



Big Question: How can we make houses in Saltney energy sustainable?

AoLE: Science and Technology	Subject: Science - Physics	Year: 8
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Big Question / Aim / Objective / Concept	Vision (Proposed outcome) / Purpose of curriculum	Prior knowledge / Learners previous knowledge
How can we make houses in Saltney energy sustainable?	This unit looks at how we can improve the efficiency of houses in Saltney. It looks at heat transfers in the context of houses and how we can build sustainable efficient houses that reduce fuel costs for individuals in the local area. This unit then links to household electrical wiring to cover the measurement of current in series and parallel circuits. It also looks at some of the uses and dangers of electricity, before moving on to electrical concepts in sustainable resources such as wind and solar energy. It investigates common technology such as modern heating systems and new technologies such as heat pumps.	<p>Likely areas covered in KS2:</p> <ul style="list-style-type: none"> • Recall the three states of matter. • Recall that matter is made of particles and describe how these are arranged in solids, liquids and gases. • Explain that heat is a form of energy and that energy is transferred from hotter to colder objects. • Describe some uses of magnets. • Be able to construct simple circuits. <p>Be able to construct simple circuits and use them to find out whether materials are conductors or insulators.</p> <ul style="list-style-type: none"> • Draw circuit diagrams and construct circuits from diagrams using conventional symbols. • Know how switches work. • Be able to investigate the effect of changing components in a circuit on the brightness of bulbs.

What does progression look like in this Big Question?

Progression Indicator	Description of learning (What matters statements)	Student evidence of progression (Blooms) / Knowledge
Excelling	<p>I can describe and explain the properties of different types of matter and relate these to how they are used.</p> <p>I can understand conservation of energy and can explain that energy is used at differing rates, and that this affects the power and efficiency of a system.</p> <p>I can apply my knowledge of energy and forces to new designs and can improve the efficiency of systems.</p> <p>I can explain the factors that affect current and describe the way in which it behaves in various circuits.</p> <p>I can use my findings to draw valid conclusions.</p> <p>I can review my own opinions based on new scientific evidence.</p>	<p>Describe temperature as a measure of the mean particle speed and use this idea to explain the Kelvin temperature scale.</p> <p>Use the idea of particles to explain temperature changes during changes of state.</p> <p>Explain changes of state in terms of the forces between particles.</p> <p>Evaluate using qualitative methods to investigate current, voltage and temperature to decide if two variables are proportional or inversely proportional.</p> <p>Evaluate the reliability of evidence on modern sustainability.</p>



Advancing	<p>I can explain that energy can be transferred from one place to another and how this can be used to provide the energy we need in our modern lives.</p> <p>I can design and create circuits that will perform a desired function.</p> <p>I can describe the factors that affect electrical circuits and this will enable me to change variables and predict what will happen.</p> <p>I can describe and explain the properties of different types of matter and relate these to how they are used.</p> <p>I can use a range of models to explain and make predictions.</p> <p>I can select relevant scientific knowledge from a range of evidence sources to evaluate claims presented as scientific facts.</p>	<p>Explain the difference between heat and temperature.</p> <p>Explain what infrared radiation is and how it is similar to light.</p> <p>Consider how some developments in insulation technology have changed the efficiency of our homes.</p> <p>Evaluate an investigation and suggest improvements to methods.</p> <p>Plan to collect valid and reliable results of heat conduction through a range of materials.</p> <p>Plan a fair investigation without help.</p>
Securing	<p>I can investigate different forms of energy and how it can be transferred.</p> <p>I can explore and describe the properties of materials and justify their uses.</p> <p>I can identify questions that can be investigated scientifically and suggest suitable methods of inquiry.</p> <p>I can suggest conclusions as a result of carrying out my inquiries.</p> <p>I can evaluate methods to suggest improvements.</p>	<p>Plan a fair investigation with some help.</p> <p>Make accurate measurements that lead to dependable conclusions.</p> <p>Present data from investigations as line graphs.</p> <p>Use the idea of particles to explain how conduction, convection, expansion and changes of state occur.</p> <p>Describe how substances expand or contract, and change state.</p> <p>Describe a convection current.</p>
Beginning	<p>I can use my knowledge and understanding to predict effects as part of my scientific exploration.</p> <p>I can recognise patterns from my observations and investigations and can communicate my findings.</p> <p>I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.</p>	<p>Display data in tables.</p> <p>Use thermometers with fine divisions accurately.</p> <p>Identify key variables in an investigation.</p> <p>Use the idea of particles to describe how conduction and convection occur.</p> <p>Describe some uses of heat conductors and insulators.</p> <p>Recognise some simple physical changes (e.g. melting, freezing).</p>



Authentic learning experiences (Local / National / International)	Skills (Literacy / Numeracy / DCF) / Cross Curricular links
<p>Local and National Context</p> <p>In this hands-on learning experience, students explore ways to improve the energy efficiency of houses in Saltney. They conduct analysis of how different materials can be classified as conductors or insulators. Using this knowledge pupils investigate how these materials limit conduction, convection and radiation to keep houses warm and the impact of this on fuel costs, appliances, and energy usage. Students learn about sustainable building materials, renewable energy options, and Welsh government incentives. They design and present their energy-efficient house plans, applying knowledge of science, and technology.</p> <p>Pupils go on to look at how improving the efficiency of houses and reducing fuel consumption reduces the draw on the National Grid and subsequently reduces the impact to climate change.</p>	<p>Numeracy</p> <ul style="list-style-type: none"> • Measurement of temperature using fine division instruments. • Construction of accurate experimental drawings, scale drawings of buildings. • Calculation of energy use in homes. • Calculation of efficiency using percentages. • Evaluation of the concept of payback time in terms of home improvements. <p>Literacy</p> <ul style="list-style-type: none"> • Development of the definitions for the law of conservation of energy. • Describe the processes of conduction, convection and radiation in terms of particles where needed. • Describe and explain using connectives to structure reasoning. • Focus on the command word of describe for the processes of conduction, convection and radiation. • Extended writing formalising sentences and structuring paragraphs. Pupils use connectives to explain their reasoning. • Summarise information. • Use oracy skills to present and discuss information. <p>Cross Curricular Links: Geography</p> <ul style="list-style-type: none"> • Pupils will investigate the key impacts to climate change and acid rain. This further links to concepts of chemical weathering.

Assessment (How will we know that students have learnt what we taught them?)	
<p>Formative assessment:</p> <ul style="list-style-type: none"> • Teacher circulating • Q&A discussions on various phenomenon and scientific understanding • Identify key terms to definitions/examples • Peer/self-assessment tasks • Group experimental work • Explanations of specific processes such as conduction, convection and radiation. • Lesson tasks such as measuring angles precisely allows the use of whiteboards or tasks that feedback to the teacher to ensure pupils have learnt the desired process. 	<p>Summative assessment:</p> <ul style="list-style-type: none"> • End of 'Biq Question' test x2 (mid topic and end of topic)

Evaluation (to be completed 2024)		
Strengths	Areas for Development	Pupil Voice