contacts	39
Appendix 2 – General Information and Contacts	40



The Power to Change Project Information Sheet



Context

Recently the DfES instructed a review of the Schools Environmental Assessment Method (SEAM). The intention is for SEAM to apply to **all** existing schools.

(source: DfES –Schools Building and Design Unit *Initial Report-Feasibility Study for SEAM 2004*)

Their intention is not surprising when you consider the following:

Schools in the UK account for nearly a **quarter of public sector energy costs**, spending a total of **£350 million per year**. Energy used to provide heating and lighting in school buildings generates **significant amounts of carbon dioxide**. The UK Government introduced the **Climate Change Levy** in April 2001 to encourage energy efficiency and so reduce carbon emissions. The levy has resulted in an **increase in fuel costs for schools of some 10–15 per cent**.

Whilst utility bills may be a small proportion of a school's annual budget, they represent a key opportunity to reduce costs. Schools can typically **achieve savings of 20–25 per cent through an energy efficiency programme**. The revenue generated can be reinvested in educational activities or development of the school. The benefits of effective energy management in schools extend beyond saving money; **classrooms are more comfortable, the schools are seen to be more eco-friendly, and there is the opportunity for pupils to be more actively involved in environmental issues**.

(Source:DfES/DEFRA Energy services for schools)

Energy sustainability in all sectors is a critical consideration and has led to The Energy Performance of Buildings Directive to which the UK and all European member states will have to comply by 4th January 2006. This will require schools to display a certificate of their annual energy consumption. (source: DfES –Schools Building and Design Unit *Initial Report-Feasibility Study for SEAM 2004*)

With these facts in mind and the knowledge that, the success of practical measures for creating energy efficiency are dependant upon the building users, SWEA is keen to develop this project to help support those with buildings management roles and bring energy efficiency education into the curriculum.

Overview

Aimed at Year 5 and 6 pupils, the project explores ways in which energy is consumed, with the pupils' own experiences and environment as the case study and their school buildings and homes as the educational tools. The expectation is that participation will raise awareness of energy efficiency and sustainability and promote positive behaviour change in the whole school community resulting in all the benefits of more efficient energy use at home and at school.

Funding

This venture is part funded by the European Commission - Energy Intelligent Europe Programme. The scheme is being developed and funded at a local level by Severn Wye Energy Agency along with a donation from County Council. Severn Wye Energy Agency is working in consultation with the LEA and local teachers.

Aims

Through this project SWEA aims to provide schools with materials, staff training and support in order that they can provide a firm and distinct place in the curriculum for energy education. A secondary aim is to help building users to monitor and improve on their energy use.

Project Programme

Through their work in this project pupils will investigate four main themes:

- Home Energy Efficiency
- School Building Energy Efficiency
- Energy sources
- Sustainable transport

The project is aimed at pupils in year 5 and/or year 6 and will provide opportunities to explore the facts begin the investigative work and promote behaviour change throughout their school community.

Placing the Project in the curriculum

The work can be used to support nearly all curriculum areas, particularly science and is seen as part of a broad partnership with the Healthy Schools Initiative, linked with PSHE and Citizenship.

It will be an interesting undertaking for schools, offering a wide range of opportunities for school development.

