Resources to support learning about safety with electricity, sources of electricity, circuits, conductivity and block coding basics.

Scootle (Education Services Australia materials)

www.scootle.edu.au

Scootle (free for all Australian teachers) has many Science and Technologies resources, including teaching notes about electricity (Yr 6), light (Yr 5) and motion/forces (Yr 4)

Get the most appropriate resources by going to :

→ www.scootle.edu.au
→ browse by Australian Curriculum
→ Science → (filter for Year level)
→ Physical Science elaborations and matching resources.

For example, at www.scootle.edu.au Learning Paths add keyword 'circuits'
there are 41 results for Learning Paths (tagged resources) that teachers have already put together.

Enter the Resource package code (e.g. R10726) or the individual resource codes(e.g. L3059) into a Scootle search to locate the materials.

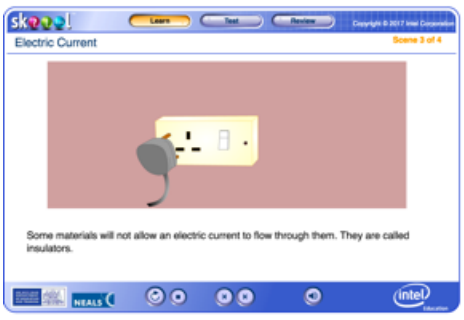
Below are two examples of 'teacher resource package' resources. There are many others.

Circuits - upper primary – R10726, teachers (suggested **Year levels** 5; 6; 7)

Interactive learning objects enable students to build and manipulate simple series and parallel electric circuits. Students investigate how current flows, effects ...etc.

Types of circuit

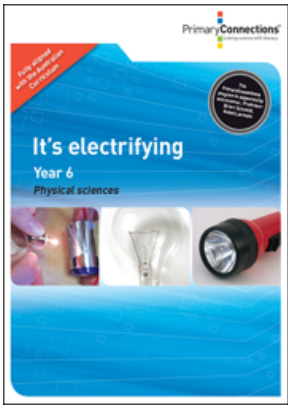
- L3059 Wiring: the series circuit
- L3055 Electrifying concert
- L3060 Wiring: the parallel circuit
- L3058 Wiring: the simple circuit



Circuit applications

- R8443 An etched semiconductor wafer
- R8449 Internal wires of a solar panel
- R8472 A silicon wafer
- R8450 Random Access Memory (RAM) chip
- R8447 Printed circuit assembly

Primary Connections: It's electrifying – S7155



This comprehensive **teacher resource** explores the role of electrons in transferring energy in electric circuits through a series of collaborative inquiry-based learning activities. Investigations of batteries, light bulbs, switches, conductors and insulators develop an understanding of how battery-operated devices, such as a torch, work.

Eight structured lessons are included, with comprehensive lesson plans, student handouts and additional teaching support material. The unit is based on the **5Es learning model** for teaching science. It focuses on literacy and numeracy to support learning in these areas and assessment strategies relevant to various stages of the teaching unit. The resource is part of a complete F-6 series.

Examples of relevant Scootle interactives

Conductivity – L7560

Test the electrical conductivity of four different materials by connecting them to an electric circuit. Insert the first material into the contact point to complete the circuit. Then observe the light bulb to see whether the material has acted as an electrical conductor and lighted the bulb. Record your results in a data table. Repeat the process for all four materials – glass, wood, copper and plastic. Use the data you collect to answer the conclusion questions.

Electric Current –M016385

Students use this resource consisting of four slides with diagrams, written explanation and voice-over to understand that current is the flow of electricity around a circuit and that the greater the resistance of the circuit, the less current flows. There is a two-question quiz and a summary slide.

Syllabus bites: Electricity – M015290

This resource is designed to support science teachers in addressing concepts in electricity in the BOS NSW Syllabus for the Australian Curriculum in Science - Stage 3. Making decisions about the use of electricity is approached from an understanding of circuits, sources and sustainability.

Conductors and insulators in circuits – L7578

Test different materials for electrical conductivity using an electric circuit. Insert each of the four materials into the contact point in turn. Determine which materials are electrical conductors by noting which ones make the light globe glow. Record data for each material. Summarise findings by answering the conclusion questions.

Wiring: the series circuit – L3059

Investigate current flow in series electrical circuits. Explore the effects of switches and breaks in the circuit. Relate circuit diagrams to actual circuits. See how circuits can be modelled by water flow. This learning object is one in a series of three objects.

