

SUSTAINABLE AND RENEWABLE ENERGY (PART 1)

Using energy at home

This module has six sections and each section requires you to carry out some fun and investigating activities.

Section 1

What is energy?

This section draws the attention of the student towards the fundamental sources of energy. It starts with a fun crossword puzzle.

Section 2

How is energy use at home?

This section concentrates on the uses of electrical energy at home and how the energy cost spent by each appliance/device. It also motivates the student to save electricity take may eventually lead to a change of lifestyle. In this section, students may relate with other issues like “carbon footprint” and “greenhouse effect”

Section 3

This section gives the opportunity for the students to visualize different energy consumption in their household by drawing pie-charts and suggesting ways to minimize the usage and energy consumption.

Section 4

This section deals with an important component in every household, the light bulb. Here the student is given different common light bulbs and are working in a collaborative group. The students are to gather some important information about each of the different types of light bulb and discuss and explain why a certain type of bulb is preferred.

Section 5

This section gives the students to role play as a house builder. It challenged the student to find a best solution to create an energy saving house. This activity requires the students to defend and explain why his decision on the house is built as such.

Section 6

This section merely gives the student an opportunity to sum-up what he has learned and how his new knowledge can realistically be carried out so as to have an impact to the people around him or her.

Objectives of the module are:

- ❖ to enable the students to list the different types of non-renewable energy and renewable energy
- ❖ to guide the students to calculate the energy consumption at home
- ❖ to motivate the students to realize the important of energy usage from various perspective through discussion
- ❖ to compare the energy consumptions of different types of appliances use at home
- ❖ to calculate the impact of using energy star appliances
- ❖ to discuss how the each household are able to consume less energy
- ❖ To provide a progressive pathway in which energy is used, from personal to local, from local to other countries and its impact in the global scale.

Prior knowledge and skills

This module is designed for use by students in the age range of 14 to 17 years. It is assumed that they have already being taught on the topic Energy in general and are familiar with, and know how to use, The following: Concepts and knowledge

- a) types of energy
- b) primary source and secondary source of energy

c) various types of units use in relation to energy

Skills

- a) able to calculate averages, ratio and percentage
- b) able to construct pie charts and other forms of charts
- c) reading and interpreting diagrams, tables and electric and other energy utility bills

Instructions for educators

Some activities are best to be done alone, while some in groups.

The teacher's role is to facilitate the learning process and to guide the students not to venture too far out of the topic.

The main emphasis of these activities is to enable the students to investigate how electrical appliances or devices consume electrical energy and how they are able to change their perspective to save energy by changing their life-style.

The teacher is encouraged to allow the students express their views and perhaps guide them to the intended path through discussion.

If the student do not have computers or are unable to carry out their activities on-line, the teacher can download the materials from the given link and carry out the activities off-line.

Activities

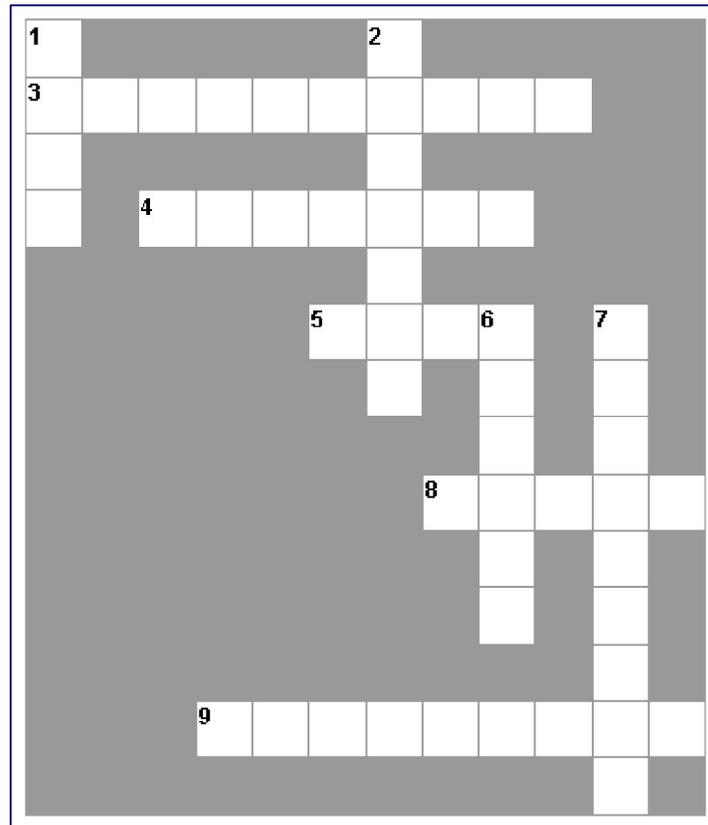
Using Energy at Home.

