# STEAM Club At Home
## Key Stage 3: Session 1 – Science
### Energy in Food

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| Understand the rate at which the energy in the food we eat is released by our bodies | 30 Min + | • Analytical  
• Mathematical |

**Driving Questions:**

- How much energy does our body need?
- Do the foods we eat provide us with sufficient energy?
- Are some of the foods we eat the best way to fuel our body?

**Resources:**

- Weighing scales (optional)
- Internet access

**Want More Info?**

More information can be found through BBC Bitesize at: [https://www.bbc.co.uk/bitesize](https://www.bbc.co.uk/bitesize)
Activity Plan:

Starter:
Energy stored in food can be released by combustion (burning) or by respiration in our cells. The labels on packets of food show how much energy they contain.

The amount of energy available may be shown in a unit called as a calorie (Kcal). However, the scientific unit for energy is the joule, which has the symbol J.

A lot of energy is available in most foods, so food labels usually show kJ (kilojoules) in stead of J. (1kJ = 1000 J).

Main Activity:
Before you eat your lunch today work out how many kJ (1 Kcal= 4.184 kJ) you are consuming. This can be done by reading the calorific content on any pre packaged food. Where food labelling is not available then either weigh or estimate the weight of each item of food and carry out a Google search i.e. ‘how many calories in 100g of pasta’ or ‘how many calories in 50g of lettuce’.

Use the total number of Kcal to calculate how many kJ you are consuming with your meal.

A brisk walk will typically require 1kJ per minute.

Before you go out for exercise, calculate how many minutes of brisk walking the meal you have just consumed has provided you the energy for (number of kJ consumed / 14 = number of minutes brisk walking).

Use the internet to research the calories and kJ contained in some of your favourite foods i.e. 1 Pizza contains an estimated 2269 calories or 9494 kJ or energy. Calculate how many minutes of brisk walking these foods provide you with the energy for.

Follow Up:

The average daily recommended calorie intake for an active 13 year old is 2600. Using the information you have found on your favourite foods calculate what % of your daily recommended calorie intake they would account for.

Using the internet, research how many calories and kJ of energy are required for different forms of activity.

Think about the different types of food you eat and consider where you could introduce healthier alternatives.
Activity Aims:
To understand how different software programmes can be used in industry, as well as daily life. To understand possible requirements of a future 

Time Allowances:
1hr+

Skills:
- Critical thinking
- Computer literacy
- Communication
- Research

Driving Questions:
- How important is computer literacy?
- What software may I be using in a future career?
- How can I develop my computer literacy?

Resources:
- Internet access

Want More Info?
'What do I actually do as a software developer?' https://www.youtube.com/watch?v=le0XiLehXHN&feature=share
Activity Plan:

Starter:

Software is a set of instructions, data or programs used to operate computers and execute specific tasks. The opposite of hardware, which describes the physical aspects of a computer, software is a term used to refer to applications and programs that run on a device. The 2 key academic fields in relation to software are computer science which is the theoretical study of software and software engineering which relates to the application & development of software.

Estimates suggest technology has already taken over 90% of jobs humans can do and predictions indicate that figure is set to increase significantly over the next 10 years. Estimates also suggest that 70% of jobs already require a high degree of digital literacy. More and more of the jobs that are available in the next 10 years will involve computers, even in some areas you may not expect.

Main Activity:

Can you identify 5 software programmes that are regularly used in home computing or in industry?

For each of the programmes you have identified can you find 2 practical uses of this software?

Consider your level of proficiency in using the software programmes you have identified. Give yourself a rating of 1 (novice) - 5 (expert) against each of the programmes you have identified.

Using the internet or discussing with a family member, consider the level of proficiency you may require in each of these programmes to meet any future career aspirations. If you currently don’t have clear career goals, consider one job as an example.

Using either the internet or discussing with a family member, for each of the software programmes you have identified, consider how you could utilise them regularly in your home environment.

Use google to search for ‘free online Microsoft office tutorials’. Carry out at least 1 basic tutorial.

Follow Up:

After completing at least 1 basic tutorial, reflect on the proficiency score you gave yourself for this programme, would you now rate yourself higher or lower? Continue to explore further tutorials of varying degrees of difficulty, and continue to look for ways you can implement these newly developed skills to help organise you and your families daily lives.
# Engineering Careers

**Activity Aims:**
Understand more about the variety of Engineering careers available and the qualifications required to achieve a career in this area.

