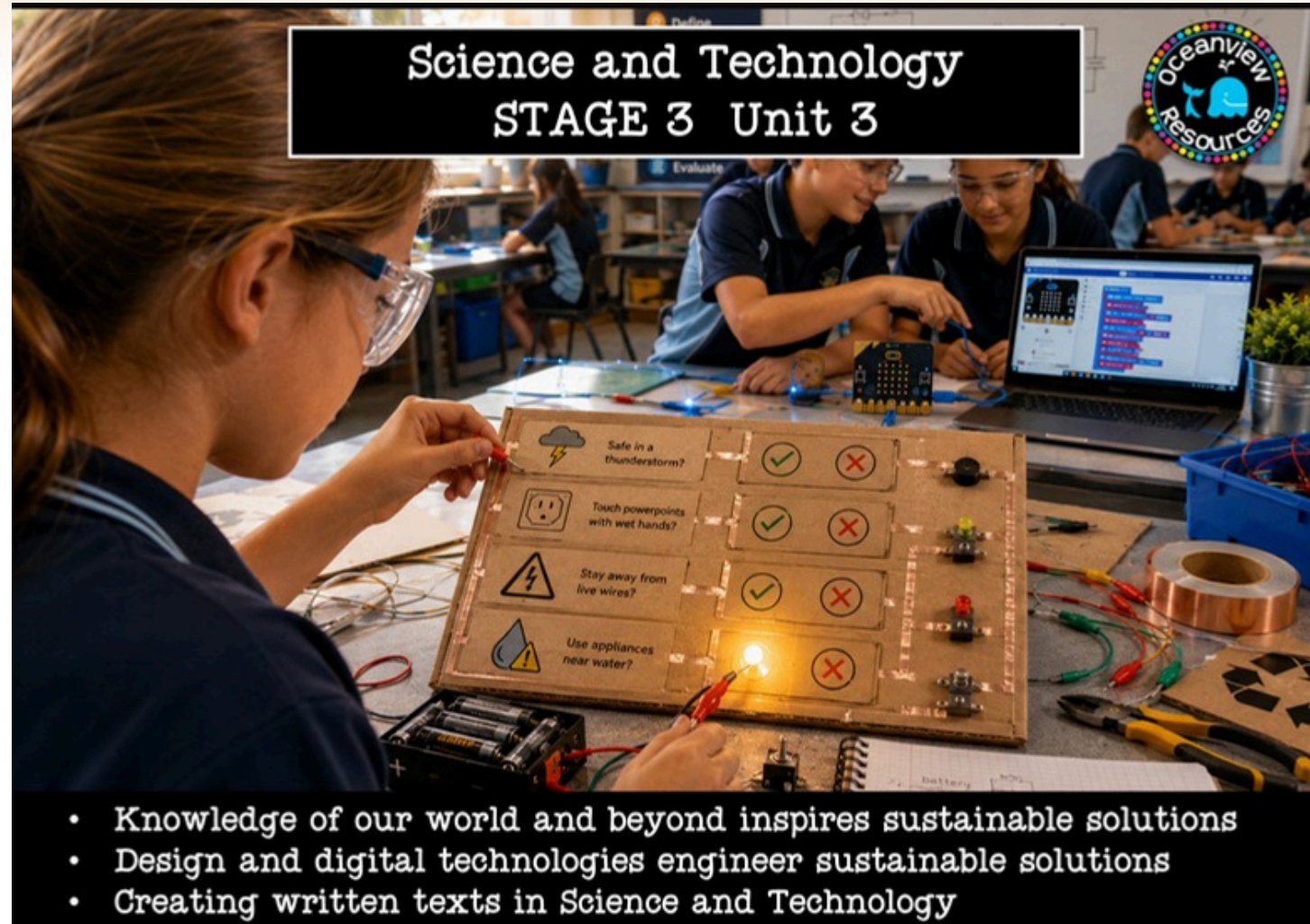


STAGE 3 UNIT 3 SCIENCE

What is included?