This module has five sections and each section requires you to carry out some fun and investigating activities relating to using energy at home.

What is energy?

It is always good to recall what you have learned in your previous lesson concerning energy.

Complete the following by filling in the spaces provided by the cross-word puzzle.



An interactive version of this cross-word puzzle can be found by clicking on http://www.pfs.edu.my/SAW2014/crossword_puzzle.htm
Answers can be obtained from the above link.

Questions:

Down: 1: An energy that keeps our body warm.

Down: 2: When an object is moving, we say that it has energy.

Across: 3: An energy that is supplied to our homes daily that powered the various appliances so that we a better quality of life.

Across: 4: A type of energy that can cause very harmful effects on all living organism if not use wisely.

Across: 5: Electrical energy is generated when fast flowing flows through the fan like turbine found in certain open fields.

Down: 6: A device that when made to turn can generate electricity.

Down: 7: A tightly twisted rubber-band is said to store up energy.

Across: 8: Fast flowing from a higher ground flows to a lower ground level causes giant turbines to turn rapidly thus producing electricity.

Across: 9: A man is said to have more..... energy if he is at the top of a hill compare to when he is at the foot of the hill.

Section 2

In this section, we would like to investigate how much electrical energy is use in your household and with the data collected, compare your household electrical consumption with your friends in your class.

Home Energy Calculator (Estimates) Electricity in Kilowatt-hours										Enter your average electric tariff					
<small>Energy cost charged by government varies in every countries. It may also be charged differently depending on the amount of energy you consumed in one month. Refer to your home monthly electric bill to know how much is the average charged per kilowatt-hour. If the amount of charges changes depending on usage the average value will be accepted. The amount of Wattage powering your devices / appliance is usually printed on the device/appliance. If only the voltage, V and the current, I is given, than Wattage, W = V X I</small>										Enter your average monthly charge according to the local rates = 0.335			Note* all the coloured cells below are protected. The white columns are for you fill in data		
Appliance	Hours per day estimated usage							Cost Estimates							
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total Hours in a week	Wattage of Appliance	Total Wattage	Total Kilowatt-Hour	Energy Cost per week			
1 Television (LED, 40")	1.50	2.50	2.00	1.00	2.50	2.50	3.00	15.00	100	1500	1.50	0.50			
2															
3															
4															
5															
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20															
										Total Cost in a week =		0.50			
										Estimated cost in a month =		2.18			
										(1 month = 4.34812 weeks, as average)					

List out all the electrical appliances/devices you have at home. If you have 5 air conditioners list them all in separate cells. If you are not sure of the electric tariff charged, ask your parents for the monthly electric bill. It would be informative to state whether your appliances/device is an energy star or energy saving category.

* An interactive version of the Home energy calculator can be obtained by clicking on this link below:

<http://1drv.ms/Tg1gzG>

You can also find an estimated electric tariff for year 2011 in the following link.

<https://talkenergy.files.wordpress.com/2011/02/asean-electricity-tariff-2011.pdf> . Please note that the

actual electric tariff would be found in your monthly electric bill.

Questions for section 2

1. What three appliances/devices that consume the most electrical energy in your household?

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2. Are the three appliances/devices you mentioned above has high wattages?

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3. Can we conclude that an appliance / device that have high wattage always use the most energy over the month? Explain.

