



Big Question

AoLE: Science and Technology	Subject: Product Design	Year: 8
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Big Question / Aim / Objective / Concept	Vision (Proposed outcome) / Purpose of curriculum	Prior knowledge / Learners previous knowledge
What are the properties of plastic?	<p>In this unit, pupils develop an understanding of plastic and the importance of a sustainable environment through designing and making a LED light. This will be based on a theme of the pupils choice but must be made from a thermoplastic (acrylic) and develop their workshop skills. The focus of the unit is for the pupils to understand the properties of the two types of plastic (thermoplastic and thermosetting plastic). There will also be a focus on electricity – conductors and insulators. During the project the pupils will work out their ideas with precision, taking into account how the product will be used, who will use it, the processes that will be used during manufacture and the product's aesthetic appearance. They will enhance their understanding of designing and developing their practical skills. The pupils will also explore CAD / CAM using the programs 2D Design and TinkerCAD.</p> <p>The pupils' challenge will be to design and manufacture a LED light. The top (design) LED light will be manufactured from acrylic that will be laser cut with the base of the product made from plywood that will incorporate a finger joint. The pupils will solder their own circuit that will include a resistor, USB and a LED.</p>	<p>Workshop tools and skills. Wood joints. Plastics. Insulators and conductors. Sustainability. The environment that we live in CAD and CAM.</p>

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 the factors that affect electrical circuits and this will enable me to change variables and predict what will happen.</p> <p>I can use prototyping as a link between my designing and making.</p> <p>I can consider how my design proposals will solve problems and how this may affect the environment.</p> <p>I can recognise that changes in materials affect their properties and uses under different conditions.</p> <p>I can make design decisions, using my knowledge of materials and existing products, and suggest design improvements.</p> <p>I can apply my knowledge and skills when making design decisions in order to produce specific outcomes.</p>	<p>Analyse and compare the properties of the two types of plastics by stating reasons why products would be manufactured by a certain type.</p> <p>Characterise electrical components explaining their function and how they work.</p> <p>Distinguish and explain the difference between an insulator and conductor by classifying products.</p> <p>Distinguish the different properties of materials and how they affect the world we live in.</p> <p>Interpret, evaluate and analyse the life cycle of a plastic effectively and explain how it can. have a positive or negative effect on the environment.</p> <p>Construct, create and develop a high quality product with accuracy.</p> <p>Evaluate and compare initial ideas with annotation and suggest improvements for designs.</p>
Advancing	<p>I can explore and describe the properties of materials and justify their uses.</p> <p>I can creatively respond to the needs and wants of the user, based on the context and on the information collected.</p> <p>I can combine component parts, materials and processes to achieve functionality and improve the effectiveness of my outcomes.</p> <p>I can use design thinking to test and refine my design decisions without fear of failure.</p>	<p>Recognise the differences between the two types of plastics.</p> <p>Summarise the properties of different plastics.</p> <p>Characterise electrical components by recalling the correct symbols.</p> <p>Explain the difference between an insulator and conductor.</p> <p>Evaluate how my own choices affect the environment and how to be sustainable.</p> <p>Critique the life cycle of plastic.</p> <p>State the name of tools, along with their functions, in the workshop that I will be using for the manufacture of my LED light.</p> <p>Sketch and annotate different initial ideas that would be suitable for purpose.</p>



	I can use a variety of simple models to describe the forces acting on an object.	
Securing	<p>I can explain how the properties of sound and light will affect how they are experienced.</p> <p>I have experienced using basic prototyping techniques to improve outcomes.</p> <p>I can take into account the impact my making may have on the environment.</p> <p>I can produce designs to communicate my ideas in response to particular contexts.</p> <p>I can select and safely use appropriate tools, materials and equipment to construct purposeful outcomes.</p> <p>I can follow instructions to build and control a physical device.</p>	<p>State the names of the two types of plastic.</p> <p>State the names of electrical components.</p> <p>Identify that a material can only be an insulator or a conductor.</p> <p>State how my own choice affects the environment.</p> <p>Identify the importance of the need to recycle materials.</p> <p>State the name of tools in the workshop that I will be using for the manufacture of my LED light.</p> <p>Sketch and label different initial ideas.</p>
Beginning	<p>I can explore and communicate the basic properties of light, sound, electricity and magnetism.</p> <p>I can safely use simple tools, materials and equipment to construct and deconstruct.</p> <p>I can explore the properties of materials and choose different materials for a particular use.</p> <p>I can safely use a range of tools, materials and equipment to construct for a variety of reasons.</p>	<p>Recognise that there are two types of plastic.</p> <p>Identify that electrical components are linked to create a circuit.</p> <p>Identify how to recycle materials to save the environment.</p> <p>Recognise the different tools in the workshop.</p> <p>Sketch different initial ideas.</p>

Authentic learning experiences (Local / National / International)	Skills (Literacy / Numeracy / DCF) / Cross Curricular links
<p>Learning experiences: Students to design and manufacture a LED light. The light will have an electrical circuit incorporated that the pupils will solder different components. Pupils will use CAD and CAM in the manufacture of the LED light. They will use a laser cutter to manufacture the design on the plastic top. Students to develop their knowledge of wood joints by creating a finger joint for the housing of the LED light. Pupils will develop knowledge of the environment by discussing the 'life cycle of a plastic product'. Students will research the different plastics (thermoplastics and thermosetting plastics). They will understand that the different plastics have different properties and will be more suitable to manufacture certain products from. Pupils will research electrical products and learn about insulators and conductors.</p> <p>National links: Recycling plastic in the local area.</p> <p>International links: Health and safety signs throughout the world.</p>	<p>Cross Curricular links: Science - Electrical components, circuits and light. Science - Insulators and conductors. Science - How different materials and processes affect the environment. Art - Sketching, modelling and Orthographic drawing.</p> <p>Numeracy: Templates. Measuring. Investigation skills - symmetry, number pattern, algebra.</p> <p>Literacy: Describe and explain using connectives to structure reasoning. Read statements linked to the plastic life cycle. Extended writing formalising sentences and structuring paragraphs. Pupils use connectives to explain their reasoning. Writing a details specification using ACCESS FM using connectives to add reasoning. Writing a design problem and brief. Summarise information. Use connectives to produce extended writing on the plastic life cycle in a chronological order. Learn key vocabulary in Product Design and how to use them to construct sentences using the frayer model. Use PEE to answer exam questions.</p>



	<p>Researching plastics.</p> <p>DCF: Using CAD and CAM. How to create designs using CAD (2D Design and TinkerCAD) to draw. How to vectorise images and draw to specific measurements. CAM - Laser cutter.</p>
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Assessment (How will we know that students have learnt what we taught them?)

<p>Formative assessment: Describe the different types of plastic. Compare the different plastics. Describe insulators and conductors. Explain the life cycle of plastic. Explain how a person can help the environment - recycling. Teacher circulating. Q&A discussions on various topics including carbon footprint. Match key terms to definitions/examples through the frayer model. Peer/self-assessment tasks. Creative sketching tasks - initial ideas, development of ideas and orthographic technical drawing.</p>	<p>Summative assessment: Design and manufacture a LED light.</p> <p>Accuracy during the manufacture, focusing on the finger joint and quality of soldering.</p> <p>Development and quality of initial ideas.</p> <p>Quality of technical drawing - orthographic drawing.</p> <p>Baseline assessment - about materials and processes.</p> <p>Compose and construct an extended piece of writing to answer the question 'What is the life cycle of a plastic product?'</p>
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Evaluation (To be completed 2024)

Strengths	Areas for Development	Pupil Voice