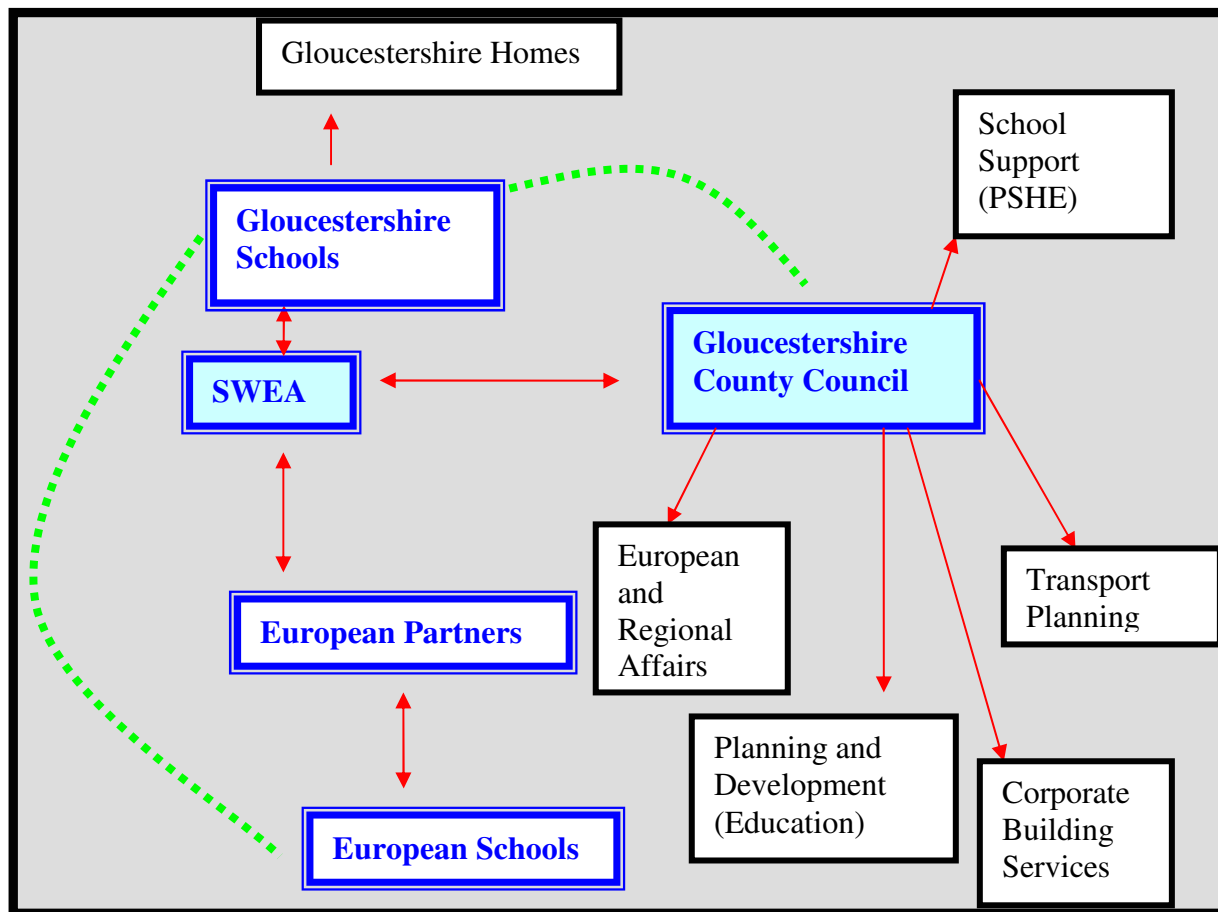
Opportunities within the Project

Schools working through the Healthy schools programme or on other eco-projects will find the structure of this project supportive to their aims. Schools who wish to try this sort of thing for the first time will find a good level of support, both from the educational material, the staff training provided and from Severn Wye Energy Agency's expertise.

The project will also be of interest to schools aiming to enhance home - school links, with comenius interests, or those wishing to increase pupil involvement with their school and add interest to a variety of curriculum areas.

Links to Severn Wye Energy Agency will also be of use to schools wishing to investigate possibilities for sustainable energy in their schools as we are able to offer advice on this.

Networks of Support Within the Project Framework



To express interest in this project or for more information please contact Rachel Close on 01594 545 369 or Email rachel@swea.co.uk



The Power to Change

Outline of School Implementation



The Power to Change

Prior to September 2005 Energy audit to provide baseline consumption data carried out by SWEA/GCC

September 2005

- Initial introduction activities for pupils and staff.
- Outcomes of energy audits made clear to staff and areas for improvement identified.

January 2006 – May 2006

- Pupils engaged in project work based on the identified themes and educational tools from a selection of good practice across Europe.
- Educational projects and materials will support improving the energy situation of the school and the involvement of the whole school community.
- Teachers supported in choosing projects and tools for their pupils and with integrating these into their lessons.
- Ongoing assessment and feedback on educational tools.

June 2006 – July 2006

- Review of the energy situation of the school, identification and celebration of progress.

July 2006 – June 2007

- SWEA involved in dissemination of project results and may approach schools for input into this.



The Power to Change



The Power to Change

Project Planner

The planner example shows the three phases of the school project and the available time in weeks. The phases have been colour coded as yellow, blue and red. The plan takes into consideration school holidays (black), testing and preparation periods (grey). Relevant national events and the timing of the energy surveys have also been indicated, although in the case of surveys this will be done by individual arrangements with the school.

The way that project activities will be placed in this time will be the choice of participating teachers with help from SWEA to select from the range of available educational tools those that are appropriate for each phase. Teachers will be invited to attend a welcome meeting where educational resources to support these projects will be presented and their applications demonstrated. These resources will also be available through the website.

The blank planner is for schools to prepare their individual programme on, and will be discussed in the welcome meeting.

	Phase 1 – Introduction to Issues / Developing background knowledge			Phase 2 – Investigating the issues / Developing experience and exploring problems			Phase 3 – Combining knowledge with experience – Science fair project / Celebration of achievements		
Month	September	October	November	December	January	February	March	April	May
		(4) Final Energy Reviews Conducted	(7) Schools Receive Final Energy Reports	(11)		(16)	(19)		
	(1) Energy Reviews Conducted	(5) 11 th Family Learning Week	(8)	(12)	(13)	(17)	(20) 14 th National Science Week		(22)
	(2) 22 nd Car Free Day	(6)	(9)		(14)		(21)		(23) 23 rd Summer Walk to School Week
	(3)	29 th Make a Difference Day	(10)		(15)	(18)			(24)

	Phase 1 – Introduction to Issues / Developing background knowledge			Phase 2 – Investigating the issues / Developing experience and exploring problems			Phase 3 – Combining knowledge with experience – Science fair project / Celebration of achievements		
Month	September	October	November	December	January	February	March	April	May
↓									
↓									



The Power to Change

Phase 1 – Introduction to Issues and Developing Background Knowledge



The Power to Change

Background Information

The first phase gives pupils a chance to develop a firm foundation for their work on energy over the course of the project. The example project uses a PSHE unit as a background for the resources developed through ‘The Power to Change’ project.

It will be necessary to give pupils some introductory sessions and we hope that basing the activities in these objectives will be helpful to schools in ensuring a full coverage in their curriculum. However, schools may choose to take a selection of the activities and integrate them into their existing plans. One way to achieve this is by using group work in class with some pupils following the energy project and feeding back into whole class discussions/ plenary sessions.

The project described here can be done in 3-4 sessions and there are a number of educational tools available to support the class activities.