- PowerPoint with over 410 slides
- Student workbook and assessment tasks
- PDF for easy printing
- Teaching notes under each slide



❑ Aligned to the NSW Sample units for Science 2025.

STAGE 3 UNIT 3 SCIENCE

What is included?

- Quick links to units.
- Sections for each lesson included in the PowerPoint presentation.
- Self Assessment tasks.

Lesson 1: 2-3 Electrical Energy

Electrical Energy

Electrical energy is a form of energy that can be transferred from a source and transformed into other forms such as light, heat, sound or movement but cannot be created or destroyed. A battery is an example of an energy source. Batteries store chemical energy, which is transformed into electrical energy.




Vocabulary	Definition
energy source	Where energy comes from.
transfer	Energy moving from one place to another.
transform	Energy changing from one form to another.

Take Notes of Your Observations

1 Use notetaking
Write short phrases or key words to record what you observe.
• Do not write long sentences.
• Use dot points or key phrases.

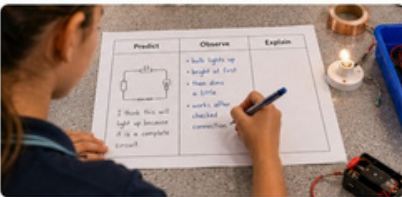
If it works:
• bulb lights up

If it does not work:
• does not work
• works after checked connection with bulb
• bulb got hot

2 Try different arrangements
• Try changing your circuit.
• Keep trying until the light bulb lights up.
• Make sure your circuit is a closed loop.

Record your observations
Write down the points and key phrases from the 'Observe' section. Write clear notes of what happens. Notes should be easy to read and later.

Handle equipment with care. Never connect the positive terminals directly. Report any broken or warm components immediately.

Lesson 1: 1 Electrical Energy

Duration: 40 minutes

Note: energy is the capacity to do work. It exists in different forms (electrical, light, heat, sound, movement) and can be transferred (passed from one object or place to another) and transformed (changed from one form of energy to another) but not created or destroyed. In prior stages, students have explored light, heat and sound energy. In this learning sequence, students explore the transfer and transformation of electrical energy.



What types of energy do you already know?

STAGE 3 UNIT 3 SCIENCE

Lesson 1: 27-29

Electrical Energy

What did the successful arrangements have in common?

- ☐ Which arrangements of battery, light bulb and wires made the light bulb light up?
- ☐ What was the same or similar about the arrangements that worked?
- ☐ What was the same or similar about the arrangements that didn't work?
- ☐ What does each component of the arrangement do?



Figure 1-2 - closed circuits

'closed circuit' - a complete, unbroken path that allows electrical energy to flow and the light bulb to glow.

'open circuit' - a circuit with a break in the path that prevents electrical energy from flowing and the light bulb from glowing.

Lesson 2: 7-8

Explaining Electrical Circuits



Using the simulation, highlighting...

- ☐ Model an open (incomplete) circuit by introducing a break in the pathway.

Electrical energy cannot flow, so the light bulb does not glow.

Check for understanding of energy transfer by building circuits in the simulation and asking students to indicate whether they are open or closed using hand signals.

An open hand indicating an open/incomplete circuit and a closed fist indicating a closed/complete circuit. Invite selected students to justify their responses.

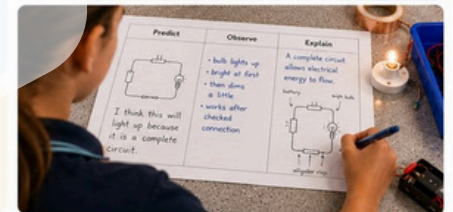
Let's Explain What We Learned



- 1 **Reflect on your learning**
Revisit the learning intentions and success criteria.
Think about what you have learned and how it connects.



- 2 **Summarise key learning**
Today we learnt:
 - A complete circuit is needed for electrical energy to flow.
 - Electrical energy transfers into light and heat.
 - Electrical energy is not transferred or transformed if the circuit is incomplete, the light bulb does not glow.



