



Energy In Action

An introduction to energy efficiency across the energy strands of the Junior Cycle Science Specification.



Learning Outcomes

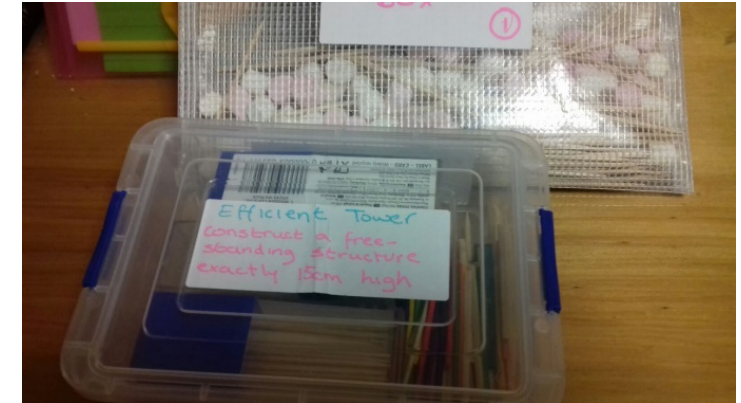


- ◆ PW 7 – **Design, build and test a device that transforms energy from one form to another** in order to perform a function; **describe** the energy changes and **ways of improving efficiency**
- ◆ PW6 – Explain energy conservation and **analyse processes in terms of energy changes and dissipation**
- ◆ NoS 10 – **Appreciate the role of science in society**; and its personal, social and global importance; and how society influences scientific research.