Educational Tools

Visiting speaker (Possible to arrange in advance through SWEA)
Consequence Card Game
Trip Tix
Posters
Money Game
Climate Change Map



Project – Making Wise Energy Choices



The Power to Change

The Power to Change

Background Information

This project is based on the QCA CPSHE Unit – Choices. Teachers may consider using the examples in this unit to provide the material for one group in a class, whilst other groups consider other scenarios (such as those described in the QCA scheme). In this way a number of topics could be covered and shared through whole class feedback at the end of the sessions.

It is expected that most pupils will:

1. Realise that they have several alternatives when making decisions.
2. Take time to consider their options and begin to assess the consequences.
3. To have knowledge of likes and dislikes and some idea of what is right and wrong
4. Be aware of peer, family and media pressure
5. Make reasoned choices and justify their choices
6. Cope with an increasing number of alternatives

A. Making Choices

Objectives:

- To recognise that they can make choices
- To share their opinions on matters that are important to them
- To take part in discussions
- To resolve differences by looking at alternatives, making decisions and explaining choices.

Pupils investigate the ways that everyday actions involve different impacts on the environment through the associated energy use. In group discussions pupils talk about why they do these things, what sort of things they could do something about and what stops them changing others.

Outcomes:

- Informed choices are made and recognised, based on the consideration of influences and consequences.
- A demonstration of a simple decision making process
- A consideration of what is important when making decisions
- A discussion of opinions and an explanation of choices.

B. How do I make decisions?

Objectives:

- To know about strategies for making informed decisions
- To consider alternatives, make decisions and explain their choices
- To be aware of rights and responsibilities when making decisions.

Using examples of decisions pupils make about their energy use, pupils devise diagrams of the decision making process, including their different options at each stage and any places where they would require more information to help inform their choice. Pupils discuss their rights and responsibilities in relation to this in order to complete a decision making strategy.

Outcomes:

- A visual communication of the decision making process
- Pupils identify situations in which more knowledge or external help maybe required.
- Pupils can identify rights and responsibilities to consider when making decisions
- Produce a source of advice for others about informed decision making
- Explain their choices.



The Power to Change

Project – Making Wise Energy Choices



The Power to Change

C. What Influences our Choices?

- Objectives:**
- To understand there are different influences that can affect choices
 - To discuss their views and communicate with others
 - To know our resources are limited and we need to make choices
 - To understand that text in the same topic may contain different information and to distinguish between fact and opinion
 - To evaluate how the media present information to their target audience.

Activities:

Reflect on things that influence choice e.g. personal likes and dislikes available knowledge, friends and family, adverts etc. Analyse information sources in terms of suitability for decision making. Pupils develop an idea of what constitutes good advice and add this to the decision making strategy. This strategy is then applied to a game that uses scenarios where decisions need to be made in order to make best use of the resources the pupil is allocated.

- Outcomes:**
- Pupils know that there are different influences on choices
 - Pupils develop a strategy for deciding what constitutes good advice
 - Pupils can discuss and communicate what they have learnt verbally or through visual presentation
 - Pupils understand that our resources are limited and we need to make informed choices about our purchases

D. How do we make informed choices in our everyday lives?

- Objectives:**
- To know how choices affect us, other people and the environment
 - To investigate and consider alternatives when making an informed choice
 - To know about the responsibility involved in making choices

Activities:

Pupils can apply the decision making process to one of the following scenarios;

- Planning an enquiry into the schools energy use
- An enquiry into use of transport to and from school
- Planning an assembly to promote energy efficiency in school.

(See phase 2 – as these ideas could be integrated into the promotion of energy efficiency and sustainability as part of Developing the school's energy efficiency)



The Power to Change

Project – Making Wise Energy Choices – Activity Ideas



The Power to Change

Introduction

Initiate class discussions or pupil research to establish the pupils' conceptions of what energy is, where it comes from and how we use it. The website and its links could be used to support pupils in their research.

It is possible to make an arrangement through the Energy Efficiency Advice Centre for an introductory talk from a visiting speaker, explaining the consequences of our energy use, the importance of energy efficiency, where to get help and advice.

Climate Change Map game to illustrate the unfair use of energy resources world wide.

A. Making Choices

Mind Mapping Game – Carbon Consequences

Three packs of cards that pupils use to build up an idea of the impact of everyday decisions. Use the game to generate group discussions about the choices represented in the game. These discussions could be extended to considering other choices and their related consequences.

Ask children to reflect on their choices and how it can sometimes be difficult to make choices because of outside influences.

B. How do I make decisions?

Pupils work to create a list of activities that have global implications that they could have an influence over. These could be examples from the consequence game, Trip Tix or other activities.

From the list ask pupils to work in groups and select a couple of activities that they can use to devise diagrams of scenarios. They should include the possible options and consequences. They could use arrows to indicate where more information would help inform their choices.

Discuss what we mean by rights, and responsibilities and how they relate to the scenarios, e.g. the right to T.V. ?/ The responsibility not to leave on standby.

Pupils should add rights and responsibilities to their diagrams and discuss their decision making strategy.

Pupils design poster for the school building focused on an energy saving theme.

What influences our choices?

Discuss the components of good advice and how to recognise it. Play 'The Money game and encourage pupils to use their decision making strategies, discuss the influences on their choices and the limitations of their available resources (money)



The Power to Change

Phase 2- Investigating the Issues



The Power to Change

Background Information

In this phase the pupils are encouraged to use their school building as an educational tool, exploring where the energy being used comes from, how it is used and measured. The energy survey for each school will provide teachers with a basis for conducting energy tours, the project and lesson plans outlined here will help teachers frame a scientific investigation for their pupils.