Explain your results

Complete the 'Explain' section of your Predict, Observe, Explain template. Include one or more labelled drawings of successful arrangements.

Reminder: Your template will be collected for the optional assessment.

Remember: Handle equipment with care. Never connect the positive and negative terminals directly. Report any broken or warm components immediately.



Name: _____

Date: _____

I Notice, I Think, I Learned

Think about the electrical circuits you explored in the simulation. Complete each part to reflect on your learning.



I Notice ...

What happened when we changed or connected parts of the circuit in the simulation?



I Think ...

What do you think this shows about how electricity flows?

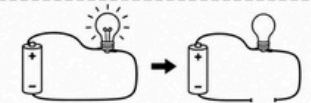


I Learned ...

What is the key idea about what a circuit needs to work?

Example
(think-aloud)

'I notice that when one wire is not connected in the simulation, the bulb does not light up. I think this shows that electricity cannot flow when there is a break in the circuit. I learned that an open circuit does not allow electricity to move because the path is not complete.'

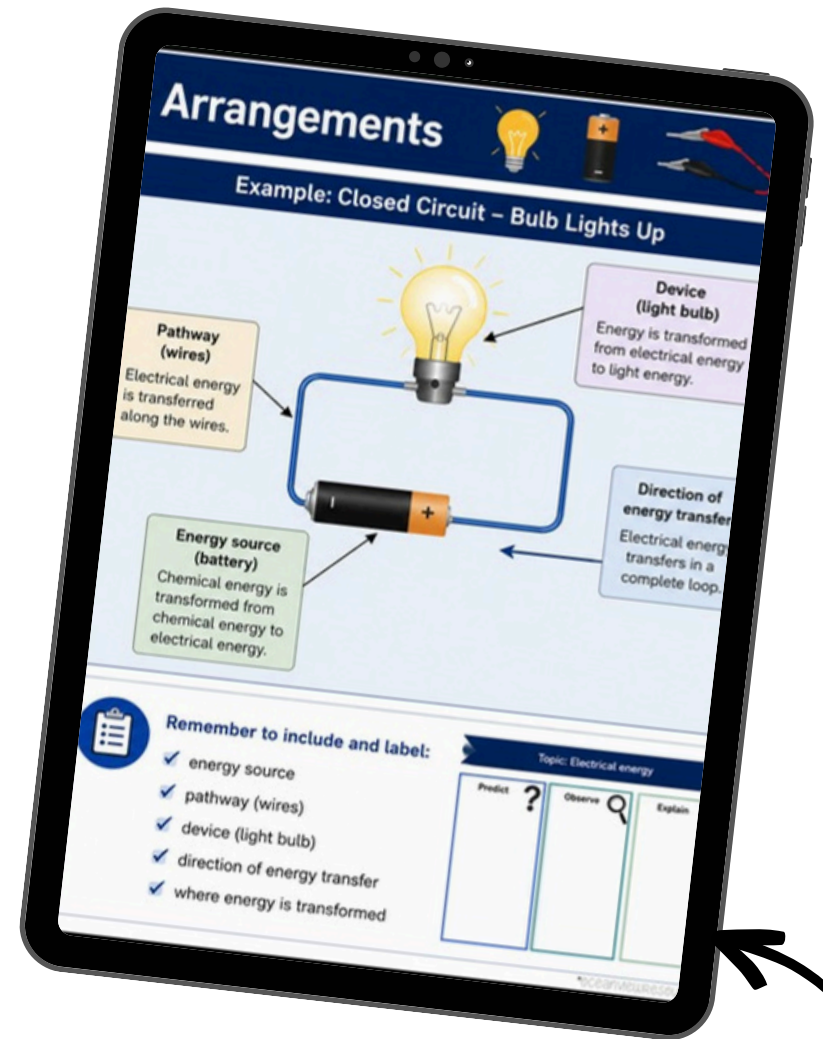


How you can use it:

All lessons are planned to be 60 minutes long.