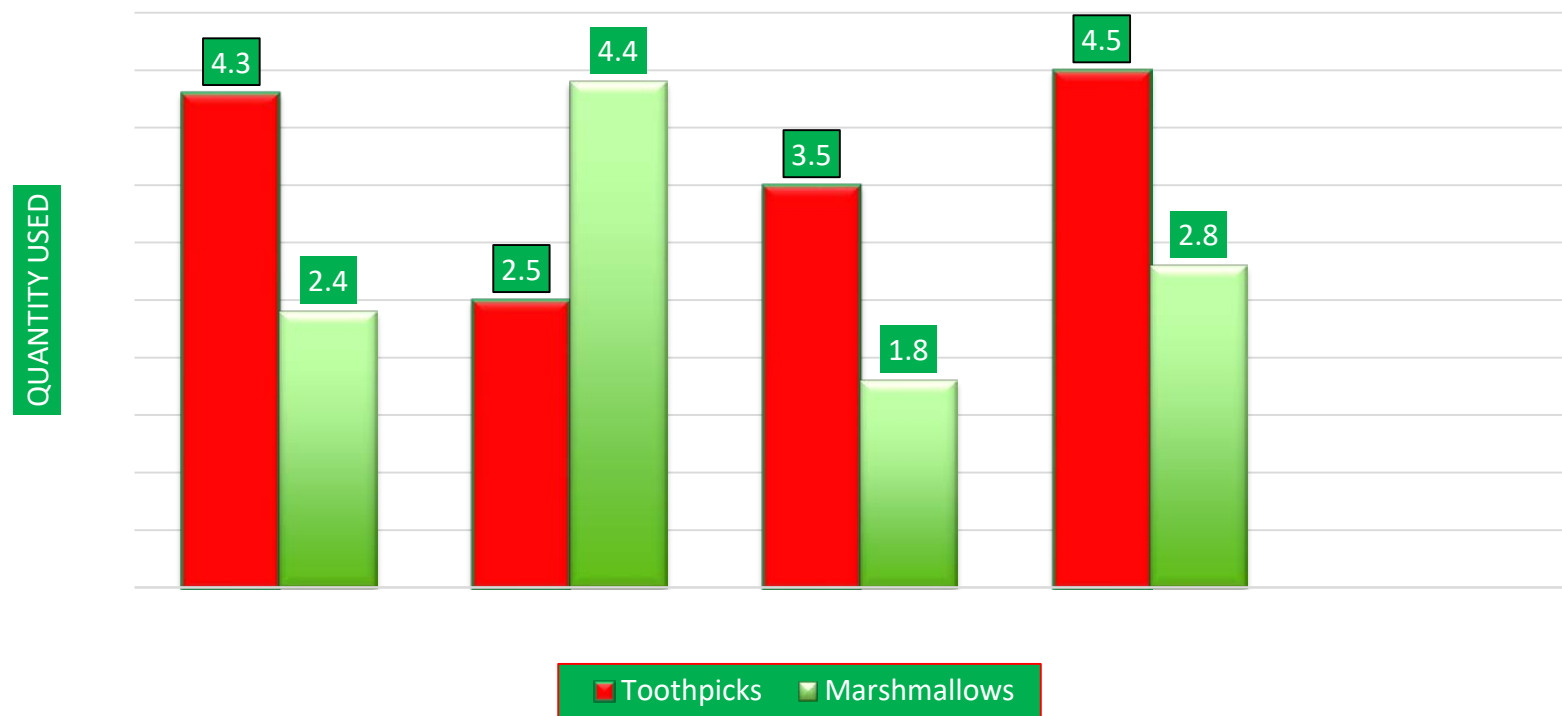
STE(A)M boxes



- ◆ Look inside your STE(A)M box
- ◆ Construct a free standing tower that measures exactly 15cm high
- ◆ You don't have to use all of the contents in the box
- ◆ You have access to a ruler and scissors if needed
- ◆ Draw 2 design ideas of your tower and then merge ideas in your group



Number of marshmallows & toothpicks used





STEAM

IN JUNIOR CYCLE



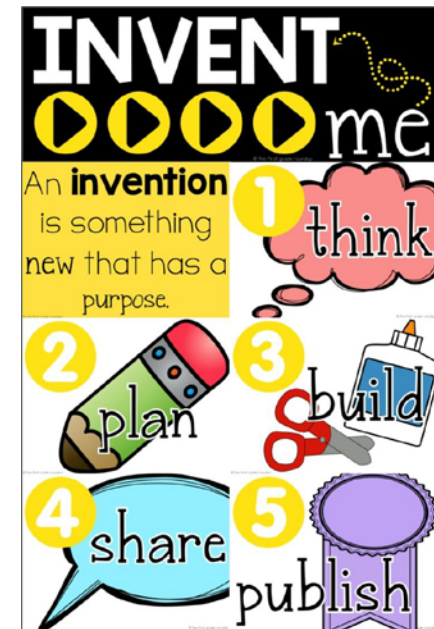
Definitions



- ◆ With **energy efficiency**, you don't have to sacrifice comfort to save energy
- ◆ **Energy conservation** involves a change in behaviour to save energy.
- ◆ Examples?

Mobile Challenge

- ◆ Look through contents of your STE(A)M box.
- ◆ Construct a mobile vehicle that can travel, horizontally, on a flat track – it must be self propelled.
- ◆ **Before you make**, draw two variations of your design and discuss in your group.
- ◆ You can use scissors and sellotape if needed. Not all contents need to be used!



SKETCH – DESIGN PROCESS



Discussion

- ◆ What propelled your vehicle?
- ◆ What were the energy conversions taking place?
- ◆ Were all the energy conversions useful?

Think about...Discuss..Write down..

- ◆ If we were to replace the balloon with a hairdryer as a propeller what energy conversions are now taking place throughout the system?
- ◆ Are all energy conversions here working as useful energy within the system? Where is energy being changed into another form that is not useful?

For you to do...

- ◆ Test your vehicle – how long does it take to travel 2m? *How could you make this a more precise measurement?*
- ◆ The Kinetic energy of your vehicle is calculated as follows:

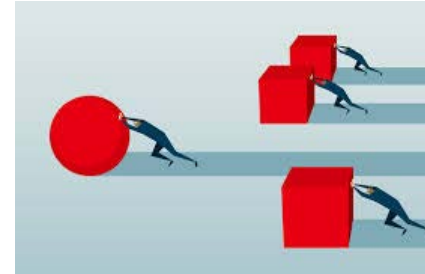
$$\frac{1}{2} \times \text{mass} \times \text{velocity}^2$$

This is the **useful energy output**. You **may not** change the mass of your vehicle but can you change its' design to make it more efficient? i.e. increase its useful energy output.



