

YEARS 5-8

Energy Efficient Lighting

Pūranga hihi pōkākā



OVERVIEW

Investigate which light bulbs are the most energy efficient and explore the difference we can make by choosing energy efficient bulbs.

NZ CURRICULUM LINKS

LEARNING AREAS:	ACHIEVEMENT OBJECTIVES:	LEVELS:	YEARS:
Science:	Nature of Science; investigating in science, communicating in science, participating and contributing. Physical world: physical inquiry and physics concepts.	3-4	5-8
English:	Speaking, writing and presenting.	3-4	5-8

TEACHER INFORMATION:

Learning sequence



INTRODUCING
KNOWLEDGE



EXPLORE AND
INVESTIGATE



CREATE AND
SHARE



REFLECT AND
EXTEND



MAKE A
DIFFERENCE

Learning intentions

Students are learning to:

- Investigate which light bulbs are the most energy efficient: LED or standard/incandescent
- Understand that LED light bulbs use less energy, cost less to run and are a better choice for the environment than incandescent light bulbs.

Success criteria

Students can:

- Use their investigations and the information given to decide which bulbs are the most energy efficient and the best long-term choice.
- Recommend energy efficient lighting for their home or school.

Resources needed

- [Energy efficient lighting slideshow](#)
- [Hand crank demonstration video](#)
- [Science centre human power generator video](#)

Additional Support

- [Smarter Homes smart lighting choices webpage](#)
- [Choosing Energy Efficient LED Lighting | Gen Less webpage](#)
- [Light Bulb Saver app](#) by Department of Environment and Energy, Australia.

Vocabulary

Lighting, electricity, resource, efficient, brightness, light bulb, incandescent, standard, LED, CFL, lumens, watts, sustainability.

LEARNING EXPERIENCE

Note: These are suggestions only and teachers are encouraged to adjust the activity to suit the needs and interests of their students.

Guiding questions for activity

- How much energy does lighting use?
- Which lightbulbs are the most energy efficient?
- Which light bulbs are the best choice for your classroom or home?



INTRODUCING KNOWLEDGE

Allow approximately 15 minutes

Shopping for light bulbs

- Share the following scenario:
Students can imagine that they are shopping for a new light bulb for their classroom or home. They have a choice between an LED bulb and a standard incandescent bulb. Both bulbs will give the lighting required, but which is the best choice?
- Students can share prior knowledge about lighting and light bulbs.
Show students the light bulb posters on slide 5 of the [Energy efficient lighting slideshow](#). Discuss the information given on the two posters.

60W

\$1 each

Standard light bulb
(Incandescent bulb)

Energy use/efficiency

★ ★

7W

\$9 each

LED light bulb
(Light Emitting Diode)

Energy use/efficiency

★ ★ ★ ★ ★

- Discuss: What factors do people need to consider to make the best choice between these two light bulbs? Considerations for choosing between the lightbulbs could include: the cost to buy a bulb, energy efficiency, cost to run, other long-term costs, carbon emissions, disposal and waste produced, how long the bulb will last (life-span), brightness (the examples given in the poster are both the same brightness), humidity in room (LEDs are less tolerant of humidity), wattage (W) and more!
- Students can then identify and record several key considerations to keep in mind when deciding which light bulbs are most suitable for their situation.



EXPLORE AND INVESTIGATE

Allow approximately 10 minutes

- View the [Hand crank demonstration video](#) to see the different amounts of energy required to power a standard incandescent bulb compared to an LED bulb.

THINKING LIKE A SCIENTIST:

What do you notice/observe about the amount of energy required to power each bulb?

Possible questions to ask participants to prompt them while viewing the video:

- Do the bulbs shown produce/make the same amount of light?
- Does the hand crank seem to turn more easily when powering the LED/standard bulb?
- The LED is more expensive than the standard bulb, but it is more 'energy efficient'- it gets five stars compared to two. What does that mean?

Notice that the standard/incandescent bulb takes a lot more effort/energy to create light than the LED bulb. It is necessary to have to push harder and exert more force to make the standard bulb work than for the LED bulb. Therefore, the LED bulb is more 'energy efficient' because it uses less energy to emit the same amount of light.

Any text highlighted in **orange** represents a link to further material. If you have printed this resource, please return to schoolgen.co.nz/for-teachers/resources to access the linked material.

Comparing the two bulbs in more detail

Provide students with a copy of the [Energy efficient lighting slideshow](#). It includes more information about the differences and similarities between LED and standard bulbs.

Comparing a standard bulb to an LED bulb	
 <p>\$1 each</p> <p>Standard light bulb (Incandescent bulb)</p>	 <p>\$9 each</p> <p>LED light bulb (Light Emitting Diode)</p>
Running costs per year: \$17.74/each	Running costs per year: \$3.55/each
Energy use/efficiency ★★	Energy use/efficiency ★★★★★
Carbon emissions: 477kg/year	Carbon emissions: 205kg/year
This light bulb lasts: About one year	This light bulb lasts: 10 years +
<div style="background-color: #f4a460; border-radius: 50%; width: 150px; height: 150px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> <p style="color: white; font-weight: bold; text-align: center;">Which bulb will YOU choose?</p> </div>	

Students can then record their ideas on slide 8, comparing the types of bulbs. An example answer sheet is provided on [page 8](#).