Wiring: the parallel circuit – L3060

Add components to complete parallel electrical circuits. Explore the effects of switches on current flows. Relate circuit diagrams to actual circuits. See how circuits can be modelled by water flow. This learning object is one in a series of three objects.

Electrifying concert – L3055

Set up wiring and stage lighting for a rock band. Add components to complete electrical circuits: simple, series and parallel circuits. Explore the effects of batteries and switches on current flows. Relate circuit diagrams to actual circuits. Test the direction that light rays travel. Assemble a spotlight and position its parts to create a range of lighting effects. This learning object is a combination of two objects in the same series.

Other websites with interactives

Interactive Sites for Education

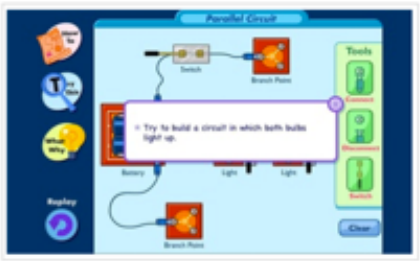
http://interactivesites.weebly.com/electricity-and-energy.html

Conductors and insulators interactive

http://www.5thgradescience.org/conductors-and-insulators.html

BBC BiteSize – Types of circuits

http://www.bbc.co.uk/education/guides/zddp34j/revision/2



Conductors/insulators Interactive Horizon Power (Australia)

http://hdz.horizonpower.com.au/electricity-all-around-us/conductors-insulators.html

Interactive learning guide

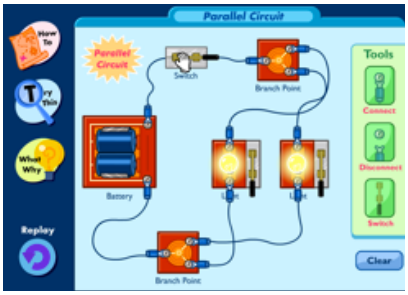
http://learnelectricity.ausgrid.com.au/Common/Interactive-learning.aspx

Requires Java. Most computers have this.

Kids electronic clubs UK

https://electronicsclub.info/seriesparallel.htm

Teacher resources on the web



Energy and Change – by the Curriculum Corporation (Australian Government)

Professional Learning resources. Student and teacher notes. Topics for Energy, Light and Electricity. Includes assessment resources. Published 2003 – but still relevant.

http://www1.curriculum.edu.au/sciencepd/index.htm

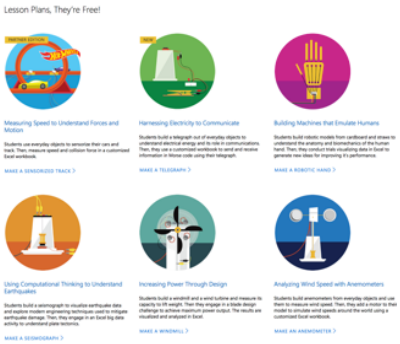
Horizon Power electrical safety and other aspects website for kids

http://hdz.horizonpower.com.au/electrical-safety.html

Sustainability, environment, batteries (Yr 7-8)

http://learnelectricity.ausgrid.com.au/Common/For-Students-in-Years-7-and-8/Batteries-and-moving-charges.aspx

Support for design projects



Practical design and technology lessons

https://www.microsoft.com/en-us/education/education-workshop/default.aspx

Find a cut-out solar house template and lesson here:

https://www.microsoft.com/en-us/education/education-workshop/activity-library.aspx

Microsoft Morse Code activity

https://www.microsoft.com/en-us/education/education-workshop/telegraph.aspx

YouTube videos

Power Plugs

https://www.youtube.com/watch?v=Pr9YntO7V1U

(and about how circuits work))

Western Power – community and household

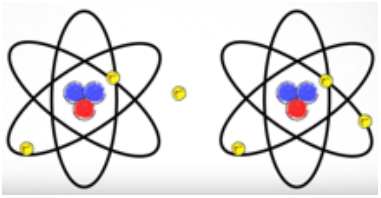
https://www.youtube.com/watch?v=BzwmEYFDIos

Napo: Shocking Situations

Claymation - animated, quite long but a very good range of safety issues covered
https://www.youtube.com/watch?v=2N7fOYZYx2g

