

INVESTIGATING THE ENERGY EFFICIENCY OF LIGHTING IN OUR SCHOOL

Teacher-led Activity

In this activity, students have the opportunity to conduct a survey on the way lighting is used in their school and identify areas where the school lighting and/or the use of lighting could be changed to increase energy efficiency and reduce the cost of the lighting. The students may develop and present a case to the Principal or Board of Trustees that suggests a lighting improvement that will result in increased energy efficiency and a reduction in the cost of lighting.

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1. INTENDED LEARNING OUTCOMES

The students will be able to:

- Identify different types of light bulbs/lighting tubes and discuss the different purposes of various kinds of lighting and their energy efficiencies
- Conduct a survey of school lighting resources and lighting practices
- Identify changes that could be made to school lighting and/or the use of lighting to increase energy efficiency and reduce the cost of lighting
- Prepare a case for changes in lighting or lighting use and present this to the Principal.

2. WHAT YOU NEED

- A standard incandescent light bulb
- An old fluorescent tube (if your school uses this type of lighting)
- An LED bulb
- A compact fluorescent light
- A halogen lamp
- If you can't get each of these items, then a photograph of each will do.
- Permission for students to visit specialist areas of the school to conduct a lighting survey.

3. FOCUS

Bring to class all of the different bulbs and tubes, and ask the students questions like:

- What features of the bulb or tube can we describe?
- Where or when would you use this light bulb or tube?
- Where in the school do we have this type of bulb?
- Are there any safety issues with this type of lighting?

4. MANAGING THE ACTIVITY

Part 1: Researching Different Types of Bulbs

- (i) Ask the students to research information about each type of bulb or tube. This information can be found at the Smarterhomes website: <http://www.smarterhomes.org.nz/energy/lighting/#1>. Students may need to use this website to answer all of the Focus questions, or the teacher may use the information to supplement the students' answers.
- (ii) Build a chart as students supply answers and add to the chart any additional information gained from the website (see Figure 1 for an example).

Figure 1

Type of bulb or tube	Features of the bulb or tube	Places/ situations where this type of lighting is used	Places where this type of lighting is used in the school	Any safety issues when using or disposing of this type of bulb or tube

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(iii) Discuss with the students the fact that many people are changing to compact fluorescent lights (CFLs) because CFLs can give as much light as incandescent bulbs yet use only about 20% of the electricity. They last up to 10,000 hours. This is about 10 times longer than the life of an incandescent bulb. However the CFLs are more expensive to purchase.

(iv) Have the students determine if the savings gained from replacing incandescent lights with CFLs are worth it by checking the following websites:

- Smarterhomes
(<http://www.smarterhomes.org.nz/energy/lighting/>)
- CarboNZero
(<http://www.carbonzero.co.nz/steps/manage.asp>)
- Consumer
(<http://www.consumer.org.nz/>) (click on Tools & resources to access the light bulb calculator).

Part 2: Reviewing School Lighting

(i) Explain to the students that the class is going to conduct a lighting survey of the school. The class will not be able to survey every room or area of the school, but the survey should look at all the main areas where lighting is used.

(ii) Ask the students to identify the areas in the school they think they should investigate. This may need to include:

- Classroom lighting
- Lighting in specialist rooms like computer rooms, technology rooms, hall, gymnasium, staffroom, school office
- Outside lighting e.g. walkways, signage, playing fields or courts
- Security lighting left on at night.

(iii) Explain that the purpose of the lighting survey is to determine:

- How energy-efficient the lighting is
- How energy-efficient the use of the lighting is.

(iv) As a result of the survey, the students will make suggestions to improve the energy efficiency of the lighting and/or use of lighting in the area of the school they investigate.

(v) Brainstorm with the students how the lighting could be made more energy-efficient. Make sure the students consider:

- Actions users can take, e.g. turning off lights when they are not needed
- Changing the type of lighting (if appropriate)
- Possible changes in positioning of lights, links in banks of lighting, wattage, use of sensors, use of timers, use of dimmers
- Related actions that will make existing lighting more effective, e.g. cleaning light shades, replacing old fluorescent tubes as these are less efficient than new tubes, painting walls a light colour

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- Related actions that increase the amount of natural light entering a room e.g. cleaning windows, removing trees close to windows, putting in a skylight.
- (vi) Assign students to working groups and give them an area of the school to investigate.
- (vii) Ask the students to visit that area of the school for an initial look at the lighting and the issues around lighting in that area they can identify.
- (viii) Ask each group to design their lighting survey. Check that each group has included:
- The type of lighting used
 - The purpose of the lighting
 - Times when the lights are in use
 - Things that might make the lighting inefficient
 - Things that already make the lighting efficient
 - Changes they could suggest (with reasons).
- (ix) Ask each group to conduct their lighting survey and present their findings to the class. Some groups may want to discuss the type of lighting used, or issues around the lighting, with other school staff, for example the caretaker or specialist teachers like art, craft, and IT teachers. Because students cannot climb up to lights and examine the wattage of bulbs, this survey does not focus on wattage and on changing the wattage of existing bulbs. However, some groups may want to discuss changing the wattage of bulbs with the caretaker or another appropriate staff member.
- (x) As a class, discuss the findings and decide if there are recommendations the class can make to the Principal to improve lighting efficiency in any part of the school and to save the school money on the power bill. The students may want to have the Principal present when they give the results of their lighting surveys to the rest of the class.
- (xi) Ask the class to do any necessary research and prepare a case for any proposed changes to the lighting, and present this to the Principal and/or a representative of the Board of Trustees.

5. REFLECTION

- What conclusions can the students make about the current energy efficiency of the lighting in the school?
- What conclusions can the students make about the way students and teachers use lighting in the school?

6. EXTENSION

- Students could develop and implement a strategy to motivate and remind students and teachers to switch off lights when they are not needed.
- Students could conduct a home lighting survey that aims to reduce the home power bill.
- Students could conduct a survey for another building in their community like the local marae, or community hall etc.

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7. SAFETY GUIDE

- Make sure the students conduct their investigation safely, e.g. students do not climb up to investigate sources of light or remove any light bulbs to investigate them.
- Make sure students do not look directly at naked light bulbs and risk damaging their eyesight.

8. RESOURCES

Websites

- Smarterhomes:
<http://www.smarterhomes.org.nz/energy/lighting/>
- Landcare Research 'carboNZero programme':
<http://www.carbonzero.co.nz>
- Energy Smart:
<http://www.energysmart.co.nz>
- Consumer:
<http://www.consumer.org.nz/>
- Government of South Australia, Department for Transport, Energy and Infrastructure:
http://www.dtei.sa.gov.au/_data/assets/pdf_file/0006/16593/lighting.pdf
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