

Electricity's 'Current War'

PHYSICS

Overview and rationale:

Building on their knowledge and understanding of electricity in Year 4, our Year 6 professors delve deeper into how electricity works. Benjamin Franklin is often described as the discoverer of Electricity through his kite experiment, but the Tesla v Edison war, whilst throwing in the contributions of Faraday, make for a fascinating competition! This fascination draws our children into how incredible a source of energy electricity is. Although they use similar circuitry and equipment as they did in Year 4, the children here use and apply their knowledge to think more critically about how they can alter their electrical circuits and the impact that these changes will have. Their understanding of electrical symbols and vocabulary becomes far greater as they make observations and ask critical questions about how circuits work and the impact that varying voltages can have on buzzers, bulbs and motors.

SCIENCE LEARNING STATEMENTS

Area of Learning	Knowledge and Skills
Scientific Enquiry and applying knowledge in context	I can use my science experience to explore ideas and raise relevant questions of different kinds.
	I talk about how different scientific ideas have developed over time giving specific examples.
	I select and plan the most appropriate type of scientific enquiry I might use to answer questions and give justifications.
	I recognise when and how to set up comparative and fair tests. I explain which variables need to be controlled and why.
	I use and develop more complex keys and other information records to identify, classify and describe living things and materials. Identify patterns that might be found in natural environments
	I can recognise which secondary sources will be most useful to research my ideas; separate opinion from fact and give justifications for their reasoning
	I make their own decisions about what observations to make, what measurements to use and how long to make them for.
	I can look for causal relationships in my data and identify evidence that refutes or supports my ideas.
	I choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. I can take repeat measurements where appropriate and give justifications for their choice.
	I can decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs, use multiple methods where appropriate.
	I can identify scientific evidence that has been used to support or refute ideas or arguments, begin to form opinions about validity of these.

NATIONAL CURRICULUM OBJECTIVES

1. associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
2. compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
3. use recognised symbols when representing a simple circuit in a diagram

KEY VOCABULARY

circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage, conductor, insulator, Franklin, Edison, Tesla, Faraday (NB Children do not need to understand what voltage is but will use volts and voltage to describe different batteries. The words cells and batteries are now used interchangeably)

'CORE' KNOWLEDGE	'ADDITIONAL' KNOWLEDGE
1) I know four key scientists that helped to discover how electricity worked – Franklin, Faraday, Edison and Tesla.	a) I know that Franklin's kite experiment in 1752 helped him to discover that electricity had a positive and negative charge.
	b) I know that both Edison and Tesla were great scientists who invented different electrical currents, Edison became much more famous because he was better at marketing his inventions!
1) I can explain how an electrical circuit operates - that electrons flow in one direction around the circuit.	a) I know that cells and batteries have positive and negative terminals and must be placed correctly in order for electricity to flow.
	b) I know that all components of a circuit need to be connected for the circuit to be complete.
	c) I know what series and parallel circuits are and that parallel circuits have more than one route to follow.
2) I can recognise circuit symbols and draw simple circuit diagrams.	a) I can draw circuit diagrams from verbal prompts.
	b) I can draw the corresponding circuit diagram from a physical circuit which I have made.
	c) I can say from a circuit diagram whether the circuit will work or not and why.
3) I know that a cell is 1.5v and a battery is 3v or more. PLAN: ASK QUESTIONS AND PLAN ENQUIRY: Bulb brightness	a) I know that adding more cells or a higher voltage battery will make a bulb brighter, motor spin faster, etc.
	b) I know that adding too much power can cause breaks within components, thus affecting the circuit.
	c) I know that we use a voltmeter to measure and record the current within a circuit – and I can use one!
4) I know that a break in a circuit will prevent the electrical current from flowing.	a) I know that components can be in any place within a circuit and all still work if connected correctly.
	b) I know that breaks in a circuit can be deliberate and useful such as switches, timers, alarms and pressure pads (traffic lights).
	c) I can suggest ways of fixing circuits.
5) I know that complete electrical circuits make something happen such as: light, sound, heat and movement.	a) I can design and make a circuit to solve a particular problem e.g. burglar alarm – and explain how.
	b) I can explain (following my investigations) how adding or removing components effects a circuit.
	c) I know how circuits are used in everyday life.
6) I understand the importance of insulators and conductors to be safe around electricity. DO: OBSERVE AND MEASURE: Conductive dough	a) I can list insulators and their properties, making suggestions as to which are appropriate for use in circuits and why.
	b) I understand water is a conductor and is extremely dangerous around electricity.
	c) I understand the need for safety outside of school e.g. in the home, being around pylons, substations, train and tram lines.