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4. Electrical energy is a very important secondary resource in each household. Explain how you would replace the work of three of the appliances if these appliances failed to function and you are not able to get them fixed or replaced for a few months.

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5. How does your electricity consumption of your household compared with your friends in the class?

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6. Why is there a difference?

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7. List out several ways you can help save electricity at home.

- a.
- b.
- c.
- d.
- e.
- f.

8. Discuss in your class the effects of leaking electricity consumption (electrical appliances that are set to standby mode)

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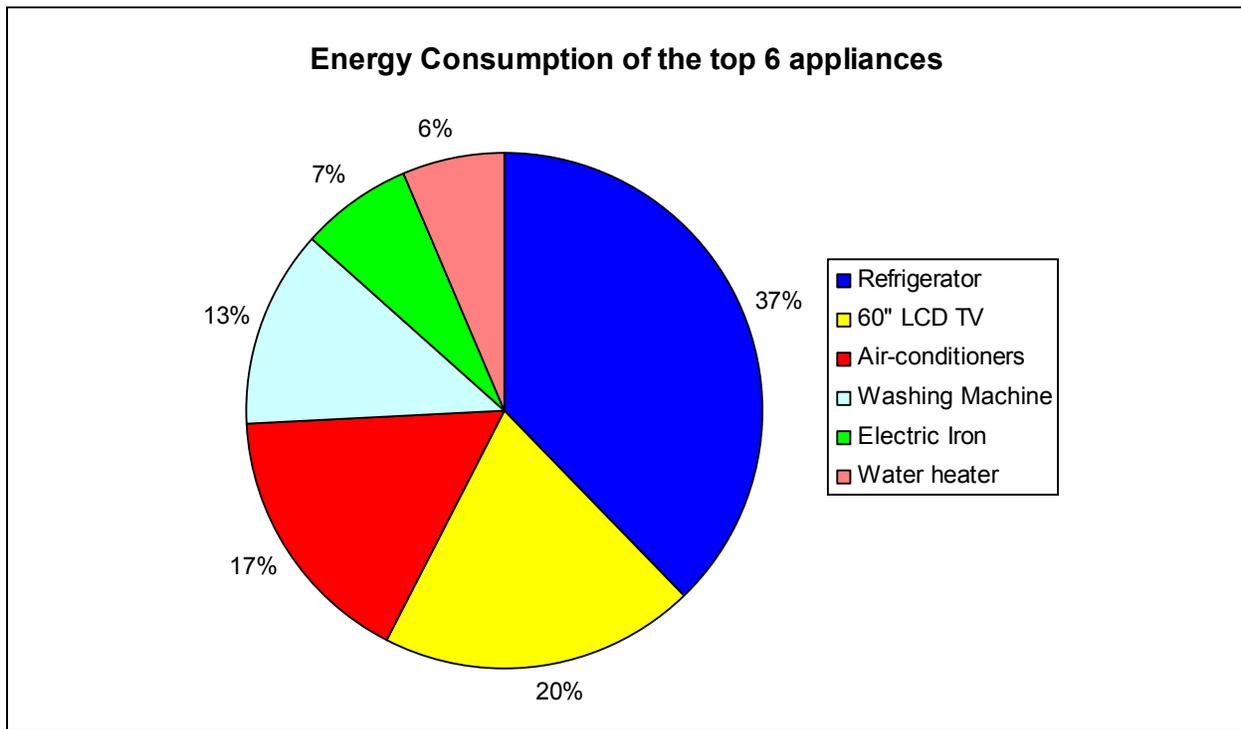
9. List out a few appliances / devices that your household always leaves on standby mode.

- A
- B
- C
- D
- E

Section 3

In this section, you are going to use the information / data from **section 2** to construct a pie chart and a bar chart to illustrate the percentage of energy consumption used in your household over a period of one week, and the most common electrical appliances used in your class. For each of the appliances specified, what type of the appliances that you must consider before buying them.

Example:



Things that you should consider are: The first one is suggested for you.