**Time Allowances:**
1hr +

**Skills:**
- Critical thinking
- Computer literacy
- Communication
- Research

**Driving Questions:**
- Why is Engineering important?
- How can Engineering shape the World in which we live?
- Where could you fit in the World of Engineering?
- How would you get there?

**Resources:**
- Internet Access

Want More Info?
- [https://www.theiet.org/career/](https://www.theiet.org/career/)
Activity Plan:

Starter:
Can you name what each of the letters stand for in the abbreviation STEAM?

STEAM stands for Science, Technology, Engineering, Art and Maths. These 5 disciplines are vital to our societies understanding & development of the World in which we live, helping us to address some of the biggest challenges facing humanity.

Engineering draws on aspects of science, technology, art and maths, to design and build solutions to a wide variety of challenges (both large and small) that the World faces. In the words of Albert Einstein "Scientists investigate that which already is; Engineers create that which has never been".

Can you think of 3 developments in Engineering that have helped to shape the World in which we live?

Can you also think of 3 challenges the World in which we live faces (ideally challenges which you care about) that Engineering could provide a solution to?

Behind all of the improvements/challenges you have listed, there are countless people just like yourself working in a career in Engineering.

(Time: 15 minutes maximum)

Main Activity:

What do you picture in your mind when you think of what an Engineer looks like? Do you see someone in overalls working with tools? Someone in a lab coat with a microscope? Someone in a suit at a computer? Engineering is a really broad subject area, and can cover all of the examples outlined above and a whole range of other examples in between.

Using the internet to research, identify 2 careers within Engineering that sound interesting. If you are unsure of which careers to look at, consider the types of engineers which may be involved in the challenges you outlined above.

Again using the internet, for each of the jobs you have identified, create an info sheet, this should include:

- What does someone who works in this job do?
- What is the average salary?
- Does someone who works in this job need to go to college or university?
- Could I do an apprenticeship in the role?
- What subjects should someone in this job ideally study at school, college and university?
- What grades would you need?
- Which universities offer the course you may require?

Follow Up:

If any of the careers you have looked into have left you wanting to know more, then please utilise the links provided in this document. You can also talk to your school careers advisor who will be able to provide you with more information on the qualifications you will need to pursue.
STEAM Club At Home
Key Stage 3: Session 4 - Art
Design and Materials

Activity Aims: To understand the importance of materials selection and accurate designs in the process of creating an object.

Time Allowances: 1hr+

Skills:
- Critical thinking
- Attention to detail
- Drawing

Driving Questions:
- Why are the accuracy of designs important?
- What are the properties of certain materials?
- Why are certain materials selected above others?

Resources:
A4 Paper
Pencil
Rubber
Ruler

Want More Info?
If you would like access to more resources around design and technology then please visit:
https://www.bbc.co.uk/bitesize/subjects/zfr9wmn
Activity Plan:

Starter:

The A for Art is a relatively new introduction into the abbreviation STEAM (Science, Technology, Engineering, Art and Maths). It has been added to highlight the importance of creativity bringing the theories of Science, Technology, Engineering and Maths to life.

The process of designing an object is integral in supporting the build phase of a project and ensuring that an object will serve its stated purpose. Equally as important in ensuring an object is fit for purpose, is the selection of materials it will be made from. Will an object need to be portable or will it stay in one place? Will it have to withstand frequent or infrequent use? What is the intended life span of the object? Will the item have to withstand heat/pressure/humidity etc? All of these questions and more need to be considered in the design and material selection of an object.

Main Activity:

Can you identify 1 object around your household? The object should be no bigger than 1 sheet of A4 paper.

Observing the object, try and write down as much information about it as possible, using the following questions as examples?

- What is the purpose of your object?
- Does the object feel heavy or light?
- Does the object feel hard or soft?
- Does the object feel durable or brittle?
- What are the dimensions of the object?
- What materials is the object made from?

Thinking back to what your object is used for and the properties of the materials used, can you identify why those particular materials have been selected?