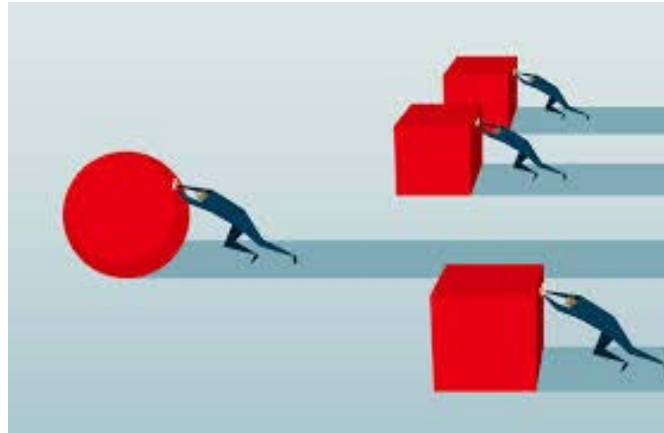
Energy Conversion and Dissipation

- ◆ Did all vehicles get the same input of power from the hair dryer?
- ◆ Did they all travel the same distance?
- ◆ Was all the energy converted into useful Kinetic Energy?



Dissipation of Energy

In most systems some energy is dissipated that is it is converted into forms which are not useful and which cannot be recovered.



DISCUSS AND DECIDE....

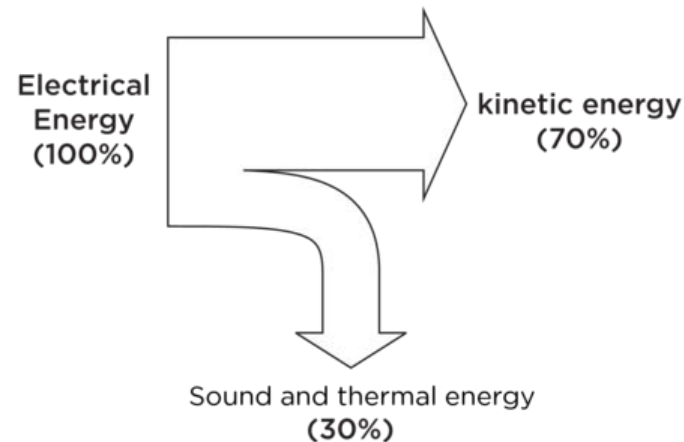
If we were to race all the vehicles over 2 metres could we say that the winning vehicle was the most efficient?



Representing energy changes and dissipation

Sankey Diagrams

- ◆ These give a visual of input and output energy.
- ◆ Width represents total energy, length doesn't matter



Activities on Sankey Diagrams

- Activities for Junior Cycle students
- Download from

www.seai.ie/teaching-sustainability/post-primary-school/energy-in-action/

STRAND C ENERGY AWARENESS
C2: MY ENERGY AUDIT

ENERGY IN ACTION
ACTIVITIES FOR JUNIOR CYCLE

C2 ACTIVITY 4: ENERGY SANKEYS

Background

Sankey diagrams represent the flow of energy visually by identifying energy stores, energy transfers and energy that is wasted. It is important that the energy we use is not wasted, and knowing the amount to determine the efficiency of a device. Students may be familiar with various graphic representations such as pie charts and scatter graphs. However, these representations often depend on the context as well as the quantity of data used.

In 1928 an Irish man called Captain William Sankey used a flow chart to show the energy efficiency of a steam engine. This type of flow chart is now referred to as a Sankey diagram, and is used to investigate systems as well as the cash flow of businesses. The diagrams are constructed from data and represent transfers involved, quantifying these transfers and thus highlighting the efficiency of the system. A Sankey diagram is shown in Figure 4. The width of the arrows represents the quantity of energy. Arrows indicate where the energy flows. In Figure 4, the arrow to the right represents useful energy, and the arrow downwards represents output of wasted energy. It also shows the conservation of energy as input of 5 J, output of 3.9 J + 1.1 J.