The investigations will lead into pupils identifying areas for improvement in their schools. The project, 'Developing the School's Energy Efficiency' is based around pupils promoting messages of efficiency and sustainability to the rest of the school community. It could also be used to help pupils build sustainable energy into other school improvement projects they are under taking such as outdoor lighting or developing an eco – garden that includes small renewable energy projects such as solar pond pumps for example.



The Power to Change

Project – Investigating the School's Energy Situation



The Power to Change

Background Information

This project is based on the QCA Science Unit 5_6H – *Enquiry in environmental and technological contexts*. This project focuses on an environmental question and its purpose is to make pupils aware of the influences on energy use in their school building. When this project is worked within the contexts of decision making and the associated responsibilities and consequences of energy use it can act as a useful stimulus for pupils considering how they can make improvements to their environment.

It is expected that most pupils will:

1. Make a suggestion of how to investigate the ways in which energy is consumed in the school.
2. Plan how to investigate the energy consumption of the school
3. Make a series of appropriate observations or measures and record these correctly.
4. Interpret their data and relate it to their scientific understanding.
5. Use scientific language to explain how they could have improved their investigation.
6. Produce a poster display of the project in which they clearly identify and explain the stages of the investigation.

A. Planning an Investigation

(Ref: Lesson Plans 1 and 2)

Objectives:

- To ask scientific questions
- To plan how to answer questions
- To decide what kind of evidence to collect

Survey carried out as a tour following the guidance in the suggested lesson plan. This focuses on:

- How and where energy is used in the school
- How energy is transferred and transported around the school
- Identifying energy 'hotspots'
- How energy use is being measured in the school

Ask the children to suggest how the amount of energy used may fluctuate in school and what things may affect this. After discussion they can formulate their ideas into a question that is possible for them to investigate now. Ask pupils to prepare a plan for how to investigate their question, deciding how to collect data and helping them decide how much data they would need.

Outcomes:

- Pupils develop a greater understanding of how energy is used and measured on a daily basis.
- Pupils can suggest ideas for investigation based on their preliminary observations. E.g. more energy will be used in the mornings/ less energy will be used over a whole weekend than on one working day
- Pupils can plan a suitable method for collecting evidence.

B. Collecting and Interpreting Data **(Ref: Lesson Plan 3)**

Objectives: To collect and record data appropriately
To identify and describe patterns in data
To look critically at data collected

Children collect data and make other observations as appropriate, e.g. outside temperatures/ weather, energy using/ conserving activities, energy saving activities, time of data collection. The pupils will need to record this information appropriately, e.g. on tables, charts, graphs which they can use to identify and describe patterns in the data and help them to look critically at the results to decide on relationships.

Outcomes: -Pupils collect and record data carefully
-Identify how strongly the results show trends with reference to the amount of data collected.

C. Explaining Results and Considering the Evidence

Objectives: To try to explain their results using their scientific knowledge and understanding
To describe the limitations of their own evidence and that of others.

Help children to suggest reasons for fluctuations in energy use, drawing on their scientific knowledge. Ask the children to prepare a poster display of their investigation question, their plans and their results and to write one large print sentence summing up their findings.

Ask others in the class to consider the sentences and make suggestions as to how this work may be improved. If necessary prompt with questions, e.g. you only collected data in a week when the weather was warm, would different weather affect your results?

Ask the pupils to consider combining their results to see if they can make firm conclusions and what else they might investigate to test their conclusions further.

Outcomes: -Pupils suggest reasons for any differences, using scientific knowledge where possible.
-Draw conclusions recognising the limitations



The Power to Change

Project – Investigating the School's Energy Situation



The Power to Change

Suggested Lesson Plans

Lesson 1

Prior Preparation:

Prior to this session it will be necessary to organise for a caretaker or similar to give a site tour of the school.

Refer to school guidance for health and safety and risk assessments.

Warn colleagues to expect visitors – although it will only be necessary for pupils to look at their own classroom as a typical example of the others.

Introduction:

Have a brief discussion with the pupils about the types of energy being used around them at that moment in the classroom have to hand a battery operated piece of equipment and a mains piece of equipment, establish that they use energy for their actions and ask pupils to think about where the energy comes from.

Explain they will be doing a bit of detective work around the school and that their chief constable will lead them on an energy tracking mission!

Site Tour for Children - Guidance

Children often only have a limited view of their school and many rooms can remain a mystery to them beyond their school days. It is important for them to have as wide a range of access as possible for this tour to complete their picture of the building they will be studying. The tour also provides an insight into the working life of the school and the role of all the staff in supporting pupils.

Consider running two or three tours in smaller groups, pupils not on tour could do some of the optional activities.

Pupils should take their workbooks and something to write with.

Before starting the tour: *Read through the pupil booklet section with the pupils so they will be aware of what they need to look out for and so that you can plan the order you would like pupils to answer the questions in.*

Q. What are the main types of energy resources in the school?

Explain that there are potential dangers, pupils should not touch. On tour they will see a number of *safety features* that are built in to our energy systems because of these dangers.

Q. Make a prediction of how many energy using appliances they think are in school? – Ask them to record in their workbooks

The Tour – *The main focus will naturally be the heating and electricity supplies, schools with other energy systems should build this into their tour plans for themselves. You will need to plan your route and explanations to make the best use of time.*

An example: Electricity – Begin with a plug and demonstrate how the metal inside the wires connects to the prongs.

Q. Why are plugs made from these materials?

Point out and explain the *safety feature* of the fuse.

Look at the socket and refer pupils to the photo in the workbook showing the inside. Warn of the dangers of taking sockets apart. Explain that the wires inside will connect to the plug and that these then run through the walls. All the electrical appliances are linked in this way.

