ACET Junior Academies

Scheme of Work for Design Technology

Y6 Electrical Systems – More complex switches and circuits

ACET

About this unit: In this unit pupils will learn about electrical products that respond to changes in the environment using a computer control program, e.g. burglar alarms, security lights etc. They will explore a range of products to investigate how they work. Children will learn to use their knowledge from Science and Computing to create a working circuit controlled by a computer program. Pupils will design and make an electrical product for an intended user and purpose that will be controlled by a computer control program. They will evaluate their completed products, judging the extent to which they have met the original design criteria.

Final piece ideas: motion sensor/light sensitive burglar alarm/sensor light (link Science 'Electricity', History 'Crime and Punishment', Art and Design 'Banksy'

Unit structure
1. Investigate and Evaluate
2. Focused Tasks
3. Designing
4. Making – Planning and making
5. Making – Finishing
6. Evaluating

Links to previous and future National Curriculum units

- LKS2 – Simple circuits and switches

1: Investigate and Evaluate

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Pupils will have an understanding of the essential characteristics of a series circuit and experience of creating a battery-powered, functional, electrical product. Pupils will have experience of using computer control software.	**Knowledge:** *(What students should know.)* That there are a range of electrical products that respond to changes in the environment. Know how different types of switch are operated and how they work. Evaluate products on design, manufacture, appearance and use. About key events and individuals relevant to the project. **Second order concepts:** *(What students should understand)* Evaluation Functionality Innovation	• **Skills** • Carry out thorough evaluations of existing products, considering how well they have been made, the materials chosen, whether they work, how they have been made and if they are fit for purpose. • Identify what the product has been made from and research and discuss how sustainable the materials are. • Evaluate how much products cost to make and how innovative they are. • Consider the impact of products beyond their intended purpose. **Key vocabulary/concepts:** https://20353.stem.org.uk/Nuffield%20Glossary2/index.html Evaluate, user, purpose, product, function, functionality, design decisions, innovation,	**Can your children:** Explore and discuss a range of products that respond to changes in the environment? Understand what products are, who they are for and what their intended purpose is. Understand how a range of switches are operated and how they work. Evaluate products on design, manufacture, appearance and use.	**Horizontal:** Spoken language – ask questions, formulate, articulate and justify answers, arguments and opinions; consider and evaluate different viewpoints. Computing – programming Science – Electrical circuits **Vertical:**

		research, control, input, output, switch, push-to-make switch, push-to-break switch, toggle switch,		

Suggested activities:		Resources:	Useful links:
Pupils explore and research a range of products with electrical components and consider how they might work. Discuss how many electrical products are monitored and controlled by computer systems which are embedded within them e.g. night lights, alarm systems, security lighting. Pupils consider e.g. *Who have the products been designed for and what is their purpose? How and why is a computer control program used to operate the products? What input devices e.g. switches, and output devices, e.g. bulbs, have been used?* Pupils could show their learning by writing algorithms for a chosen product using everyday language which explain how the electrical product might work. Pupils investigate electrical sensors such as light dependent resistors (LDRs) and a range of switches such as push-to-make, push-to-break, toggle, micro and reed switches. To develop pupils' understanding of how they are operated by the user and how they work, provide opportunity for children to use each component to control a bulb in a simple circuit. Remind children about the dangers of mains electricity. Children could research key events and famous inventors related to the project, e.g. Thomas Edison – light bulb. Pupils complete an evaluation of a chosen product(s).		Resources for web-based research, Existing electrical products Images and film clips of existing products in use that cannot be explored physically.	https://www.lancsngfl.ac.uk/curriculum/d_t/index.php?category_id=61&s=!B121cf29d70ec8a3d54a33343010cc2 https://www.bbc.co.uk/bitesize/topics/zq99q6f https://www.schoolsofkingedwardvi.co.uk/ks2-computing-computer-programming-4-algorithms/