Possible 'higher order' questioning	
Remember	Can you name the essential components of an electrical circuit?
Understand	Why will a circuit be less bright of you add more bulbs?
Apply	Why do some switches have more than one setting?
Analyse	Adding more buzzers to a circuit weakens the sound. What can you infer from this?
Evaluate	What would be the impact of adding more cells and more wires to a circuit? Would these cancel each other out?
Create	Can you design an electrical circuit for your kitchen at home?

School Value	Topic relevance: How/when/where/why is it needed?
Respect	- We must respect planet Earth and save energy wherever we can.
Responsibility	- Electricity is a form of energy, which should be saved. The less energy we use, the better it is for the environment. We have a responsibility to look after our world and therefore, turning off lights, the TV, etc, makes a big difference when all added together.

DESIGN AND TECHNOLOGY

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
Developing, planning and communicating ideas			
• *Use research and develop design criteria to inform the design of innovative, functional, appealing products that are fit for purpose, aimed at particular individuals or groups* • *Generate, develop, model and communicate their ideas through discussion, annotated sketches and computer-aided design.*	• Communicate their ideas through detailed labelled drawings. • Develop a design specification. • Explore, develop and communicate parts of their design by modelling their ideas. • Plan the order of their work, choosing appropriate materials, tools and techniques. • If relevant, apply their understanding of computing to program, monitor and control their products, aimed towards their audience.	• Know what a prototype is. • Know how to use Computer Aided Design to make a 2D or 3D design.	key audience, designing, enterprise product, target group, product, design criteria, research, prototype, diagrams, process, Computer Aided Design, 2D designs, 3D designs
Working with tools, materials and components to make products			
• *Select from and use a wider range of tools and equipment to perform practical tasks [for example, cutting, shaping, joining and finishing], accurately* • *Select from and use a wider range of materials and components, including construction materials, textiles and ingredients, according to their functional properties and aesthetic qualities*	• Confidently select appropriate tools, materials, components and techniques. • Assemble components to make working models. • Use tools safely and accurately. • Construct products using permanent joining techniques. • Make modifications as they go along. • Aim to make and to achieve a quality product.	• Know how to consider functional and aesthetic properties. • Know how to use tools safely. • Know which joining techniques are best and provide permanence.	designs, investigate, investigations, tools, components, functional, aesthetic properties
Evaluating processes and products			
• *Investigate and analyse a range of existing products* • *Evaluate their ideas and products against their own design criteria and consider the views of others to improve their work* • *Understand how key events and individuals in design and technology have helped shape the world*	• Evaluate their products, identifying strengths and areas for future development. • Carry out appropriate tests. • Evaluate their product against the original design specification. • Disassemble and evaluate existing products. • Evaluate against their original criteria and suggest ways that their product could be improved. • Evaluate their work both during and at the end of the assignment. • Record their evaluations using drawings with labels	• Know what design specifications are. • Know that we can evaluate success by looking at original design specifications. • Know that seeking evaluation from others can help improve a product next time. • Know that evaluating during an assignment means that it can be improved as we go. • Know that disassembling a product means you can see strengths and things to improve in more detail.	decorative techniques, project, finishing techniques, triangulation, strength, evaluate, critically, improve, suggestions, design criteria/target group
Electrical systems			
• Understand and use electrical systems in their products [for example, series circuits incorporating switches, bulbs, buzzers and motors].	• I can create circuits using electronics kits that employ a number of components with increasing confidence. • I can control outputs such as motors. • I can apply computing and use of electronics to embed intelligence in products that respond to inputs.	• I know a variety of output devices e.g. motors, bulbs etc. and can explain what they do. • I know that it is important to plan out a design first, before creating it. • I know how to use simple algorithms to control outputs.	Bulb, bulb holder, battery, battery holder, USB cable, wire, insulator, conductor, crocodile clip control, program, system, input device, output device, series circuit, parallel circuit
Project			
Electrical circuits – the current war!			