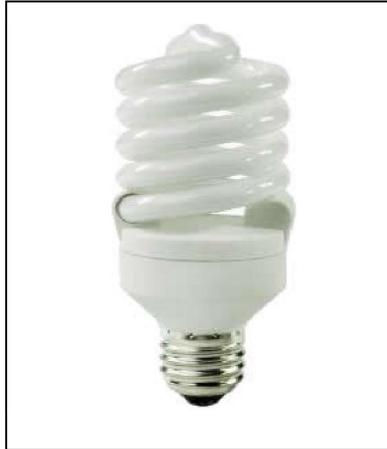
- 1. Buying a refrigerator that has an inverter.
- 2.
- 3.
- 4.
- 5.
- 6.

Click here for survey: http://www.pfs.edu.my/SAW_Electric_Consumption_survey_at_home.htm

Section 4

In this section, we would like to investigate the usage of electric light bulbs at home. Are all light bulbs with equal lumens (brightness) consumed the same energy?

Look at the three types of bulbs generally use at home:



Incandescent light bulb

Compact Fluorescents bulb

Light Emitting Diodes bulb

Questions and activities for section 3

1. Does your household uses these bulbs?

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2. Which of these bulbs claimed to save energy?

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3. From a survey, many people still prefer to use the incandescent light bulb although it consumes more electrical energy. Explain why the preferences?

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4. Given the data of lifespan of the various type of light bulbs below:

Types of bulbs	Incandescent light bulb	Compact Fluorescent bulb	Light Emitting Diodes bulb
Life Span (average)	1,200 hours	8,000 hours	50,000 hours
Average price			
Amount spent per hour			

Go to your nearest electrical shops to inquire the price of each of the following items above. Make sure that the bulbs are all of the same wattage.

From the information that you have collected and calculated, which bulb is the best value for money? Explain.

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5. Form a group and delegates each member of your group to find the information needed to fill up the table below:

LIGHT OUTPUT (LUMENS)	Incandescent light bulb (Wattage)	Compact Fluorescent bulb (Wattage)	Light Emitting Diodes bulb (Wattage)
450			
800			
1,100			
1,600			
2,600			

IMPORTANT FACTS	Incandescent light bulb (Wattage)	Compact Fluorescent bulb (Wattage)	Light Emitting Diodes bulb (Wattage)
Turns on instantly			
Durability			
Heat emitted			
Click on and off frequently			
weight			

ENVIROMENT CONCERNS	Incandescent light bulb (Wattage)	Compact Fluorescent bulb (Wattage)	Light Emitting Diodes bulb (Wattage)
Carbon dioxide emission			
Contains any toxic chemical			

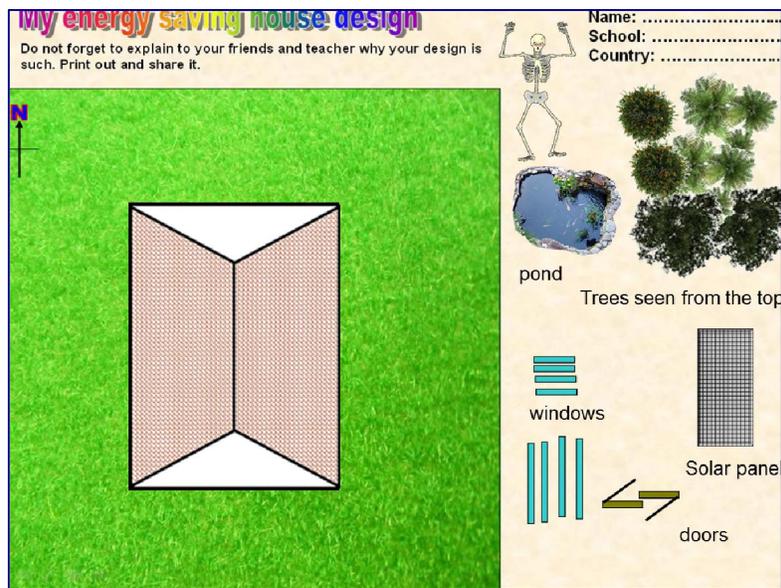
Any extra information can be obtained from: <http://www.designrecycleinc.com/led%20comp%20chart.html>

Click here for survey: http://www.pfs.edu.my/SAW_types of bulbs used.htm

Section 5

In this section, we would like to “build an energy saving house”.