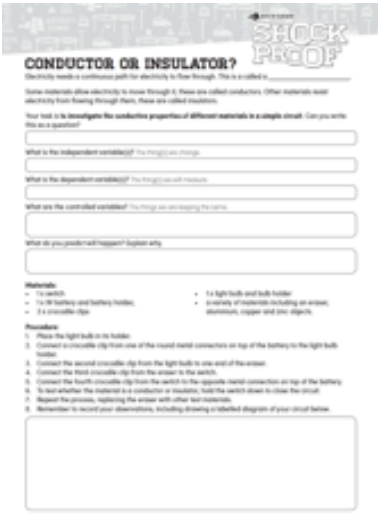
Short stories depict the confrontation between Napo and various electrical hazards, and the longer stories involve the organisation of work and working relationships. The hazard is played by a small figure drawn by an electric arc in electric blue colour. The film is designed to illustrate some of the issues, to promote discussion and to lead to safer working practices.

Energy generation and transfer to the community



https://www.youtube.com/watch?v=20Vb6hlLQSg

Good explanation of energy generation and transfer but has US references, eg. 11v power outlets and NA electricity grid. That could make an interesting teaching point though.



What is Electricity?

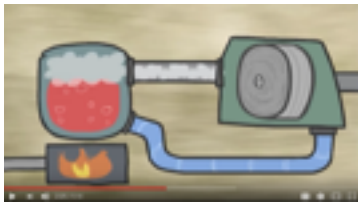
https://www.youtube.com/watch?v=oB1v-wh7EGU

https://www.youtube.com/watch?v=DZxDz2UUkh4

Both of these are quick and simple explanations of atoms and electrons and basic circuits. Students may be interested to know the relevance of the "Electra" character in the Student Diary, although solid understanding of atomic level concepts is not required by the syllabus for this age group.

Western Power Outreach programs

https://www.westernpower.com.au/community/our-education-program/



Circuit Breakers: Shock Proof and other teacher resources and lesson plans PP, 1-2, 3-4, 5-6 (includes printables and PLAY SAFE video for juniors).

Electricity is part of our everyday lives - and it's easy to become complacent around it. But electricity is by its very nature hazardous. The program captures four key concepts:

- Understanding how electricity works
- The dangers of electricity
- How to stay safe around electricity
- Raising awareness of Western Power's network

Endeavour Energy (Australia) – outreach resources

Poster and lesson plans

http://www.electrickids.com.au/wps/wcm/connect/electrickids/electrickids/home/home

APPS for iPADs

Exploriments Electricity: Simple Electrical Circuits in Series, Parallel and Combination

By IL&FS Education and Technology Services Ltd. $2.99

https://itunes.apple.com/au/app/exploriments-electricity-simple-electrical-circuits/id490164401?mt=8

Exploriments has a whole range of apps (various prices)

Building Parallel Circuits – LITE (Adaptive Curriculum)

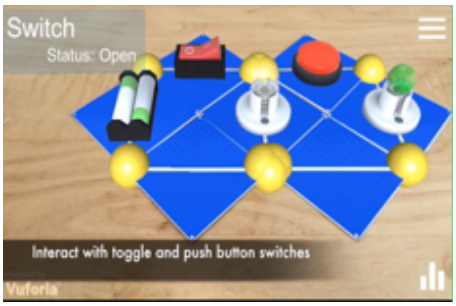
Free

https://itunes.apple.com/us/app/building-parallel-circuits-lite/id464587017?mt=8

Using 3D graphics and 2D electronic symbols, you will build simple parallel circuits by using wires, batteries, switches, and light bulbs. By constructing their own closed circuit with two light bulbs, you will develop a deeper understanding of series and parallel circuits and discover that electricity follows the path of least resistance.

AR Circuits – Augmented Reality

Explorental $1.49
Build circuits using augmented reality components!!

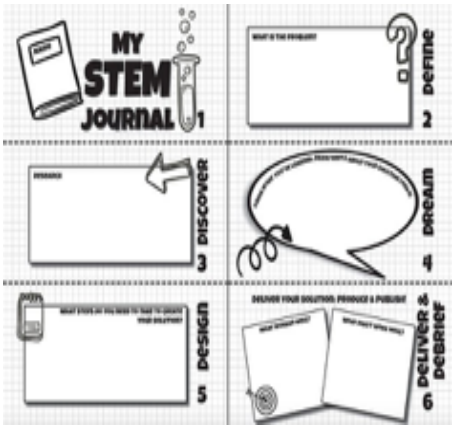


https://itunes.apple.com/au/app/ar-circuits-augmented-reality-electric-circuit-kit/id1078510835?mt=8

You need to print the launch trigger pictures for the AR parts at http://arcircuits.com/

Useful tools

STEM journal (print PDF, free)



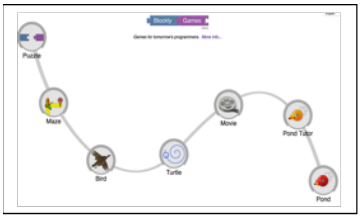
https://globaldigitalcitizen.org/wp-content/uploads/2016/11/6D-STEM-Journal.pdf

QR code scanners

(many free apps available)

QR codes are used in the Student workbook, intended for use students with smart phones or tablets.