MUSIC

Controlling sounds through Singing

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
- Pupils should be taught to play and perform in solo and ensemble contexts, using their voices and playing musical instruments with increasing, fluency, control and expression - Maintain harmony in a song, singing confidently and accurately.	- Sing an individual role in a group performance, from memory or by reading notation, singing solos, accompaniments or directing a group. - Evaluate different types of singing from different cultures and heritages and discuss their preferences. - Sing in unison and two parts. - Demonstrate a good singing posture. - Follow a leader when singing. - Listen to each other and be aware of how you fit into the group. - Sing with awareness of being 'in tune'.	- Know and confidently sing 5 songs (over the year group) and their parts from memory, and to sing them with a strong internal pulse. - Know about the style of the songs so you can represent the feeling and context to your audience - Choose a song and be able to talk about: *Its main features *Singing in unison, the solo, lead vocal, backing vocals or rapping taking place *What the song is about and the meaning of the lyrics - Know and explain the importance of warming up your voice	Notation, directing, harmony (singing higher or lower than the main melody), clear diction, pulse, vocals, posture, conductor, rounds, clarity of projection, musical theatre, semitones, chromatic scale, syncopation

Controlling sounds by Playing (and Performing)

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
- Play and perform in solo and ensemble contexts, playing musical instruments with increasing accuracy, fluency, control and expression. - Play and perform music across a range of historical periods, genres, styles and traditions, glockenspiels and keyboards - Play parts from memory - Take the lead in a performance	- Play a musical instrument with the correct technique within the context of the song. - Rehearse and perform their part within the context of the song. - Listen to and follow musical instructions from a leader. - Communicate the meaning of the words and clearly articulate them. - Record the performance and compare it to a previous performance. - Discuss and talk musically about it – "What went well?" and "It would have been even better if…?" - Maintain own part in a two part songs, play accurately with awareness of what others are playing. - Improvise using 5 notes of the pentatonic scale.	- Know and be able to talk about: *Different ways of writing music down – e.g. staff notation, symbols *The notes C, D, E, F, G, A, B + C on the treble stave *The instruments they might play or be played in a band or orchestra or by their friends *Performing is sharing music with an audience *Everything that will be performed must be planned and learned and is different for each occasion *How you must sing or rap the words clearly and play with confidence *How a performance can be a special occasion and involve an audience including of people you don't know *A performance involves communicating ideas, thoughts and feelings about the song/music	Names of notes being played, names of instruments being played, quaver, crochet, minim, semibreve, rest, constructively appraise, musical theatre, semitones, chromatic scale, syncopation, pentatonic scale

Creating and developing musical ideas (Improvisation and Composing)