Making a show of tracing the cables through the walls (an electronic cable finder from a DIY store could be used to test this along the way) direct pupils to the fuse box. Explain this as a *safety feature*.

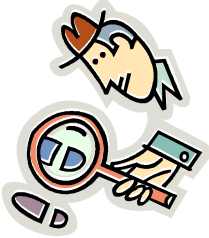
Show pupils the meter – Q. What does this do?

Explain reading a meter and ask them to note the reading in their books.

More detailed guidance relating to your individual school will be available through your energy survey.

Summing Up

Discuss the tour with the children, what they found out, how accurate their predictions were. Give them an opportunity to complete the sentence at the bottom of their work sheet.



Project – Investigating the School's Energy Situation

Energy Detectives:

Your mission is to track the energy in your school follow the chief you've been assigned to and watch out for all the evidence...



Explain how an electrical appliance receives energy through its plug. You can use words and diagrams and try to include the word 'conductor'.

Write down some of the safety features you saw on tour, Try to explain how ONE of them works.

Record the meter readings you see here:

Type of meter _____ Location _____

Reading _____

Type of meter _____ Location _____

Reading _____

Type of meter _____ Location _____

Reading _____

I predict that there are about _____ energy using appliances in this school

Count the number of energy using devices in the rooms to complete the table below. To complete the final column, for each room total up the energy using devices and then multiply your answer by the number of rooms like that in the school. Make sure you visit ALL the types of places, even the staffroom and the store cupboards!

E.g. my classroom has 10 mains electricity and 4 other energy sources = 14

In my school there are 8 classrooms. $14 \times 8 = 112$

We can estimate that the classrooms hold about 112 energy using appliances altogether.



The Power to Change

Project– Investigating the School's Energy Situation



The Power to Change

Suggested Lesson Plans

Lesson 2

Prior Preparation:

Pupils will benefit from having taken an energy tour prior to this session.

Introduction:

Re- cap with the pupils the things that they discovered on their energy tour and use as discussion points things that pupils had highlighted as being things they did not know before.

Activities:

In groups ask the pupils to come up with a list of ideas of things that would influence the amount of energy used, when do they think most/least energy is used? Ask the pupils to use their lists to formulate an enquiry question. Pool the suggestions from the class and as one group decide on a shortlist that would be feasible for investigation, highlighting the reasons why some questions are more feasible than others.

Re-group the pupils into their original smaller groups and ask them to select an enquiry question from the shortlist and devise a plan to investigate it. Display some key questions that they will need to consider to help them formulate their discussions, e.g. what will you measure? / What equipment will you need? / How much data will you need to collect?

Ask pupils to prepare their plans for a poster display including the enquiry question they chose and why they chose it. This is the poster display that will be completed in Section C of the project.

Summing up

Distribute roles and responsibilities for data collection in the class.

It is useful to have the data collection under way as soon as possible. It is likely that pupils will want to collect meter readings as a measure of energy use, there are a number of ways of achieving this over the data collection period. E.g. the selection of some responsible meter monitors, enlisting the help of another member of staff such as caretaker to carry out the data collection on your behalf, the setting up of a web cam so that metres can be read from classroom PC.

In any remaining time discuss reasons why it is important to monitor how much energy we use.



The Power to Change

Project– Investigating the School's Energy Situation



The Power to Change

Suggested Lesson Plans

Lesson 3 (It may be possible to combine Lesson 3 and 4 for more efficient time use)

Prior Preparation

Make sure relevant data has been collected.

Activities:

Pupils organise their raw data onto graphs and charts and discuss in their investigation groups what information their data gives them. Pupils could use spreadsheets and other data packages to present their results. Help pupils to recognise how strongly the results show the relationships identified. Pupils continue to develop their poster display by adding their results.

Summing up: Select some investigation groups to present their results to the class and see how the results of different investigations link with each other.

Lesson 4

Prior Preparation:

Make sure relevant data has been collected and presented.

Activities:

The pupils will need to discuss their results and find some explanations for the fluctuations in energy use. Ask them to devise one concluding sentences that they can add to their poster in large print.

Invite groups to swap over investigation posters and ask them to study each others carefully finding up to three things they think the group did well and up to two things they could have improved. If necessary prompt with questions, e.g. you only collected data in a week when the weather was warm, would different weather affect your results?

Summing up:

Considering the results of all the groups what firm conclusions can be made, what other things could they investigate?

Discussion:

What impacts does our energy use have?

What things could we do to reduce these impacts?

Can we identify an area of improvement for the whole school and bring about a change?

Pupils should engage in activities to promote whole school awareness of energy efficiency. This could be achieved through the next project, 'Developing the School's Energy Efficiency' or in a less structured way through the supporting activities listed at the end.



The Power to Change

Project- Developing the School's Energy Efficiency



The Power to Change

Background Information

This project is based on the CPSHE QCA Unit 6 – Developing the school grounds. Here the emphasis is switched to improve the energy efficiency of the school building and it is hoped that it will provide teachers with a range of new ideas for meeting the requirements of this unit. This project can stand alone but will benefit from work on the project 'Investigating the School's Energy Situation'.