There are 16 weeks of units plus 4 additional extension units.

20 hours of teaching time



This unit aligns with the new NSW syllabus documents.
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STAGE 3 UNIT 3 SCIENCE

Lesson 2: 11

Explaining Electrical Circuits



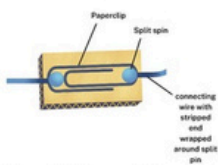
Circulate as students work. Provide **guidance** and **feedback** on the accuracy of circuit diagrams and labels. Ask:

- ☐ Can you show where the energy is transferred in your circuit and where it is transformed?
- ☐ Is your diagram a complete circuit? What tells you that?
- ☐ Have you labelled all the components in the circuit?

Lesson 3: 3-4

Circuit

Figure 5 - paperclip switch



A **switch** is a point in a circuit where the circuit can be easily broken. This stops the electrical energy from flowing. When the switch is off, the circuit is open (incomplete), and no electrical energy is flowing. When the switch is on, the circuit is closed (complete) and electrical energy flows.

Open PHET circuit construction kit and model a circuit with a battery, light bulb and open switch.

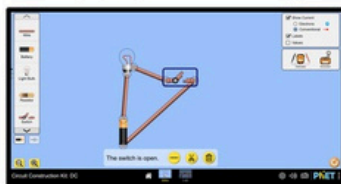


Figure 6 - circuit with open switch

Name: _____ Date: _____

I Notice, I Think, I Learned

Think about the electrical circuits you explored in the simulation. Complete each part to reflect on your learning.

I Notice ...
What happened when we changed or connected parts of the circuit in the simulation?

I Think ...
What do you think this shows about how electricity flows?

I Learned ...
What is the key idea about what a circuit needs to work?

Example (think-aloud)

"I notice that when one wire is not connected in the simulation, the bulb does not light up. I think this shows that electricity cannot flow when there is a break in the circuit. I learned that an open circuit does not allow electricity to move because the path is not complete."

Investigating Electrical Conductivity

1. Variables in our investigation

Independent variable: the material being tested.

Dependent variable: whether the light bulb lights up.

Controlled variables: things we keep the same in every test.

2. How do we observe the flow of electrical energy?

A light bulb lighting up shows that electrical energy is flowing in the circuit.

3. The test circuit

Insert material to be tested

4. What will happen?

✓ If the material is a conductor, the circuit is complete and the light bulb will light up.

✗ If the material is an insulator, the circuit is not complete and the light bulb will not light up.

5. Materials to test

Let's brainstorm materials we can test for conductivity.

- Prepared items
- Additional objects from the classroom

6. Examine the materials

Take time to examine each material. What do you notice about:

- How it looks?
- How it feels?
- Do you think it will let electrical energy flow?

7. Controlled variables - Keep these the same in every test

Battery (same brand and charge)

Light bulb (same type and wattage)

Connecting wires (same length and type)

Contact points (same positions)

Remember

★ Change only **ONE** thing (the material) each time you test.

STAGE 3 UNIT 3 SCIENCE

Lesson 4: 6-9 Planning a Fair Test

What are you going to investigate?	What do you predict will happen? Why?
------------------------------------	---------------------------------------

Pose and record a testable question under 'What are you going to investigate?'

☐ Use the sentence frame 'How does the [independent variable] affect [the dependent variable]?'

For example, 'How does the type of material affect whether electricity flows through a circuit?'

Independent variable

An independent variable is a factor that is deliberately changed.

dependent variable

The dependent variable is a factor that changes in response to changes to the independent variable. It is observed or measured.

controlled variable

Controlled variables are factors that are kept constant.

Name: _____ Date: _____

Conductivity Investigation Planner

Learning intention: We are learning to investigate which materials are conductors or insulators of electrical energy.

1. Draw and label your investigation set-up

Draw a labelled circuit diagram showing how you will test whether a material conducts electricity.