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
- Use musical notations. - Use a variety of different musical devices in composition (including melody, rhythms and chords).	- Create simple melodies using up to five different notes and simple rhythms that work musically with the style of the song. - Listen to and reflect upon the developing composition and make musical decisions about how the melody connects with the song. - Record the composition in any way appropriate that recognises the connection between sound and symbol (e.g. graphic/pictorial notation). - Compose and perform melodies using five or more notes. - Show confidence, thoughtfulness and imagination in selecting sounds and structures to convey an idea.	Know and be able to talk about: *Improvisation - is making up your own tunes on the spot. When someone improvises, they make up their own tune that has never been heard before. It is not written down and belongs to them. - Know that using one, two or three notes confidently is better than using five - Know that if you improvise using the notes you are given, you cannot make a mistake - Know three well-known improvising musicians - Know and be able to talk about: *A composition: music that is created by you and kept in some way. It's like writing a story. It can be played or performed again to your friends. *A composition has pulse, rhythm and pitch that work together and are shaped by tempo, dynamics, texture and structure -Notation: recognise the connection between sound and symbol -Create music reflecting given intentions and record using standard notation.	Names of notes being played, names of instruments being played, quaver, crochet, minim, semibreve, rest, improvisation, composition, tempo, dynamics, timbre, texture, pulse, rhythm, combinations, pitch, layering sounds, musical elements, interrelated dimensions of music, pentatonic scale Notation: pause, rest symbol, pentatonic scale, five notes, group of notes, accompanying notes

Responding and reviewing (Appraising)

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
- Appreciate and understand a wide range of high-quality live and recorded music drawn from different traditions and from great composers and musicians - Accurately recall a part of the music listened to. - The historical context of the songs. What else was going on at this time, musically and historically? - Evaluate how the venue, occasion and purpose affects the way a piece of music is created.	- Identify and move to the pulse with ease. - Think about the message of songs. - Compare two songs in the same style, talking about what stands out musically in each of them, their similarities and differences. - Listen carefully and respectfully to other people's thoughts about the music. - Use musical vocabulary confidently to describe music. - Talk about the musical dimensions working together in the songs. - Talk about the music and how it makes you feel, using musical language to describe the music. - Work out how harmonies are used. - Use the knowledge of how lyrics reflect cultural context and have social meaning to enhance own compositions. - Refine and improve own/others' work.	- Know five songs from memory (across the year), who sang or wrote them, when they were written and why? - Know the style of the songs and name other songs in those styles. - Choose three or four other songs and be able to talk about: *The style indicators of the songs (musical characteristics that give the songs their style) *The lyrics: what the songs are about *Any musical dimensions featured in the songs and where they are used (texture, dynamics, tempo, rhythm, pitch and timbre) *Identify the structure of the songs (intro, verse, chorus etc.) *Name some of the instruments used in the songs - Know and talk about that fact that we each have a musical Identity - Know how the other musical dimensions are sprinkled through songs and pieces of music.	Musical dimensions, duration, timbre, pitch, dynamics, tempo, texture, structure, rhythm, melody, harmony, staccato, legato, crescendo, diminuendo, musical arrangements, percussion, repeating refrain, musical theatre, semitones, chromatic scale, syncopation

Listening and applying knowledge and understanding (Theory)

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
- Use and understand musical notations - Develop an understanding of the history of music - Listen to, review and evaluate music across a range of historical periods, genres, styles and traditions, including the works of the great composers and musicians - Compare and contrast the impact that different composers from different times have had on people of that time. - Analyse features within different pieces of music	- Copy back rhythms based on the words of the main song, that include syncopation/off beat - Lead the class by inventing rhythms for others to copy back - Use increased aural memory to recall sounds accurately.	- Know and be able to talk about: *How pulse, rhythm, pitch, tempo, dynamics, texture and structure work together to create a song or music *How to keep the internal pulse - Musical Leadership: create musical ideas for the group to copy or respond to - Use knowledge of musical dimensions to know how to best combine them. - Describe different purposes of music in history/other cultures.	Compare contrast names of famous composers, leadership, copy, respond, analyse, syncopated patterns, notation, musical dimensions, duration, timbre, pitch, dynamics, tempo, texture, structure, rhythm, melody, harmony, staccato, legato, crescendo, diminuendo, musical arrangements, repeating refrain, musical theatre, semitones, chromatic scale, syncopation

Composers/Musicians/Artists/Styles | ***Switching it on (Sing Up)*** | **Genre of the half term – *TBC***