National Curriculum References:

- 1a to talk and write about their opinions, and explain their views on issues that affect themselves and society
- 2a to research, discuss and debate topical issues, problems and events
- 2f to resolve differences by looking at alternatives, making decisions and explaining choices
- 2j that resources can be allocated in different ways and that these economic choices affect individuals, communities and the sustainability of the environment
- 4a that their actions affect themselves and others, to care about other people's feelings and to try to see things from their points of view

Also strands,; 5a, 5c, 5d, 5e, 5h of the Breadth of Opportunities recommendations

It is expected that most pupils will:

- 1 Contribute ideas and listen to the views of others
- 2 Express their views to one other and the whole class
- 3 Know how decisions are made in school and how they can contribute
- 4 Work in a group and recognise the importance of asking different people for their views
- 5 Understand that there are limitations in any project relating to cost, time and resources

A. How Can we get Involved in Developing the School's Energy Efficiency

Objectives:

- To develop the role of pupils as members of the wider community
- To discuss issues with their class
- (-About how democratically elected individuals can represent the views of many people.)

Review some case studies of community projects and review the energy audit results of the school with the pupils and use these to stimulate a discussion on how the energy efficiency of the school building could be improved. It will also be useful to look at any results the pupils drew from the project entitled, 'Investigating the School's Energy Situation'.

You could set up a committee comprised of a variety of people representing; all the building users, chief decision makers in the school, members of the wider community, and those with relevant expertise. Pupils could be elected to key positions such as chair and secretary. Alternatively, establish the class as an efficiency committee and draw up a list of people that they may want to consult in their decision



Project- Developing the School's Energy Efficiency



The Power to Change

The Power to Change

making process. This will provide pupils with the same scope of opinions and, if there is any need for class 'committee meetings' pupils could be elected to key positions for just one meeting.

Split the group into sub committees to identify areas that they could improve and begin to plan how they would achieve their improvements. Remind pupils to think about any discoveries they made while investigating the school's energy efficiency and to have a look at the energy report from SWEA.

- Outcomes:**
- Pupils identify their own opinions about the school's energy use
 - Pupils take part in suggesting potential improvements
 - Recognise that a variety of individuals will contribute to the decision making process
 - Contribute to discussions, sharing ideas and listening to the opinions of others.

B. What do we Think About Using Energy?

- Objectives:**
- To reflect on and talk about what they like and dislike
 - To consult with the school community
 - To know about the importance of consultation and listening to other people's views

Engage the pupils in a debate around the motion that, 'We Can Not Make Any Difference to The World's Energy Problems'. Split the class into groups for and against the motion and provide them with relevant information.

Some pupils could be elected to chair the debate and take notes.

Prepare a series of statement prompt cards that can be introduced at various points to the discussion groups in the discussion to aid the proceedings.

At the end of the discussion hold a vote to decide whether the motion is carried or not.

Pupils should be encouraged to think about how small actions can accumulate to have a positive impact and feel empowered to take actions.

- Outcomes:**
- Pupils identify their own opinions and reflect on those of others
 - Pupils offer reasons for their judgements
 - Pupils recognise their potential for instigating improvements

C: Identifying priorities and Making Changes

- Objectives:**
- To generate and explore ideas
 - To communicate ideas to others
 - To know about their expectations for change and the complexities of a project

Following their discussions pupils could compile a survey that would identify the sorts of actions the school community would be prepared to carry out to save energy and use this as a basis for planning future actions.

They should be encouraged to consider and consult all users, reflect on ideas and make suggestions. Pupils should engage in costing their projects, finding funding ideas and discussing limitations. Revisiting the Money Game could help with this.

More detailed advice is available in the QCA Unit – Developing our School Grounds.



The Power to Change

Project- Developing the School's Energy Efficiency



The Power to Change

Supporting Activity Ideas

- Ask the Class to prepare a school assembly promoting messages of energy efficiency
- Pupils write letters to school governors/ management/ PTA raising awareness of the school energy situation and how it could be improved.
- Pupils prepare manned stands displaying energy efficiency information at school fairs (SWEA can help provide material for this)
- Pupils make presentations or small pieces of drama with energy themes
- Poetry / Poster competitions.
- Energy challenges – who can save the most energy in a week?



Phase 3 – Practical application of knowledge and skills acquired



The Power to Change

The Power to Change

Background Information.

In this final stage of the project the pupils have a chance to apply their knowledge and skills to practical projects. There will be opportunities for the display of pupil work and celebrating the schools progress. We have given one detailed project idea here but through the resources available through networking meetings and the website a range of practical projects are available.



The Power to Change

Project– Designing an Animal Transporter



The Power to Change

Background Information

This project is based on the QCA Science Unit 5_6H – *Enquiry in environmental and technological contexts*; however. This project focuses on a technological question and its purpose is to make pupils aware of ways to make the most of the naturally occurring heating and cooling potential of materials and structures and how efficiency can be part of a structures design. This project illustrates how buildings are structured to include efficiency. It can act as a useful stimulus for pupils considering how they can make improvements to their own environment.

See lesson plans for advice on an introductory session for this project.

It is expected that most pupils will:

1. Make a suggestion of how to investigate materials and find those with suitable properties.
2. Plan how to answer the questions of a suitable design.
3. Make a series of appropriate observations or measures and record these correctly.
4. Interpret their data and relate it to their scientific understanding.
5. Use scientific language to explain what they did and how they could improve things
6. Produce a model of their design and an explanation of its component parts.

A. Planning an Investigation

(Ref: Introductory Session and Lesson Plans 1 & 2)

Objectives: To use scientific knowledge to identify significant features of an artefact to be designed.

