

Teacher Notes

Six for Six features 6 sets of complementary resources and/or activity suggestions aligned to curriculum requirements for KS2 & 3 STEM subjects using real-world examples of Siemens technology, engineering or manufacturing principles as basis for learning.

Teachers are invited to select one or more suites of Six for Six materials to be used at their own discretion over the course of a half-term or term.

Each set of six includes:

- Comprehensive teacher notes
 - Introducing and providing an overview of key learning objectives for the six resources and/or activity suggestions
 - Curriculum matrix including learning outcomes
 - Recommendations for when and how to use the resources
 - Links to additional learning opportunities and events associated with the STEM learning framework and calendar
- Six, curated lesson plans, films, interactive learning tools, workshop or challenge event activity suggestions each linked to the other to repeat and reinforce learning opportunities

Download here

Module 1: Understanding the body and how it works – using and interpreting images to understand systems such as digestion and skeletal in the human body.

Module 2: Living in a world made by STEM – looking at the changes made to the world around us by developments in science and technology.

Module 3: Energy for thrills – seeing how the concept of energy transfer can help us make sense of everything from rollercoasters to double deck buses.

Module 4: Power to the people – the quality of our lives depends upon a reliable and cheap supply of energy. This needs to be achieved without damaging the environment however.

Module 5: Getting around – transport systems are crucial to modern life but need careful planning and operation to be fit for purpose. Thought needs to be given to the technology used, organisation and energy sources.

Module 6: Building the things we need – manufacturing skills are crucial to providing the products we need but they also provide jobs and develop skills. Manufacturing uses scientific ideas, logical thinking and an understanding of the wider world.



Module 2: Living in a world made by STEM

Introduction

Technology is a powerful force for change. Inventions and developments can have a significant impact on the lives people live and sometimes in ways that were not easy to predict. Many adults can point to innovations that have affected the way they live aspects of their lives and also express points of view as to whether or not this has been a good thing. Pupils however may have a limited understanding of the way in which the world has changed in the last hundred years or so and how, in many ways, these changes have been more extensive and far reaching than in any such previous period. Furthermore, they may not see how technology is a key driver for change.

There have been many changes in society that technological developments have made possible. The purpose of the sets of materials is not only to identify these but also to promote discussion and debate as to the pros and cons of these developments.

Educational context/curriculum links

This suite of materials is designed to support teaching over a period of time. The resources are gathered together here for sake of convenience but there is no expectation or suggestion that they be used consecutively. Rather the idea is that as and when the topics arise in schemes of learning that the resources are accessed and deployed.

Subject references:

Technology

- develop the creative, technical and practical expertise needed to participate successfully in an increasingly technological world
- critique, evaluate and test their ideas and products and the work of others
- understand how key events and individuals in design and technology have helped shape the world

Overview of assets

Type of resource	Title of resource
Lesson plan and activity suggestions	Clean silent trains
Interactive learning tool	Life without STEM
Digital Badge reward	Technology
Lesson plan and activity suggestions	Words along wires
Lesson plan and activity suggestions	Let there be light
Lesson plan and activity suggestions	Bus activity
Links to careers and employment opportunities	Early Careers



Rationale

The key idea with the activities is to get pupils thinking about the difference that technology has made to our lives. There are some technologies that we now take for granted that are, in fact, relatively recent developments. It is also important for pupils to realise that behind such changes there are decisions that have been made about the best solution to a problem.

These problems may require quite different skills to address them effectively. The decision might be based on competing technologies and require an understanding of each of those approaches or it might be based on logistics and organisation.

1. Lesson plan: Clean silent trains

Clean Silent Trains

Within the overall context of exploring the impact that various technologies have on people's lives, this set of activities uses the context of rail travel. It starts with setting the scene with the changing style of rail travel, comparing a journey from the late 19th century on a steam train with one using electric traction, thus introducing the application of the electric motor. Other applications of motors are then explored, including domestic appliances and in cars, leading up to the Volks Electric Railway (the world's oldest operating electric railway).

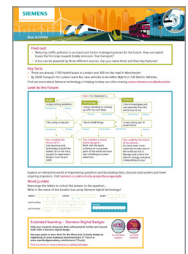


The learning activities then move into planning an operational sequence on the railway, which applies mathematical ideas to calculating speed, scheduling a timetable and comparing different organisational arrangements.

2. Independent study:

Bus Activity Worksheet

These ideas can be reinforced with home-based study following up on the themes of construction and transport using the bus activity sheet. Pupils could be asked to use the sheet to construct a model bus and to find out what is meant by 'hybrid technology' in the context of powering (the full size version of) such a vehicle.

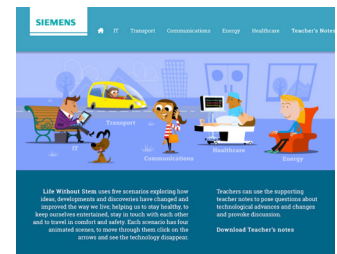


It may also be appropriate to make use of the [SeeWomen case studies](#), to highlight ways in which a number of women have worthwhile careers in STEM areas.

3. Interactive learning tool: Life without STEM

Interactives

This resource presents pupils with a series of scenarios in animated cartoon form. In each case there is a sequence of images and pupils are asked to suggest how the way in which technology has changed has made a difference to the people affected. Various questions are suggested and the overall intention is to get pupils to think about the impact made, which may not always be a positive one.