On a sheet of A4 paper, using a pencil, do a scale 2d sketch of your item (example page 3). Your drawing should try to capture as much detail as possible and note the measured dimensions. Try and put your self in the position of someone trying to use your drawing to produce the object. Do you feel your drawing provides enough detail that someone could use it to reproduce the object accurately? If not then please consider completing additional 2d sketches of your object from other useful angles.

In Engineering these types of drawing are of vital importance, as they can be used by those producing an object to ensure they are doing so accurately. Whilst over the last 30 years this type of design work is now being completed using computer aided design (CAD), all drawings used to be done by hand, in a similar way to how you are working now. Imagine how many detailed drawings would need to be completed for a major project such as a rocket or a submarine.

Follow Up:

If you would test yourself on your knowledge of the properties of materials then you can have a go at the following quiz: https://www.educationquizzes.com/ks3/d-and-t/resistant-materials-01/
2 Dimensional Sketch Example:

Nintendo Wii Remote

![Dimensions of Wii Remote](image-url)
STEAM Club At Home
Key Stage 3: Session 5 – Maths
Data Visualisation

Activity Aims:
Understand how to simply and effectively communicate complex data to others.

Time Allowances:
1hr+

Skills:
• Attention to detail
• Critical Thinking

Driving Questions:
• Are you able to present data effectively?
• Are you able to analyse data to make logical decisions?

Resources:
A4 Paper (preferably graph paper)
Pencil
Rubber
Ruler

Want More Info?
If you would like access to more resources around the representation of data then please visit:
https://www.bbc.co.uk/bitesize/guides/zrg4jxs/revision/5
Activity Plan:

Starter:

Graphs and charts condense large amounts of data into easy to understand formats that clearly and effectively communicate important points.

Any type of data can be represented in graphs and charts, anything from information on Engineering to information on people. Therefore, no matter what future career path you choose to go down, there is a high probability you will be expected to produce graphs & charts in order to communicate data to others and/or interpret the information in them yourself.

Main Activity:

You work for a company who are currently in the process of selecting the material required to create the structure of a new product. 6 potential metals have been identified Aluminium Alloy, Zinc, Stainless Steel, Beryllium Cooper, Magnesium Alloy and Cast Iron. You have been asked by your manager to conduct some research into the weight, melting point, strength and cost of each metal and discovered the following:

You have been asked to produce 4 bar charts to share this information with a groups of Engineering managers. Each individual bar chart should focus on 1 property i.e. Weight or Cost etc. and include the data of each metal.

<table>
<thead>
<tr>
<th>Metal</th>
<th>Weight (Kg/dm³)</th>
<th>Melting Point (°C)</th>
<th>Dollars per Kg</th>
<th>Tensile Strength (psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium Alloy</td>
<td>2.8</td>
<td>463</td>
<td>3</td>
<td>42061</td>
</tr>
<tr>
<td>Beryllium Copper</td>
<td>8.3</td>
<td>865</td>
<td>30</td>
<td>200152</td>
</tr>
<tr>
<td>Cast Iron</td>
<td>6.8</td>
<td>1127</td>
<td>1.3</td>
<td>60000</td>
</tr>
<tr>
<td>Magnesium Alloy</td>
<td>1.9</td>
<td>349</td>
<td>18</td>
<td>5946</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>8</td>
<td>1400</td>
<td>2.38</td>
<td>73244</td>
</tr>
<tr>
<td>Zinc</td>
<td>7.1</td>
<td>419</td>
<td>1.9</td>
<td>5366</td>
</tr>
</tbody>
</table>

You have been asked to produce 4 bar charts to share this information with a groups of Engineering managers. Each individual bar chart should focus on 1 property i.e. Weight or Cost etc. and include the data of each metal.

Can you use this information to identify the lightest material, the material with the highest melting point, the cheapest material and the strongest material?

The metal which will be selected will be the metal with must have a tensile strength no lower than 20,000 psi a weight no heavier than 7.5Kg/dm³, a melting point no lower than 350 degrees and be as cheap as possible. Can you select your recommendation for the metal which should be used?

Follow Up:

You have completed a simple set of bar charts, which can be an excellent way of visualising data. Using the internet can you find 5 other methods of visualising data, and consider whether they may have been an alternative way of visualising the data you have produced.