Ask children to explore how materials trap and hold heat through a variety of small experiments (some suggestions can be found in the lesson plans). Explain that they will be using what they learn about different materials in order to design a temporary home for transporting a small pet. Give them some guidelines to help them frame their research:

- It must be made from materials designed to capture heat from the outside and maintain a comfortable temperature.
- Ventilation should be included and ways of controlling the temperature to ensure it doesn't get too warm need to be considered.
- Pupils cannot expect to use a fuel source as this is dangerous for the animal and may not be possible when the transporter is in use.
- The animal home is functional – does not have to be for the animal to eat, sleep or play in.

Ask the children to work in groups to create designs for the animal transporter labelling where they will use specific materials

Outcomes: -Pupils recognise that different materials have different thermal and insulation properties and show this in their designs.
-Create designs that show their knowledge of the properties of different materials.

B. Considering the problem to be solved

(Ref: Lesson Plans 3 & 4)

Objectives: To plan a suitable approach e.g. creating a variety of designs and selecting the best fit for the design specification.

To test out designs, making a series of observations.

To adjust designs in a systematic way in light of observations and evidence collected.

Provide pupils with a small box as the basic structure and a variety of materials for them to create their initial ideas from.

They can test their ideas by placing them in the sun (or if cloudy, in front of a bright bulb as a substitute) for a warming period. After it is removed from the heat source pupils should monitor the temperature and time how long it will take for the temperature to drop below a comfortable temperature.

Ask them to plan improvements onto original designs in a different colour, explaining their modification in terms of scientific knowledge and understanding.

Outcomes: -Pupils test and adjust designs systematically

-Record ideas describing and explaining designs and adjustments using their scientific knowledge

C. Presenting and evaluating the design

Objectives: To try to explain their designs using their scientific knowledge and understanding where possible.

To evaluate the limitations of their designs and those of others.

Ask children to make a large diagram (or a final model) of their final animal transporter with annotations explaining the reasons for each part of the design, e.g. we painted the inside black because this colour holds the heat well.

Help children evaluate their designs and suggest how they might be improved.

Outcomes: Pupils evaluate the quality of the final product making suggestions for improvements.

It is a good idea to ask pupils to bring in a named box each well in advance to give them a chance to find one suitable – unfortunately cereal boxes are not ideal as it is better to have more depth. Larger boxes of tea bags, shoe boxes etc. are better.



The Power to Change

Project– Designing an Animal Transporter



The Power to Change

Suggested Lesson Plan

An Introductory session:

Teachers should consider doing the following activities to make pupils aware of how homes and buildings are insulated to make them more efficient in terms of energy needed for space and water heating. It is possible to make a prior arrangement with our Energy Efficiency Advice Centre to deliver a similar session for you.

Prior Preparation:

You will need:

- a coat, a body-warmer/sweater, a pair of gloves, a pair of sunglasses, several scarves, a nice warm hat, a small electric heater (optional)
- the insulation illustrations and fact cards
- The Power to Change thermometer cards

Introduction

Briefly recap with the children the reasons that it is important to reduce our energy use.

Explain that you will demonstrate how buildings are designed so that they don't need to use so much fuel to keep them warm and comfortable.

Activities

Choose a pupil to represent a building and bring them to the front of the class introducing them to their peers as Number 30 Elm Road.

- Illustrate how Number 30 stands strong with their foundations (feet) firmly rooted in the ground, outside in all weathers, wind, rain and snow.
- When it is horrible outside the residents of number 30 feel the cold through the hard, cold materials of number 30's structure so they turn the heat up high and keep themselves nice and warm. (Here you could use the electric fan heater to demonstrate turning it up high)
- Make sure the pupils understand that the heat is set very high to warm the whole house. Q. Why doesn't it just keep getting hotter and hotter in the house? /What happens to the heat?
- Work through the insulation illustrations in their numbered order using the illustrations on the back to choose which items of clothing to add to the pupil. If you keep the heater on the pupil they will begin to feel warmer and warmer as an illustration the insulation is working.
- When the pupil is fully insulated you can show how the heating can be kept lower or even off, to achieve a comfortable temperature for everyone in Number 30.

Q. What temperature do you think your home needs to be for it to be comfortable?

Use the thermometer cards to discuss temperatures and illustrate the comfortable temperature of 21°

Encourage pupils to use the cards around the room note the difference in the area that was closest to the electric heater. Do different parts of the room have different temperatures?

Encourage pupils to use their thermometer cards at home so that you can have a discussion about the temperatures they found in parts of their own houses.

Share the facts on the temperature poster with the pupils and display this in your classroom

Summing Up

Ask pupils to recall as many insulation features as they can and record as a list for display over the project work as a reminder of possible features.



The Power to Change

Project– Designing an Animal Transporter



The Power to Change

Suggested Lesson Plan

Lesson 1

Prior Preparation

It is very helpful if pupils have experienced an introductory session similar to the one explained in this guide.

Ice will be needed for some of the demonstrations

Thermometers will be needed for recording temperatures

Various insulating materials- cotton wool, straw, paper, material scraps etc

Clear sandwich bag

Introduction

Explain that they will become ‘architects and engineers’ using what know about insulation and structure design in order to design a temporary home for transporting a small pet.

Give them some guidelines to help them frame their research:

- It must be made from materials designed to capture heat from the outside and maintain a comfortable temperature.
- Ventilation should be included and ways of controlling the temperature to ensure it doesn't get too warm need to be considered.
- Pupils cannot expect to use a fuel source as this is dangerous for the animal and may not be possible when the transporter is in use.
- The animal home is functional – does not have to be for the animal to eat, sleep or play in.