If you are asked to build a simple house that is energy efficient, what would be your perception?



For this you can download the spreadsheet file from <http://www.pfs.edu.my/SAW2014/house.xls>

or in Power Point file from <http://www.pfs.edu.my/SAW2014/myenergysavinghouse.pps>

** The macro coding used in the power point is graciously provided by Hans W. Hofmann and is allowed for educational purposes.*

This activity is best carried out using Power Point 2003 as the macro coding is created for this version.

At the moment, Power Point 2010, 2013 seems to have some coding problems. Anyway, you can still carry out the activity using the spreadsheet file provided above.

Instructions

All the objects can be rotated, and move about (by drag and drop).

Each student or group is to discuss and arrange the house as well as the windows, doors, and other object if needed so that the household will be energy efficient.

The student or group will be asked to explain why the house and all other related objects are arranged as such.

Please do not forget that the sun rises in the East and sets in the West.

Print out your design and paste it on the board for everybody to see.

To share your thoughts, you can sent your work, with the picture of your efficient house with explanations to this email yeangsoon1960@yahoo.com.sg

The webmaster will then upload your information to be shared with other kids in the Asian Pacific Regions.

Remember to state your age, name, country and region you came from.

Additional Questions

- 1. How trees and pond help in obtaining a more energy efficient home?

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- 2. Some Asian cultures believe that the strategically positioned house with it's strategically environment will bring good fortune to the home owner. Do you think the above belief has some truth in it as it also suggest that part of the good fortune is the result of the home owner ability to save money due to a more energy efficient home. Discuss.

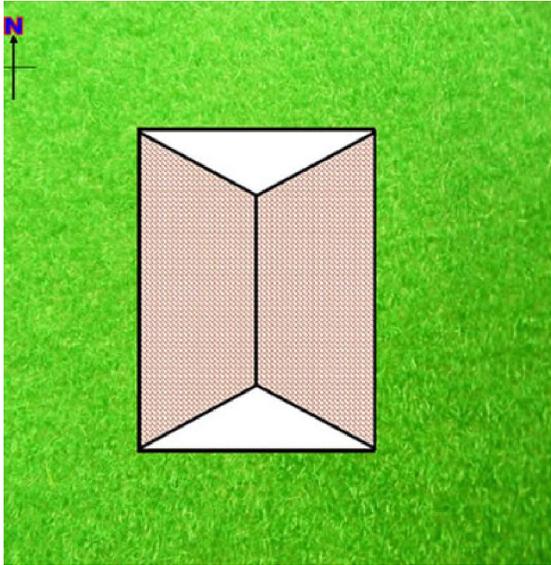
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Extra Activity (Online Discussion)

The activity in section 5 can further be enhanced by screen capture the student group project (the completed arrangement of the model house) and upload it in padlet discussion online.

1. Make sure that all groups who uploaded their model diagram are about the same size.

Preferably (400 by 409 pixels and about 54kb) as shown below:



2. Once the group has uploaded their finish product arrangement, they can write something the reasons why their house and all the other accessories are arranged in the manner. Remember to give a name for the group. Other members of the class from another group can then give constructive comments or ask questions in the padlet. Click on the link to open a new “wall” http://www.pfs.edu.my/SAW_solarhouse.htm
3. If the padlet has been used by other group please click add a new padlet on the right of the panel.*

Section 6

From all the above section, what resolutions or impact you can realistically carried out so that your energy consumption in your household can be greatly reduced? Would such changes create changes in-lifestyles in your family?

Can you list out some of the benefits that your family would be rewarded based on the above awareness several years down the road?

List the benefits below:

1.

Click here to share on line: http://www.pfs.edu.my/SAW_forum_lesson_learned.htm

THE END