Remember to label:

Energy source (battery) Light Bulb Connecting wires Contact points Test material

2. Predict

In your workbook, list the materials you will test. For each material, predict whether it is a:

☐ Conductor ☐ Insulator

Think Like a Scientist

Where is the energy source in your diagram?

How does your diagram show a complete circuit?

What evidence supports your prediction?

★ Teacher reminder: Collect completed investigation planners for the optional assessment.

CONDUCTIVITY INVESTIGATION - DO THE EXPERIMENT!

1. Set up your conductivity tester

Use the equipment to build this simple circuit.

You will need:

- ☐ 1 battery with holder
- ☐ 1 light bulb with holder
- ☐ 3 connecting wires with crocodile clips

IMPORTANT
Make sure all connections are secure.

2. Test the materials

- Select materials from the list of materials.
- Insert the material at a time into the gap in the circuit.
- Observe the light bulb. Does it light up?
 - Yes - the material is a **CONDUCTOR**.
 - No - the material is an **INSULATOR**.

3. Record your results

Record each material and your result in the results section of your investigation planner.

Example:

Material tested	Light bulb lights up?
Copper coin	✓
Plastic ruler	X
Aluminium foil	✓

4. Share and discuss your results

After the investigation, share your results with the class.

Think about:

- Were the results the same or different for each group?
- What patterns do you notice in the results?
- Do you think we can rely on this data?
- What challenges did you face when undertaking the investigation?

Safety and fair test reminders

- Handle batteries and wires carefully. Do not short the battery.
- Change only ONE thing - the material you test.
- Keep these the same in every test: battery, light bulb, wires, circuit set up.

Name: _____ Date: _____

EXIT TICKET

Directions: Use what you learned today about electrical conductors and insulators to complete the sentences below.

1. An electrical conductor is ...

2. 2 examples are ...
1. _____ 2. _____

3. An electrical insulator is ...

4. 2 examples are ...
1. _____ 2. _____

STAGE 3 UNIT 3 SCIENCE

Lesson 7:1 Digital Conductivity Tester

Duration: 40 minutes

What is a micro:bit?

The micro:bit is a small programmable device developed by the Micro:bit Educational Foundation.

INPUTS

- Buttons A and B**
Press to give the micro:bit input.
- Pins**
Connect to other components and sensors.
- Sensors**
Detect light, temperature and movement.

OUTPUTS

- LED display**
Shows letters, numbers, icons and animations.
- Speaker**
Makes sounds and plays tones.

The micro:bit can be programmed using block coding or JavaScript. You write instructions and the micro:bit performs the functions you choose!

It is a powerful tool for learning, creating and solving real-world problems!

Lesson 7:2-3 Digital Conductivity Tester

Turn and Talk

digital system

A digital system is the combination of hardware and software components used to achieve a purpose.

What is a digital system?

I will call out a name of materials. Stand if the material is a conductor and sit if it is an insulator.

- ☐ plastic chair
- ☐ rubber band
- ☐ wooden chopping board
- ☐ metal key



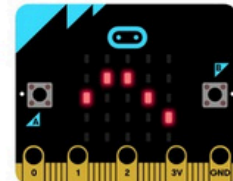
Lesson 7:4-6 Digital Conductivity Tester

- ☐ Why is metal a conductor?
- ☐ Why is plastic an insulator?
- ☐ What are properties that make a material a conductor or insulator?

In this lesson, you will program a micro:bit to test whether materials are conductors or insulators.

Instead of a light bulb glowing or not glowing like the circuit built in Lesson 5, the result will appear as a tick or cross on the micro:bit's LED display.

The LED display is the 5 × 5 grid of lights on the front of the micro:bit that shows the output of the program.



Setting Up a micro:bit as a Conductivity Tester

The micro:bit must be connected to a computer to power it.