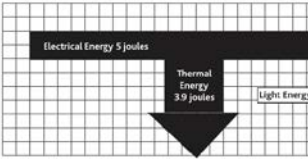


Figure 4

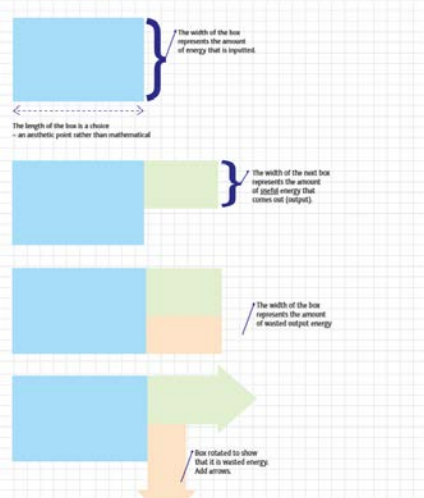
Suggested approaches:

- As an introduction to Sankey diagrams, ask students to describe the various types of graphs such as maths, geography and business studies. Raise the following questions:
 - Why are these graphs used?
 - What type of information do they give?
 - What shapes do these graphs take?
 - How do we interpret the resultant patterns?
 - How useful are these graphs?

STRAND C ENERGY AWARENESS
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ENERGY IN ACTION
ACTIVITIES FOR JUNIOR CYCLE

C2 ACTIVITY 4 (I): CONSTRUCTING A SANKEY DIAGRAM



Lets have a go



STRAND C
ENERGY AWARENESS

C2: MY ENERGY AUDIT



**ENERGY
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ACTIVITIES FOR
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C2.4 WORKSHEET H: READING A SANKEY DIAGRAM


Activity on Electric Vehicles

- Activities for Junior Cycle students

- Download from

www.seai.ie/teaching-sustainability/post-primary-school/energy-in-action/

STRAND A
ENERGY AND SUSTAINABILITY
A4: EXPLORING OCEAN AND TIDAL ENERGIES



**ENERGY
IN ACTION**
ACTIVITIES FOR
JUNIOR CYCLE

A4 ACTIVITY 4: EXPLORING ELECTRIC VEHICLES (EVS)

Background

Petrol and diesel have been the principal transport fuels ever since the invention of the internal combustion engine in the late nineteenth century. This tradition relies on fossil fuels and creates CO₂. Today we are looking for alternatives. Battery powered motors already exist, but the limited achievable travel distance means that electric cars are not yet rivaling petrol or diesel cars in terms of practicality or performance.

Since the first safe prototype, a lithium ion battery, was built in 1985, the replacement of petrol or diesel powered vehicles with electric alternatives has become increasingly likely.

In this activity students compare and contrast an electric car with a petrol or diesel one.

Suggested approaches:

- Ask students to brainstorm about their understanding of electric cars in groups. A summary of ideas could be written up for further reference.
- Show the [Science Squad video](#) available on the SEAI site. After seeing the video the students can revisit the earlier discussion and see how the video affects their original findings.

What to do:

1. Divide the class into three groups:
 - Group A** is the sales group. The members must devise a campaign to sell an electric car like the LEAF and present a sales pitch to the class.
 - Group B** is another sales group. They are selling traditional cars and must draw up a number of arguments against electric cars in favour of petrol driven cars. They must present a sales pitch focusing on the advantages of traditionally powered cars over electric vehicles.
 - Group C** is a client group. The members do not know whether to buy an electric car or a traditional car. They must draw up a list of questions for the sales groups.
2. Using the SEAI programme [Aran Island Electric Vehicle](#) as their case study, and drawing on other resources, each group should write a summary of the programme, describing it from their assigned viewpoints. The groups should present their cases to the class within a given time frame, and this should be followed by a questions-and-answers session.
3. The groups can disperse, and a final discussion can take place where students give their individual opinions about electric vehicles and the teacher evaluates the presentations with the class.