Comparing LED and standard bulbs

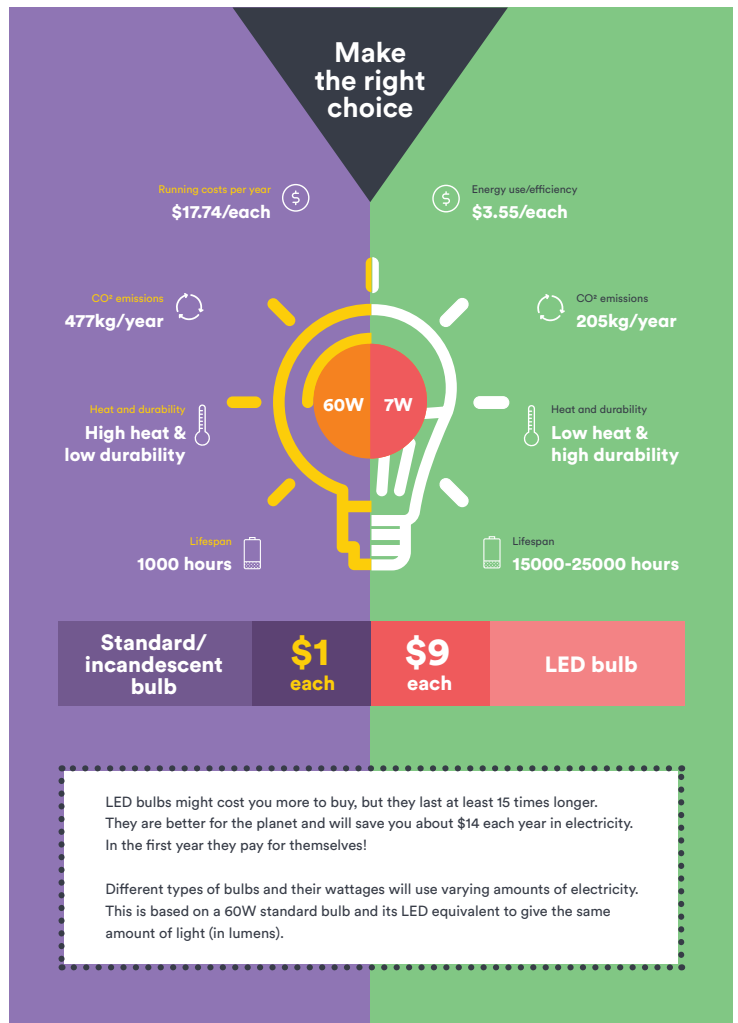
See slide 8



CREATE AND SHARE

Allow approximately 20 minutes

Students can create their own posters or infographics to share information about energy efficient and sustainable lighting choices. An example is shown on the right.





REFLECT AND EXTEND

Allow approximately 15 minutes

Long-term savings and comparison

How do our choices affect us and the planet in the long-term?

Show the following table (slide 5 of [slideshow](#)) to demonstrate an example of how much energy, waste and carbon could be saved by a classroom changing 10 standard bulbs for LED bulbs. The savings are over 10 years:

Choices for ten light bulbs over 10 years		
	All standard light bulbs	All LED light bulbs
Factors		
Number of lightbulbs needed	100	10
Cost (lightbulbs)	\$100.00	\$90.00
Cost (electricity)	\$1774.00	\$355.00
Carbon emissions	4,770kg CO²	2050kg/CO²
Waste	90 light bulbs thrown away after use	No waste

Questions for students:

- How much money would they save in electricity costs over ten years if they bought LED bulbs? (Answer: $\$1774.00 - \$355.00 = \$1419.00$)
- What would the total savings be over the ten years? (Answer: $\$1429.00$)
- How many tonnes of CO₂ would be saved with LED bulbs? (Answer: 2720 tonnes).

Making a final decision about light bulbs

Students can share their ideas about which bulbs they would choose or recommend to light their classroom or home. Ask them to justify their decisions based on environmental concerns, costs and other factors.



MAKE A DIFFERENCE

Allow approximately 15 minutes

Savings at home and school

- **Learn more** about how much you could save using LED bulbs in your home or classroom.
- Students can then write their overall recommendations for changes in lighting for their home or classroom.
- Design and draw a layout for your home or classroom including light sources and light bulbs currently being used.
- Research alternative lighting and design a classroom that would use less electrical energy for lighting.
- Together, agree on and create a plan of how a school might change to more energy efficient lighting over time. This could be presented to school leaders for a path towards sustainable action.

Example answer for slide 7: [Energy efficient lighting slideshow](#)

LED light bulbs	VS	Standard light bulbs
Cost-effective- less expensive to run		Less energy efficient – convert only 5% energy into light
Long lasting		Cheaper, but cost more over time (including energy use)
Energy efficient		Create more waste
Create less waste		More carbon emissions

We hope you have enjoyed this educational STEM resource.

School-gen is a Genesis community initiative to get kaiako, tamariki and whānau enthused about STEM.

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