- 1 Connect to computer.**
Connect the micro:bit to a digital device using a USB data cord to power the device.
- 2 Attach to pin P0.**
Attach one crocodile clip to pin P0 on the micro:bit.
- 3 Attach to GND.**
Attach a second crocodile clip to the GND pin on the micro:bit.
- 4 Leave the ends disconnected.**
Leave the free ends of both clips disconnected. You are now ready to test materials.

Remember: Hold only the insulated parts of the clips. Do not touch the metal parts at the same time.

Your micro:bit conductivity tester is ready to use!

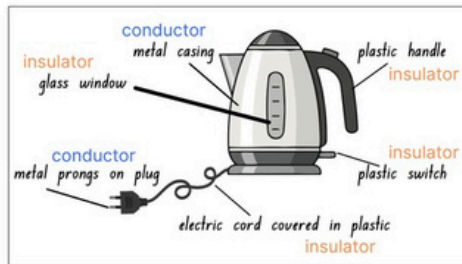
STAGE 3 UNIT 3 SCIENCE

Lesson 6: 8-13

Electrical Insulators for Safety

What insulators are used in everyday life?

Insulators **inhibit** the flow of electrical energy. Insulators are used in many appliances and electrical devices to keep users safe.



What materials can we see in the kettle that are insulators?

How do the insulators provide safety for the user of the appliance?

Discuss these questions with a partner.

ELECTRICITY FOLLOWS THE PATH OF LEAST RESISTANCE

Electricity always tries to return to its source and complete the circuit.

1. NORMAL CIRCUIT

Electricity flows through the complete circuit.

2. CIRCUIT DISRUPTED

Electricity follows any available path that completes the circuit.

Human body provides a path for electricity to return to the source.

This can cause:

- Burns
- Damage to internal organs
- Serious injury or even death

IS THIS DANGEROUS?

Human bodies contain a lot of water and minerals (such as salt). This makes humans good conductors of electricity.

Water
Minerals
Nerves and organs

KEY IDEAS

- If an electrical circuit is disrupted, electricity will try to return to its source.
- It will take any path available.
- Electricity tends to follow paths of least resistance.

STAY SAFE!

- Never touch damaged electrical equipment.
- Never touch exposed wires.
- Always report broken or unsafe electrical items to an adult.

Name: _____

Date: _____

Self Assessment

I can identify electrical insulators in everyday life.

I can use notes and labelled images to explain how electrical insulators can ensure electrical safety.

ELECTRICAL SAFETY REFLECTION	
1. Do the electricity safety rules help you stay safe? 2. Do the electricity safety rules help you stay safe?	3. Explain your thinking. How do the electricity safety rules help you stay safe?
4. What did you learn? 5. What did you learn?	6. What did you learn? 7. What did you learn?



Rate how you felt about this activity.

YESTERDAY'S CONDUCTIVITY TESTER

We used a battery and a light bulb to find out if electricity can flow through a material.

CONDUCTOR

Metal spoon lets electricity flow. The bulb lights up.

INSULATOR

Plastic ruler does not let electricity flow. The bulb does not light up.

If electricity can flow... → the bulb lights.

STAGE 3 UNIT 3 SCIENCE

What is included?

- Video links
- Created for use with the IWB.
- Suggested teaching prep for each lesson.
- Outcomes and indicators included for each lesson.