The resource is open access; it may be appropriate to suggest to pupils that they use this at home and discuss with other family members (including, if possible, older generations) to elicit their ideas and reactions.

4. Digital Badge reward: Technology

Digital badges

This digital badge is based on the use of the resources to explore the pros and cons of various technological innovations; it can be applied to a wide range of contexts.





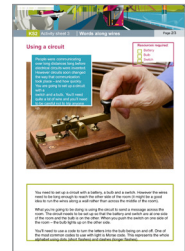
5. Lesson plan: Words along wires

Words along wires

This set of activities starts by asking pupils to consider and suggest various ways in which information could be transmitted across the room and comparing these. It then goes on to suggest activities that can be done to explore three of these – light, signs and circuits. These include practical investigations so that pupils can see how they work, comment upon their pros and cons and suggest how well they could scale up to working over longer distances.

There is a suite of supporting resources that suggest details and also tasks and questions that can be used to provide a focus.

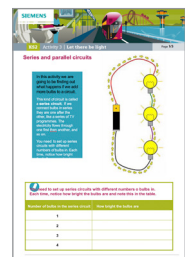
The overall intention is to see that different technologies offer solutions to problems and that a key challenge for people is to make critical and informed decisions.



6. Lesson plan: Let there be light

Let there be Light

These activities centre around the challenge of making electricity. Pupils are likely to appreciate both how versatile and how invaluable electricity is but may not have many ideas as to how it can be made. The starting point is a high crank generator (such as a wind up torch) then, having established that movement is necessary, looks at other ways of driving a generator, such as from flowing water. This is then extended to looking at circuits and ways of connecting bulbs. There is scope for practical work and demonstrations here to prompt ideas, questions and discussion.



Best teaching practice

There are various ways in which the resources can be used effectively but there are some key components that should be maintained.

The first of these is developing an understanding of different devices and understanding how they work. Encourage pupils to ask questions, (where possible) try ideas out and develop an understanding of how the device works. This then enables pupils to progress to suggest applications and modifications.



Secondly, pupils need to apply skills and concepts from a number of different areas of the curriculum to come up with solutions. Scheduling the rail system in Clean Silent Trains for example needs calculations, but it also needs the skill of comparing solutions and with applying these to a context involving people. Understanding how generators are used involves consideration of how to use materials but also the exploration of simple circuits.

Thirdly, there needs to be a questioning approach towards uses of technology. The examples are often ones that represented a step forward and would have been well received at the time but even they had a downside. Electric trains need fewer staff than steam trains and electric lights don't need the cleaning that gas lights would have done.

Links to careers and employment opportunities

Although it will be some years before pupils make crucial decisions about subjects they study at school, research shows that they often form attitudes towards STEM subjects at an early stage. It is useful if early interest can be nurtured and if pupils can be supported to see themselves as potentially being active in this area. For aligned resources relating to STEM careers see 'Raising Aspirations, Inspiring Futures' developed in collaboration with the Personal Social Health Education (PSHE) Association at [See Women](#)

Find out more at [Siemens Early Careers](#)

Further reference

Each of the contexts here is based on real life examples. If pupils are interested it is easy to find out more online.

Volk's Electric Railway runs for a mile along the seafront at Brighton and has carried passengers since 1883: the Volk's Electric Railway Association website has details of the history.

Cragside is owned by the National Trust and still contains examples of the original electrical system. As well as the pioneering use of hydroelectric power, it made use of the then revolutionary Swan incandescent light bulb. It was one of the first private residences to have a vacuum cleaner, dishwasher and washing machine. The Wikipedia entry has details and pictures.

Morse code was used extensively for many years and played a vital role in wartime communications and in maritime rescue. Its use is now more limited but it is still used by enthusiasts.

Pupils may be interested to see other examples of early technology - especially when it is within the lifetime of living relatives. Images can be sourced using an internet search and could include the first:

- TV
- mobile phone
- microwave oven
- computer
- fridge
- vacuum cleaner

What is also important, is not just to look at the images but consider how progress has been made and maybe, in some cases, if there is a downside.



For additional modules, visit www.siemens.co.uk/education

Suite No.		1	2	3	4	5	6
Phase		Primary	Primary	Secondary	Secondary	Secondary	Secondary
Focus		STEM	STEM	Science	Design Technology	STEM	STEM
Module:		1	2	3	4	5	6
Title		Understanding the body and how it works	Living in a world made by STEM	Energy for thrills	Power to the people	Getting around	Building the things we need
Asset #1	Lesson plan and activity suggestions	The human body - skeletal muscular system	Clean silent trains	Formula for thrills	E-zero Island	Inspired bus company	Keeping it lean and mean
Asset #2	Lesson plan and activity suggestions	The human body – digestive system	Bus activity sheet	Monte Rosa Mountain Hut	Interactive learning tool. Energy Island	Green power challenge	Totally in control
Asset #3	Interactive learning tool	Inside the Human Body	Life without STEM	Formula for thrills	Siemens Farm	Self driving challenge	Lean machines
Asset #4	Digital Badge reward	Curiosity	Technology	Rollercoaster challenge	Energy Challenger	On the move Challenger	Mechatronics Challenger
Asset #5	Lesson plan and activity suggestions	The human body – circulatory system	Words along wires	Here comes the Sun	Blowing in the Wind	Ringing true	A case to resolve
Asset #6	Lesson plan and activity suggestions	More than skin deep	Let there be light	Blowing in the Wind	Underwater Energy	A case to resolve	Sustainability