Remind pupils of the insulation features they learned about in the introductory session and explain how choices of materials and interior decoration can also help to improve energy efficiency and that what they discover in today's activities will help pupils with their designs.

Activities

Decide whether to use whole class demonstration or small group work and feedback to ensure pupils benefit from the experience of all the small experiments. Before conducting experiments ask pupils for their opinions – if they think a difference in temperature will be achieved ask them to estimate how much or what the temperature will be to increase their understanding of what these measurements mean.

1. Thermometer in a bag

This experiment demonstrate the Greenhouse effect (see teacher's notes below for a child friendly explanation). Lay a thermometer in the sun and read the temperature after five minutes. Now shake a clear plastic bag to fill it with air and place the thermometer inside, sealing it carefully. Leave this in the sun for a further five minutes and compare the readings.

The air (gasses) inside the bag trap the heat in the same way the earth's atmosphere does.

2. Colour and temperature

Place an ice cube on squares of coloured paper, include black, white and one other colour that is not too similar e.g. yellow. Lay them in the sun and observe the different lengths of time the ice melts.

Black absorbs heat the best whilst white reflects the heat away, this is why solar panels use black material.

3. Insulating materials

Q. What does an insulator do? Pupils often think the purpose of insulators is to keep something warm , this experiment shows how some materials are better insulators than others and that an insulator's purpose is to maintain the temperature of the insulated area.

Q. What would stop an ice cube melting? Cover 3 ice cubes, one with foil, one with wool, one with paper and leave one as a control. – Allow to stand for 15 minutes.

Q. Which was the best insulator? / Why? The thickest material will be the best insulator..

4. Reflecting heat

Line a box with silver foil and leave a similar one as it is. Place a thermometer in each and record the temperatures (which should be roughly the same). Place a night light in each and record how the temperature rises noticing any differences in the rate and amount of increase.

Summing Up

Discuss what the children have found out and the ideas that this has given them for features to include in their animal transporters.

Teacher's Notes

The earth is protected by its 'atmosphere',

Q. What is the atmosphere? – Pupils often envisage this as a physical thing 'a bubble' around the earth. It can be explained as gasses that surround the earth creating an invisible shield. It has two jobs;

1. The outer layer 'ozone' stops harmful rays entering the earth's atmosphere and doing damage.
2. The atmosphere itself traps gasses to keep our planet warm – if this didn't happen the earth would be frozen and lifeless.

The atmospheres gasses trap the heat. Like a greenhouse the heat gets in but is not allowed out again hence the label greenhouse gasses. Pollution adds more of these gasses to the atmosphere which are trapping more and more heat and the Earth is getting hotter.

Discussion point: What is likely to happen if the earth keeps getting warmer?



The Power to Change

Project– Designing an Animal Transporter



The Power to Change

Suggested Lesson Plan

Lesson 2

Prior Preparation

Decide whether transporters are to be created by individuals, pairs or groups.

Introduction

Remind pupils of the requirements for their designs and of some of the features that they have seen in the past sessions.

Activities

In their design groups pupils plan out the features of their designs creating a design poster with appropriate labelling and examples.

Summing Up

Encourage pupils to share their design ideas with other members of the class, explaining in their own words why they have included certain features and where they got their ideas.

Lesson 3

Prior Preparation

Have plenty of materials available for pupils to create their designs from.

Introduction

Discuss with the pupils the ways in which temperature can affect our health.
What can happen if we get too hot?/ cold (see teacher's notes below for details)

Remind them of the importance of comfortable temperature and to ensure the animal has fresh air and will not get too hot.

Activities

Allow pupils time to create their designs.

Summing Up

Ask pupils to consider what they will do next time in order to test their designs.

Teacher's Notes

The thermometer cards and temperature poster give advice about comfortable temperatures. Controlling temperature is very important for a healthy lifestyle and particularly important for those with very young or elderly relatives. Health problems are often associated with very extreme temperatures and conditions such as dehydration, pneumonia and hypothermia. These are real dangers, but far more common are the problems associated with poorly heated or ventilated homes.

Chest problems including asthma are a common effect of this and are exacerbated when a home is damp due to poor ventilation. Circulatory problems are also effected by temperature and coldness can also effect cognitive abilities. Keeping fit and healthy improves the circulation of blood around the body and the bodies natural capacity to keep itself warm. Exercise warms us up and reduces the need to use other forms of energy for heating.



The Power to Change

Project– Designing an Animal Transporter



The Power to Change

Suggested Lesson Plan

Lesson 4

Prior Preparation

If the weather is not suitable for using heat from the sun warm up a high wattage bulb at the beginning of the session.

Introduction

Establish how the transporters will be tested with the pupils.

Activities

They can test their ideas by placing them in the sun (or if cloudy, in front of a bright bulb as a substitute) for a warming period. After it is removed from the heat source pupils should monitor the temperature and time how long it will take for the temperature to drop below a comfortable temperature.

Ask them to plan improvements onto original designs in a different colour, explaining their modification in terms of scientific knowledge and understanding and produce a final presentation (diagram or model) with some notes explaining the scientific understanding behind design features. E.g. We painted the inside black because this colour attracts and radiates heat.

Summing Up

Ask pupils to set out their designs and invite pupils to look at the work of others. Have a feedback session where pupils can comment on things they saw others do well and how they might adjust their own designs if there were time.

It is possible that pupil work from this project be used by SWEA for display.

Please advise children not to test their designs with any real pets – paints and glues etc may be toxic for small animals and the transporters themselves may not be 100% secure!

Appendix 1

Information about SWEA and Contacts

Appendix 2

General Information and Correspondence