Resources:

- The [Aran Island Electric Vehicles](#) webpage is essential to the task.
- [Click here](#) for a pdf booklet on the Aran Islands Electric Vehicles programme.
- The [ESL webpage on electric cars](#) could prove useful.
- [Click here](#) for RTE coverage of electric cars, including the Aran Island project.



What is our role as Educators in reducing global demand for energy?

- ◆ Discuss 5 things in your school or at home that use energy – heat, electrical etc. State the energy conversions involved.
- ◆ How can you calculate the % efficiency of 2 devices?
- ◆ Record ways of increasing the efficiency of the 2 devices.





Abstract for Winners 2017: Raising awareness of energy ratings for household appliances, among adults in their community.

Proposal forms to be submitted by end November 2017 with:

- Team details - school, students, contact details, topic choice
- Researching your topic - How? Where? When? Who?
- Who is your target audience? Peers, Children, Adults



Clean, renewable energy



Saving water saves energy



Reduce your food miles



Saving energy at home / school



Greener fashion



Greener travel



Climate action



3. Will you use other ways of researching? For example, you may use checklists to see where energy is being wasted, interview experts or speak to members of your target audience. Give 2 examples.

4. What have you discovered and learned about your topic so far?

Who will be your target audience?

Now that you know a little bit more about your topic, which audience will you target with your campaign. Please choose one of the below. Tick all that apply.

<input type="checkbox"/> Your peers
<input type="checkbox"/> Adults and the wider community
<input type="checkbox"/> Primary school children

Who will you try to reach with your campaign and where will you try to reach them? e.g. Fourth year students at break time in your school, children in the local primary school or adults in your neighbourhood.



Provide an estimate of how many people you think your campaign will reach.

Your campaign

What is your One Good Idea?

How do you hope your idea will encourage people to take action to increase energy efficiency and help tackle climate change?



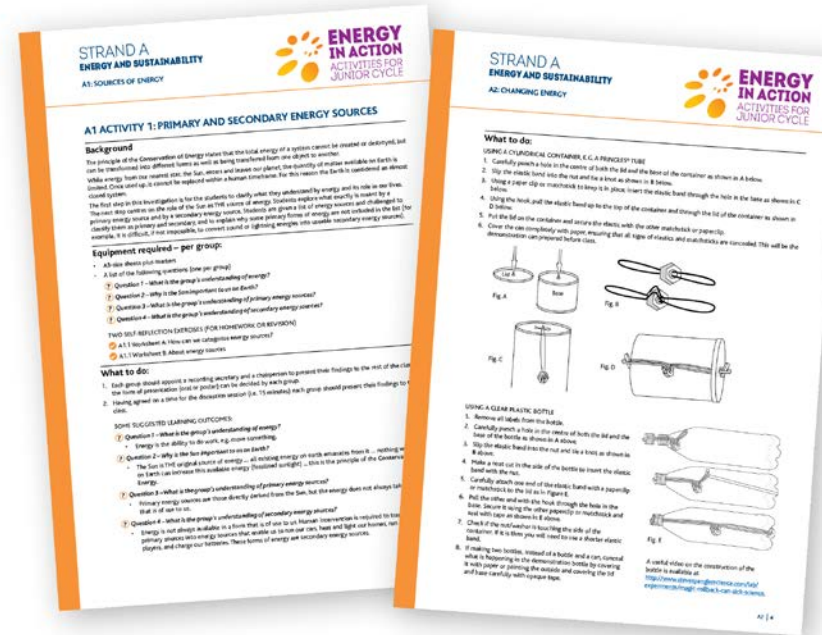
What are you hoping to get people to do? What simple action will you encourage people to take?

Tell us about your campaign ideas. This should include how will you share your message and communicate to your target audience. We want to know: When? Where? How?

List any of the methods you will use to get your message across e.g. a song, a poster, a billboard campaign, a press release, a website, social media, a buffet, a board game, a book/mag, a puppet show, a short film, a TV or radio advertisement, a presentation or a quiz. If you have social media channels, please provide the links.



Activities for Junior Cycle



www.seai.ie/teaching-sustainability/post-primary-school/energy-in-action/