

# LED light bulbs vs standard bulbs



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## Activity description

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

## Curriculum links:

Science: Level 3-4 (Years 5-8)

Nature of science; Investigating in science, Communicating in science, Physical world.

Maths: Level 3-4

Number and algebra

# Teacher information:

## LED bulbs vs standard bulbs

### Learning intentions

Students are learning to:

- Investigate which light bulbs are the most energy efficient (use the least amount of energy to work): LED or standard/incandescent
- Understand that LED light bulbs use less energy, cost less to run and are better for the environment than incandescent light bulbs.

### Success criteria

Students can:

- Use their investigations, the Human Energy Generator and the information given to decide which bulbs are the most energy efficient and the most economic long-term choice
- Recommend energy efficient lighting for their home or school

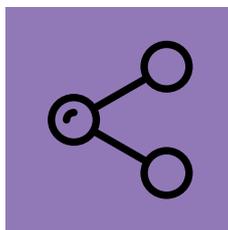
### Guiding question

Which light bulbs are the best choice for your classroom or home?

### Resources needed

- Human Energy Generator (preferred). Contact to organise a loan of the generator.
- Comparing a standard bulb to an LED bulb table
- Poster: Make the right choice (page 7)
- Hand crank demonstration: <https://www.youtube.com/watch?v=k6FY301agC4> or Science centre human power generator: <https://www.youtube.com/watch?v=5SWeZiCIEp4>

### Learning sequence



### Background information for teachers and students

- EECA: Choosing the right energy efficient bulb  
<https://www.energywise.govt.nz/at-home/lighting/choosing-the-right-energy-efficient-bulb/>
- Light Bulb Saver mobile app by Department of Environment and Energy, Australia  
<https://play.google.com/store/apps/details?id=au.gov.energyrating.lampguide&hl=en>

# Learning Experience guide:

## LED bulbs vs standard bulbs

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



### 1. Introducing knowledge

#### Introduction: Shopping for light bulbs

Allow approximately 15 minutes

- Students can share prior knowledge about light bulbs.
- Share the following scenario:

Students can imagine that they need a new light bulb for their classroom or home.

They are shopping and 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?

**60W**

**\$1 each**

**Standard light bulb**  
(Incandescent bulb)

Energy use/efficiency

★ ★

**7W**

**\$9 each**

**LED light bulb**  
(Light Emitting Diode)

Energy use/efficiency

★ ★ ★ ★ ★

- What other factors do people need to think about to make the best choice between these two light bulbs? *Discuss.*  
*Considerations for choosing between the lightbulbs could include: the cost to buy a bulb, energy efficiency, cost to run, long-term costs, carbon emissions, waste produced, how long the bulb will last (life-span), brightness (they are both the same brightness), humidity in room (LEDs are less tolerant of humidity), wattage (W) etc...*  
Summarise the considerations the participants have discussed. Identify and record 4 key considerations to keep in mind when deciding which light bulbs are best.
- Students can record any wonderings or questions they have at this stage to investigate later.



## 2. Explore and investigate

Allow approximately 30 minutes

Using the Human Energy Generator to investigate the energy use of different light bulbs



Use the Human Energy Generator to investigate more about the energy use and efficiency of LED bulbs and standard (incandescent bulbs).

- Participants can carefully turn the hand crank to make electricity (using the DC generator inside) to power one of the bulbs at a time.
- First try the LED and then the standard bulb. Switch on the appropriate bulb and do not switch between bulbs while turning the hand crank.

If the Human Energy Generator is not available

- View the video clips: Hand crank demonstration: <https://www.youtube.com/watch?v=k6FY301agC4> or Science centre human power generator: <https://www.youtube.com/watch?v=5SWeZiCIEp4> to see the different amount of energy required to power the bulbs.



### Thinking like a scientist

Possible questions to ask participants to prompt them while trying to power the bulbs or viewing the videos:

- What happens when the hand crank is turned?
- What do you notice/observe about the amount of energy required to power each bulb?
- Do the two bulbs produce/make the same amount of light?
- How does the hand crank feel to turn when you are 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?

*Students should notice that the standard/incandescent bulb takes a lot more effort/energy to create light than the LED bulb. They can tell this because they have to push harder and exert more force to make the standard bulb work than they do for the LED bulb. From this experience they can both feel and see that the LED bulb is more 'energy efficient' because it makes the same amount of light as the standard bulb, while using less energy.*

## Comparing the two bulbs in more detail

Give groups of students the Comparing a standard bulb to an LED bulb information sheet (below and link ) to help give them further information to understand the differences and similarities between LED and standard bulbs.

Groups could make a venn diagram about the similarities and differences.

Comparing a standard bulb to an LED bulb	
 <b>\$1 each</b>	 <b>\$9 each</b>
<b>Standard light bulb</b> (Incandescent bulb)	<b>LED light bulb</b> (Light Emitting Diode)
Running costs per year: <b>\$17.74/each</b>	Running costs per year: <b>\$3.55/each</b>
Energy use/efficiency ★ ★	Energy use/efficiency ★ ★ ★ ★ ★
Carbon emissions: <b>477kg/year</b>	Carbon emissions: <b>205kg/year</b>
This light bulb lasts: <b>About one year</b>	This light bulb lasts: <b>10 years +</b>

Which bulb will **YOU** choose?



### 3. Make and share

Allow approximately 30 minutes

- View the poster: Make the right choice on right.
- Students can create their own posters or infographics to share information about energy efficient and sustainable lighting choices.



#### Making a final decision about light bulbs

- Students can share their ideas about which bulbs they would choose to light their classroom or home and justify their decisions.
- They can 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.



#### 4. Reflect and extend

Allow approximately 20 minutes

##### Long-term savings and comparison

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

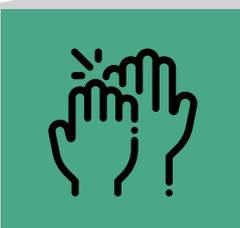
Show the following table to demonstrate an example of how much energy, waste and carbon could be saved by a classroom changing their 10 standard bulbs for LED bulbs. The savings are over 10 years:

Choices for ten light bulbs over 10 years		
Factors	All standard light bulbs	All LED light bulbs
Number of lightbulbs needed	<b>100</b>	<b>10</b>
Cost (lightbulbs)	<b>\$100.00</b>	<b>\$90.00</b>
Cost (electricity)	<b>\$1774.00</b>	<b>\$355.00</b>
Carbon emissions	<b>4,770kg CO<sup>2</sup></b>	<b>2050kg/CO<sup>2</sup></b>
Waste	<b>90 light bulbs thrown away after use</b>	<b>No waste</b>

What other investigations could they do to find out more? Attempt to answer their wonderings/questions using other resources on page 8.

##### Savings at home and school

Try the Energywise calculator to see how much you could save using LED bulbs in your home or classroom: [www.energywise.govt.nz/tools/lighting](http://www.energywise.govt.nz/tools/lighting)



#### 5. Act/ Use knowledge and skills

Students can write their overall recommendations for changes in lighting for their home or classroom.

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.