STEM@CGI
SCIENCE - TECHNOLOGY - ENGINEERING - MATHEMATICS

Data Communications Company

Smart homes

CGI is delighted to partner with Smart DCC to deliver a series of STEM from Home packs about the introduction of technology to our homes, use of renewable energy and how we can help to save the environment.

Smart DCC provide products and services that enable the communication of energy use in our homes and businesses with energy suppliers and network operators. This helps people to understand and reduce energy costs, while saving the planet! CGI help Smart DCC to design, build and manage the technology behind smart meters for homes across the UK.

This first pack in this series looks at smart homes. Children can learn about the technology behind smart homes, research smart meters, discover how homes are powered and design a smart home of their own!

What is a smart home?

Smart homes incorporate technology and automation (things happening automatically) allowing homeowners to monitor and control energy use in the home. This can include lighting, heating, hot water, electricity and security.

Your home may already be smarter than you think
Smart homes are constantly evolving as technology advances, you may already have technology that makes your home smart:

Smart speakers

These include Alexa, Siri, Google Home and many more. These tiny virtual assistants can tell us what the weather is going to be and play music, but did you know if you have the correct equipment, they can also turn on and off lights and close blinds?

Household goods

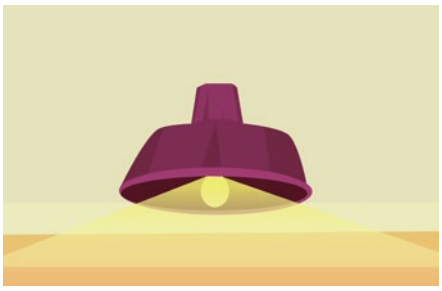
Even everyday household items can be smart. You can brew coffee from your phone, access the internet from our TV's and clean the house with app controlled robot vacuum cleaners!

Smart blinds and curtains

Closing blinds and curtains can help to keep heat in the home, stopping heat escaping through windows. The ability to control them from anywhere can also make your home more secure.

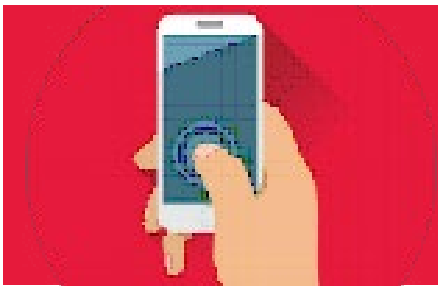
Smart lighting

Smart lights can be turned on and off remotely, be put on timers and sensors and even change colour. This avoids having lights on for longer than you need and can help to keep your home secure.



Security

Security devices such as lights, cameras, gates and alarms can all be virtually monitored and controlled, allowing us to keep our homes secure, even when we are not there.



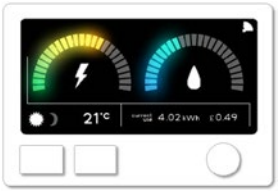
Heating and gas

Many smart home utilities allow you to turn the heating and gas on/off and control the temperature from anywhere. Turning these off when you're not home can save hundreds of pounds each year!

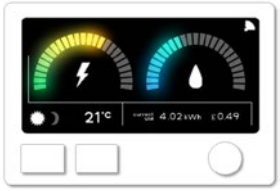
Smart meters

What is a smart meter?

A smart meter is a two-way digital communication device located in homes and businesses that measures the amount of electricity and gas used. Energy companies provide an in-home display (IHD), a small energy monitor that displays energy readings, this is different from the actual smart meter itself, just acting as the display. The actual smart meter looks a lot like standard gas and electricity meters that you may already have in your home.



How do smart meters work?



Smart meters measure and record electricity and gas usage every 30 minutes, displaying this data on your smart meter

The data is then transmitted to the energy company and energy network

Energy providers make consumption data available via online and in-home display

You can then monitor your household energy usage and better manage your costs

How do smart meters make a home smart?

- Smart meters allow you to get more reliable and up to date readings of your energy use, allowing you to realise the exact cost of your energy use and reduce and control your spend.
- The meters automatically notify your provider in the event of an outage, allowing for faster repairs to get the power back on.
- Smart meters can be remotely read, eliminating the need for manual readings and providing accurate readings rather than estimated bills.
- Some companies also make energy usage data available via apps for phones and tablets.

Smart meter cost savings
Can you work out the following cost savings as a result of using a smart mater?

Peter's smart meter informs him that leaving the light on in his living room for 1 hour costs £0.02p. If he was to turn off his living room light for an extra hour each day, how much could he save in one year?

Amy spends on average 1.5 hours per day watching TV, if it costs her £0.03p per hour, how much is this costing her per month?

In the last week, Mo has had 5 showers and 2 baths. The boiler and water costs for each shower cost 24p and 53p for each bath. How much has Mo spent in total in the last week?

Bonus question: How much could Mo had saved if he had taken 7 showers and no baths?

How are homes powered?

There are two main ways in which homes are powered:

Electricity
Electricity powers the light in our homes and some tech including TV's, phone chargers and games consoles. Most things that can be charged will be powered by electricity. The electricity that comes into our homes is generated at power stations. It flows from the stations, through large transmission lines to substations. Distribution lines then carry the electricity into our homes, coming through outlets where we plug in our devices.

What are the advantages of using electricity as a power source?

What are the disadvantages of using electricity as a power source?

Gas
Gas powers the boilers in our homes, heating the house through radiators and heating water for baths and showers. Gas can also be used for cookers and fireplaces.
Gas companies drill thousands of feet into the earth using big wells and pumps in order to bring the gas to the surface. They then send the gas through gas mains buried underground, connecting to pipes that bring the gas into our homes.

Water

Though not currently monitored via smart meters, water is a key utility in the home, allowing us to shower, flush the toilet, do the washing up and drink! Some homes have water meters installed rather than paying a fixed monthly bill, allowing them to only pay for what they use. Water that we use in our homes comes from lakes, rivers and underground supplies. Water companies have large intake pipes that transports the water to a treatment plant, making it safe for use before storing it and piping it through to our homes.

As we all become more environmentally-conscious, the way in which we power our homes is changing. Newer and more eco-friendly methods are becoming more popular, these include:

Wind power

Solar power

Water power

How do each of these power sources work?

Wind power

Solar power

Water power

Can you name any more power sources?

Reducing our energy use not only saves money on utility bills, but also helps to save the environment. Below is a picture of Sarah's kitchen. How many ways can you spot to help Sarah reduce her energy use?

Design your own smart home

Now that you are an expert in the technology and energy sources used in our homes, your task is to design your own smart home!

You should aim to include the following:

- Bedroom
- Kitchen
- Living room
- Bathroom
- Garden

Consider the following aspects in your design:

- How will your home be powered?
- What technology will you use?
- What security will you have?
- How will you dispose of any waste?
- How will your home help the environment?
- Will you source any of your own food and water?

Designs can be hand-drawn, made as a model or designed virtually using PowerPoint or Blender.

Ask your parent/guardian to upload pictures of your STEM creations to **Twitter**, **LinkedIn** or **Facebook** using **#STEMfromHome** and **#ExperienceCGI**, remember to tag CGI & DCC!

For more information or additional support with STEM activities when working remotely, contact **enquiry.uk@cgi.com**