2: Focused Tasks

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Pupils will have explored and researched a range of existing electrical products relevant to the project. They will understand what products are, who they	**Substantive knowledge:** *(What students should know.)* Understand and use electrical systems in their products. Apply their understanding of computing to program, monitor and control their products. Know and use technical vocabulary relevant to the project.	**Skills** • Know how to use learning from Science and maths to help design and make a wide range of products that work • how more complex electrical circuits and components can	**Can your children:** Build electrical systems to enable their product to work? Write programs to control a product?	**Horizontal:** Maths – carrying out accurate measurements (cm/mm) Science – Electrical circuits

			Test products and use problem solving skills when things go wrong.	Computing – programming – design, write and debug programs **Vertical:**
are made for and what their purpose is. Pupils will understand how a range of switches are operated and how they work. They will have evaluated products on design, manufacture, appearance and use. They will have researched famous inventors relevant to the project.		be used to create functional products • that mechanical and electrical systems have an input, process and output • Use a wide range of materials and components • Work safely, hygienically and accurately with a wide range of tools. • Accurately assemble, join and combine materials and components **Key vocabulary/concepts:** Series circuit, switch, input device, output device, system, monitor, control, program,		

Suggested activities:	Resources:	Useful links:
Share a design brief with the children, e.g. to make a bulb light remotely. Model and allow opportunity for pupils to construct electrical circuits required for the product. Model and allow opportunity for pupils to write programmes to control their electrical circuits. Explore writing different programmes to achieve different outcomes – to make the bulb flash repeatedly, to make the bulb light when it becomes dark, to make the bulb light in response to movement.	Relevant tools and equipment for making electrical systems e.g. batteries, crocodile leads, bulbs, bulb holders, range of switches, Computer control software, interface boxes/standalone boxes, connecting leads	

3: Designing				
Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:

Children will have an understanding of how electrical products are controlled or monitored. They will understand that programs are written to control or monitor electrical systems in order for them to work remotely. Children will have made simple electrical systems to meet a design brief and will have explored writing and testing programs to control or monitor their system.	**Substantive knowledge:** *(What students should know.)* That a design brief outlines what a user wants a product to be like. That research should be carried out to inform design ideas. That responses from research should be used to inform the design specification. Take account of the constraints of time, resources and cost.	**Skills** • Describe the purpose of their product and the features that will appeal to the user • Explain how particular parts of their product work • Gather information about the needs, wants, preferences and values of particular individuals and groups, carrying out surveys, questionnaires etc. • Develop a design specification for their design. • Draw on research, including surveys, research to generate innovative ideas • Model ideas through the use of prototypes and pattern pieces. • Communicate and represent ideas through exploded diagrams, annotated sketches, cross sectional drawing and computer based programmes (where appropriate) • Make design decisions taking into account constraints such as time, resources and cost • **Key vocabulary/concepts:** Design decisions, functionality, innovation, authentic, user, purpose, design specification, design brief, annotated drawings,	**Can your children:** Develop ideas about the product they are going to make based on the needs, wants, of the user. Communicate ideas through annotated sketches diagrams. Produce detailed step-by –step plans of how the product will be made including lists of tools, equipment and materials needed.	**Horizontal:** Science – Electrical circuits Computing – programming – Spoken language – participate in discussions to generate, develop and communicate ideas Art and Design – use drawings to develop and communicate ideas **Vertical:**

Suggested activities:		Resources:	Useful links:
Develop a design brief with the children which is authentic and meaningful e.g. the need for security lighting on a driveway. Pupils use research and discussion to generate innovative ideas for their product. Pupils work in groups to develop a design specification for the product, carefully considering the purpose and needs of their intended user. Pupils communicate ideas through annotated sketches, pictorial representations of electrical circuits or circuit diagrams. Pupils indicate their design ideas in their drawings, including the location of the electrical components and how they work as a system with an input, process and output. Pupils produce detailed step-by-step plans anddetailed lists of tools, equipment and materials needed.			

