

Human Energy Generator Activity

LED light bulbs vs standard bulbs

Science

Curriculum Levels 3-4

Learning intention for this activity

Participants will understand that LED light bulbs use less energy, cost less to run and are better for the environment than incandescent light bulbs.

NZ Curriculum links:

Science: Nature of science; Investigating in science, Communicating in science, Physical world Maths: Number and algebra



Learning experience

Which light bulbs are the best choice for your classroom or home?
Students/participants will use both the Human Energy Generator and the information on tables and posters below to help them make a decision about which light bulbs to choose.

1. Introduction: Shopping for light bulbs

Scenario: Imagine that you need a new light bulb for your classroom or home. You are in a shop, looking on the shelves. These two light bulbs will give you the light you need.

Apart from the information on the shelf, what else do you need to think about to make a good choice between these two light bulbs? Discuss what you need to consider.



A purple rectangular card featuring a white incandescent light bulb in the center. To the left of the bulb is a yellow circle with '60W' in black. To the right is a red circle with '\$1 each' in white. Below the bulb, the text reads 'Standard light bulb' in white, followed by '(Incandescent bulb)' in a smaller white font. At the bottom, it says 'Energy use/efficiency' in white, with two white stars below it.



A green rectangular card featuring a white LED light bulb in the center. To the left of the bulb is a yellow circle with '7W' in black. To the right is a red circle with '\$9 each' in white. Below the bulb, the text reads 'LED light bulb' in white, followed by '(Light Emitting Diode)' in a smaller white font. At the bottom, it says 'Energy use/efficiency' in white, with five white stars below it.

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 3 or 4 key considerations to keep in mind.

2. Using the Human Energy Generator to help with your decision

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?

Let's try the Human Energy Generator to see if we can 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.
- 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.

Thinking like a scientist

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



- What happens when you turn the hand crank?
- How does the hand crank feel to turn when you are powering the LED/standard bulb?
- 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?

Participants 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.

3. Using further information and your considerations to help with your decision

Using the Human Energy Generator has helped us to see that the LED bulb uses a lot less energy than the standard bulb.

Now, are you ready to make a reliable decision about which bulb to buy? (refer to earlier discussion). Participants may have other questions about comparing the two bulbs. Encourage them to investigate their earlier considerations.

Give participants the comparison of lightbulbs below on the following page to help give them further information to help guide their decision.

Comparing a standard bulb to an LED bulb	
 \$1 each	 \$9 each
Standard light bulb (Incandescent bulb)	LED light bulb (Light Emitting Diode)
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 +

Which bulb will **YOU** choose?

4. Making a final decision about light bulbs

(For very interested/advanced users)

Ask participants to make a choice about which bulbs they would choose to power their classroom or house. They have 10 light sockets to fill.

Show the following table to demonstrate how much they could save by using LED bulbs over 10 years:

Choices for ten light bulbs over 10 years		
Factors	All standard light bulbs 	All LED light bulbs 
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

Extending learning

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

Make the right choice

Running costs per year
\$17.74/each 

Energy use/efficiency
\$3.55/each 

CO² emissions
477kg/year 

CO² emissions
205kg/year 

Heat and durability
High heat & low durability 

Heat and durability
Low heat & high durability 

Lifespan
1000 hours 

Lifespan
15000-25000 hours 



**Standard/
incandescent
bulb**

**\$1
each**

**\$9
each**

LED bulb

LED bulbs might cost you more to buy, but they last at least 15 times longer. They are better for the planet and will save you about \$14 each year in electricity. In the first year they pay for themselves!

Different types of bulbs and their wattages will use varying amounts of electricity. This is based on a 60W standard bulb and its LED equivalent to give the same amount of light (in lumens).