

Socket vs. Solar

Modelling solar energy supply and demand with Algebra

Year Level:	7	Subject:	Mathematics (Algebra)	Topic:	Electricity demand
Duration:	1 x 50 minute lesson	Curriculum:	Content description codes: <ul style="list-style-type: none">• VC2M7A01: recognise and use variables to represent everyday formulas algebraically and substitute values into formulas to determine an unknown• VC2M7A02: apply the associative, commutative and distributive laws to aid mental and written computation, and formulate algebraic expressions using constants, variables, operations and brackets• VC2M7A04: investigate, interpret and describe relationships between variables represented in graphs of functions developed from authentic data	Climate Topics:	<ul style="list-style-type: none">• Renewable energy (solar)• Energy transition• Energy efficiency• Emissions

Brief Overview

In this lesson, students model household electricity use with fans, comparing low and high power settings. Using a smart plug, they measure and record wattage, then use algebra to calculate total demand across the day. Students graph their results against solar supply to see when renewable energy meets demand and explore how solar, batteries, wind, or efficiency can reduce fossil fuel use.

Learning outcomes

Learning Intention

Students will use algebraic formulas to calculate and represent energy use. They will learn how to express, substitute, and graph data to model changes in electricity demand.

Success Criteria

- Formulate and simplify algebraic expressions using variables and operations
- Substitute values and solve equations to model real-world situations
- Represent relationships between variables on a graph and interpret the results
- Explain how mathematical modelling can help analyse patterns and support decision-making

Introduced climate science concepts	Presumed knowledge
<ul style="list-style-type: none"> ● Renewable energy (solar) ● Energy transition ● Energy efficiency ● Emissions 	<p>VC2M6A02: find unknown values in numerical equations involving brackets and combinations of arithmetic operations, using the properties of numbers and operations</p> <p>VC2M6A03: design and use algorithms involving a sequence of steps and decisions that use rules to generate sets of numbers; identify, interpret and explain emerging patterns</p>

Teaching materials and resources

Tool ID	Student/teacher	Tool and link	Overview	Source
R0	Teacher	Glossary of climate terms	This document provides teachers with a glossary of key terms relevant to this lesson plan	Monash Climate Change Communication Research Hub

R1	Teacher	Lesson PowerPoint	PowerPoint slides with lesson content and activity instructions for students to follow, includes speaker notes	Monash Climate Change Communication Research Hub
R2	Student	Smartplug or power meter	This device measures watt usage of connected devices Options: Plug-in Power Usage Meter – \$19.95 Power Meter With Separate Screen – \$29.95 240V Plug Power Meter Electricity Usage Monitor – \$22.89	School/teacher to provide
R3	Student	Plug in fan/s (desktop or standing)	For students to create and measure different energy conditions You MUST have a wall plug to be able to measure wattage in this activity Options: 30cm Bench Fan - White – \$19 Click 30cm Desk Fan – \$25 Click 15cm Clip on and Desk Fan – \$12	School/teacher to provide
R4	Student	Student worksheet	This worksheet provides mathematical questions for students to complete during the lesson using the measured wattage values from the fans	Monash Climate Change Communication Research Hub
R5	Teacher	Worksheet Answers	Solutions of the hand out questions for teacher reference	Monash Climate Change Communication Research Hub
R6	Student	Calculator	For mathematical calculations	Student/school to provide

Lesson outline				
Stages	Description	Tool ID	Slide Number	Time
Before lesson: Material prep	For this lesson you will need special materials as listed in the table above. Ensure these have all been sourced before starting this lesson.	R2 + R3	–	–
Part 1: Learning introduction	<p>Teacher: Begin the lesson with the PowerPoint (slides 1-5).</p> <ul style="list-style-type: none"> • Slide 1 (Optional to show to students): Learning goals • Slide 2: Title slide • Slide 3 (Discussion question): What are ‘watts’? • Slide 4: Definitions • Slide 5: Where our watts come from (energy sources) <p>Students: Participate in class discussion, no need for note taking.</p>	R1	1-5	5mins
Part 2: Activity introduction + Data collection	<p>Teacher: To start the activity, go through slide 6 that has the activity instructions, and distribute the <i>student activity worksheet (R4)</i>.</p> <p>Divide the class into groups based on the number of available smart plugs and fans, and help students collect the wattage data.</p> <p>Students: In their groups, students are to:</p>	R1 R2-4	6	10min

	<ol style="list-style-type: none"> 1. Collect one smart plug and one plug in fan per group 2. Plug: Smart plug → wall socket, then fan → smart plug 3. Run the fan on <u>low speed</u> for 30-60 seconds 4. Run the fan on <u>high speed</u> for 30-60 seconds <ul style="list-style-type: none"> ○ Wait a few seconds after switching speeds to let the reading and motor adjust 5. Record the values in the table at the top of their worksheet 			
Part 3: Calculations and graphing worksheet	<p>Teacher: Once the class has collected their wattage values, have them return to their seats and complete the <i>student activity worksheet (R4)</i>.</p> <p>The answers are provided in the <i>worksheet answers</i> document (R5).</p> <p>Students: Student are to complete the activity worksheet using the recorded data, and ask the teacher for help if they require any assistance.</p>	R1 R4-6	6	30min
Part 4: Activity learning reflection OPTIONAL ASSESSMENT Have students hand in their worksheets OR if worksheets not	<p>Teacher: Once worksheets have been completed, change to the final slide for a wrap up discussion.</p> <ul style="list-style-type: none"> ● Slide 7 (Discussion questions): <ol style="list-style-type: none"> 1. Did the available solar energy cover the electricity demand at any point? 2. How can renewables and households work together to create a sustainable energy future? <p><i>Answers are provided in speaker notes</i></p>	R1	7	5min

finished, complete for homework	Students: Participate in class discussion.			
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Links for further reading

- [Top 10 energy saving tips](#) – VIC GOV
- [What is renewable energy?](#) – UN
- [How can we address the causes of climate change?](#) – CSIRO