Name: _____ Date: _____

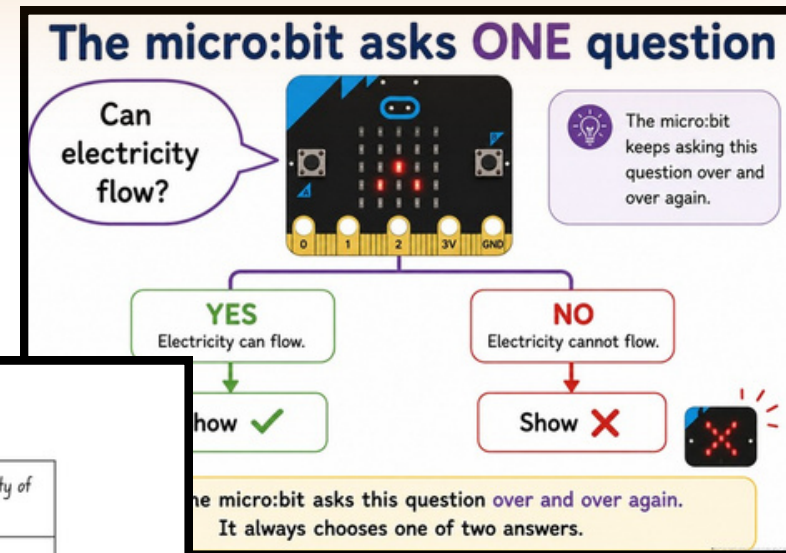
Self Assessment

I can connect components in a digital system to test conductivity of materials.
I can create an algorithm to perform a function..



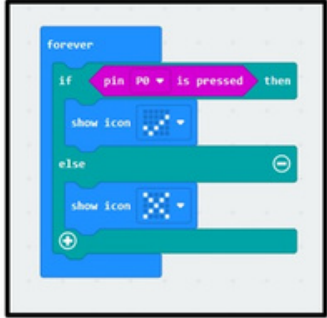
Rate how you felt about this lesson

😊 😐 ☹️



Lesson 8: 5-7 Modifying Algorithms

In this lesson, you will first recreate a conductivity tester algorithm in [MakeCode](#) and then modify it to display icons and play sounds. Then the micro:bit will be used as a 'buzzer' to respond to true or false questions. You will keep the same decision pathway structure and change only the outputs.



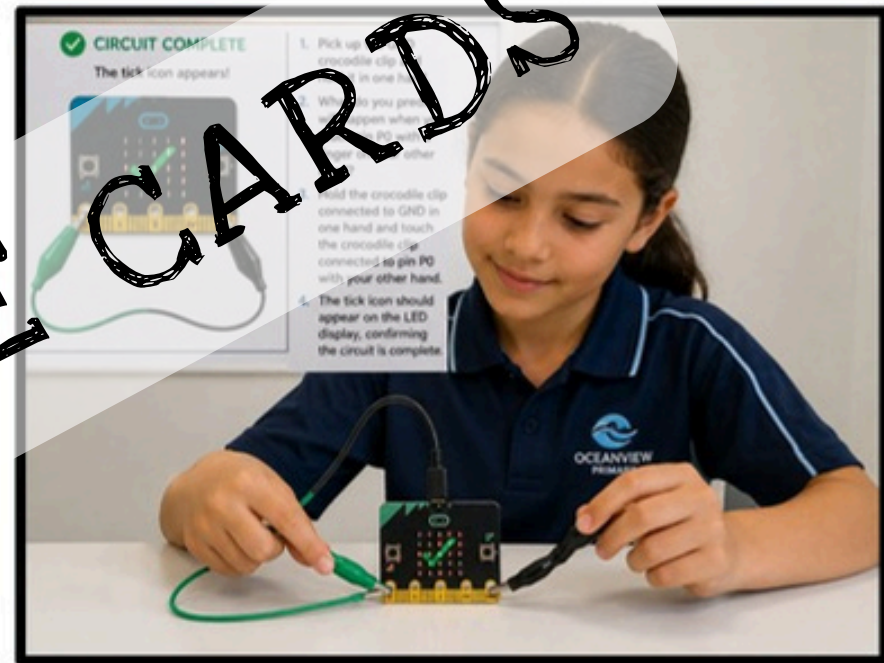
Teaching Notes

Lesson 8: 9-11

Modifying Algorithms

In this lesson you will use your own bodies to complete the circuit instead of classroom materials.

1. Pick up the GND crocodile clip and hold it in one hand.
2. What do you predict will happen when you touch pin P0 with a finger on your other hand?
3. Hold the crocodile clip connected to GND in one hand and touch the crocodile clip connected to pin P0 with your other hand.
4. The tick icon should appear on the LED display, confirming the circuit is complete.



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