4: Making

Links to previous learning	Knowledge and second order concepts	Skills, Concepts and Vocabulary:	Assessment criteria:	Curricular links:
Pupils will have developed ideas based on the needs, wants, preferences and values of an intended user. They will have communicated ideas through drawings and diagrams. Pupils will have considered the stages of making and will have produced a step-by-step plan.	**(May need more than one lesson)** **Substantive knowledge:** *(What students should know.)* How to select and accurately assemble materials and securely connect electrical components. How to create and modify a computer control program to enable an electrical product to work automatically in response to changes in the environment. Continually evaluate and modify the working features of the product to match the design specification.	**Skills** • Use a wide range of materials and components • Work safely, hygienically and accurately with a wide range of tools. • Accurately measure, mark out, cut and shape materials and components demonstrating skills in using tools and equipment safely and accurately. • Accurately assemble, join and combine materials and components • Accurately apply a range of finishing techniques that	**Can your children:** Select and assemble materials and connect electrical components? Create a program to enable an electrical product to work automatically by responding to changes in the environment? Use problem solving skills when things go wrong? Evaluate ongoing work against the original design specification?	**Horizontal:** Maths – carrying out accurate measurements (cm/mm) Science – Electrical circuits Computing – programming – design, write and debug programs **Vertical:**

		involve a number of steps, including those learnt in Art • Demonstrate resourcefulness when tackling practical problems. **Key vocabulary/concepts:** Intended user, purpose, design criteria, design specification, design brief, series circuit, fault, connection, switch, battery, battery holder, bulb, bulb holder, crocodile clip, wire, program, control, sequence, selection, repetition, debug,		

Suggested activities:		**Resources:**	**Useful links:**	
Give pupils the opportunity to revisit their design plans and recap the order in which the products will be made. Pupils collect the materials and tools required for their circuits. Pupils use knowledge from previous lessons and from science to construct their circuits. Once constructed, pupils should test their circuits to identify any faults. Pupils use their knowledge and skills from previous lessons to identify where a fault is and to correct it before completing their product. Pupils create and modify their control program to enable their product to work automatically in response to changes in the environment. Pupils should use problem solving skills when things go wrong. Encourage children to critically evaluate their ongoing work against the original design specification. Pupils make changes to their products as they work to overcome any problems that arise or to make improvements. Pupils record and changes made on their plans.				

5: Evaluating –				
Links to previous learning	**Knowledge and second order concepts**	**Skills, Concepts and Vocabulary:**	**Assessment criteria:**	**Curricular links:**
Children will have generated and developed ideas for their product. They will	**Substantive knowledge:** *(What students should know.)*	• **Skills** • Use their design criteria to critically evaluate their product in terms of quality of	**Can your children:** Use their design criteria to critically evaluate their product in terms	**Horizontal:** Spoken language – as questions, formulate, articulate and justify

have explored different electrical products and designed a product with an intended purpose for an intended user. They will have chosen techniques to make and finish their product. They will have evaluated their evolving work and overcome problems using problems solving skills.	That evaluations identify the strengths and areas for development in terms of quality of design, manufacture and whether it is fit for purpose. That products should be tested by the intended user. That products are continually developing through evaluating and identifying improvements. That views from the user should be considered when identifying areas for improvement **Second order concepts:** *(What students should understand)* Evaluate Develop Evolve Innovative	design, manufacture and whether is it fit for its intended purpose. • Consider the views of others, including intended users, to improve their work. **Key vocabulary/concepts:** Evaluate, design criteria, design brief, innovative, user, purpose, authentic, innovative, function, product, ideas, appeal, finish, improve	of quality of design, manufacture and whether it is fit for the intended purpose? Consider the views of others when evaluating their work and identifying improvements that could be made.	answers, arguments and opinions; consider and evaluate different viewpoints **Vertical:**

Suggested activities:		**Resources:**	**Useful links:**
Pupils evaluate their final products, comparing it to the original design specification. They should critically evaluate the quality of design, the manufacture, functionality, innovation and fitness for the intended user and for purpose. against the design criteria. They consider the extent to which the product meets the needs of the intended user and suits the intended purpose. *Does the product suit the purpose? Does it suit the intended user? Are the materials suitable for the product? How well has the product been made? How well has it been finished? Could the product have been made more appealing?* Where possible allow feedback from the intended user. Pupils complete an evaluation for their own product.		Final products Evaluation resources	