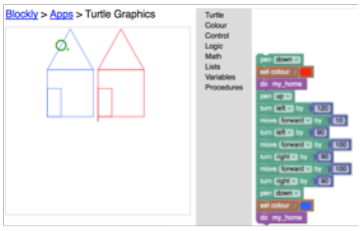
Developing and understanding coding skills



Blockly Games

Familiarisation with Block coding

https://blockly-games.appspot.com/



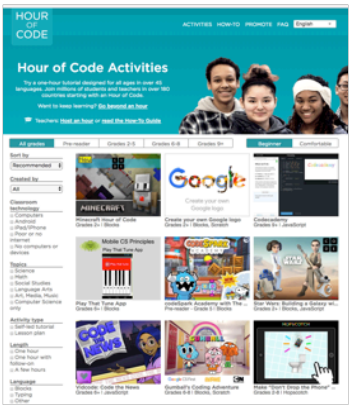
Turtle Graphics (Logo language)

Block coding for 2D picture drawing

https://blockly-games.appspot.com/turtle

and used in the student workbook activity for introducing procedures:

https://beagleboard.org/static/blockly/apps/turtle/en.html



Hour of Code

Many online coding games, filterable by grade, device type, topic, activity type, code type.

https://hourofcode.com/au/learn

Teacher lesson plans and unplugged activities, especially good for teaching computational thinking

https://studio.code.org/courses?view=teacher

Digital Technologies Hub (Australian)

Very good explanation of terms and concepts, activities and case studies

https://www.digitaltechnologieshub.edu.au/

Lesson plans and projects for students

https://www.digitaltechnologieshub.edu.au/teachers/scope-and-sequence/5-6

CSER Fundamentals P-6 (Australian)

An excellent, free, certificated, accredited online course for developing understanding of Digital Technologies concepts (P-10, various courses). Join the online community for teaching ideas!

https://csermoocs.adelaide.edu.au/moocs/

Next steps…

Once students have used a very ‘visible’ system and done some deeper thinking about the basic concepts of coding, electronics and system design, then they will have a much better understanding of ‘how things work’ and be ready to engage fully with smaller format circuit boards and control systems.

Here are just a few popular examples of education products on the market.
(information edited from www.edtechs.com.au)

Hummingbird

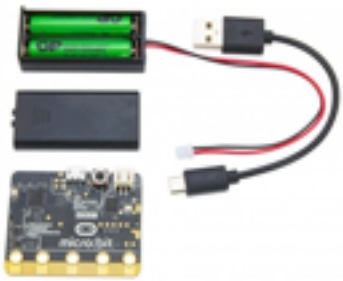
The Hummingbird Robotics Kit is designed to enable engineering and robotics activities that involve the making of robots, kinetic sculptures, and animatronics built out of a combination of kit parts and crafting materials. Combine it with software environments like Scratch, Snap!, and the CREATE Lab Visual Programmer. Components such as motors, sensors and lights need to be bought separately.

Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

BBC micro:bit GO

This is a pocket-sized codeable computer with motion detection, a built-in compass, LED display, and Bluetooth technology built in. It is available in a range of colours, and designed to be fun and easy to use. It can be coded with something simple in seconds – like lighting up its LEDs or displaying a pattern – and also connects to other devices, sensors, kits and objects, and is a companion to Arduino, Galileo, Kano, littleBits and Raspberry Pi, acting as a spring board to more complex learning. Each element is completely programmable via easy-to-use software.



Raspberry Pi

The Raspberry Pi is a fantastic starting point for the development of the Internet of Things (IoT) projects. The low cost and 'plug and play' nature of Pi makes for a board that is accessible to all and has numerous connectivity options. Pi is the perfect experimental tool. Linux-based operating systems run on the Pi with plenty of access to free software and downloads. There is a Pi community – DesignSpark.