

science within work

resources pack





Place the CD ROM in your disc drive. If you are using Microsoft Windows then the disc will auto-run. If you are using Mac OS then double click the 'FutureMorph' icon to open the folder, from there double click the 'LAUNCH CD' icon.

If you have any problems accessing the resources on the CD ROM then please visit www.futuremorph.org to download the files.



introduction

Many young people do not see science or maths as useful and think that studying science related subjects leads to a life in a lab wearing a white coat. This multi-media learning resource shows that a science education doesn't narrow their career choices. Rather, it broadens their horizons.

Science, technology, engineering and mathematics (STEM) are used in all sorts of jobs. Some have an obvious connection with STEM – they may require specific qualifications or training, or use scientific techniques and knowledge. Others have a less obvious link – employees may not be aware they are *using* science learning or skills. Such jobs demonstrate how science and maths are all around us.

This resource is part of a larger project which includes the Future Morph website, www.futuremorph.org. The website is designed to help 11-19 year olds explore the opportunities science and maths can offer and to support teachers, parents and careers staff. We hope to encourage young people to engage with the science and maths they study and see the value of the subjects.

This resource is designed to help you use the world of work as a context for your teaching and help your pupils see the relevance of STEM to their future.

On this disc (and on the website) you will find:

- Ten short (~ 4 minute) videos featuring interviews with a wide range of people from a variety of employment areas ('themes').
- A practical activity linked to each video. These are for 11-14 year olds and mapped against the Key Stage 3 Science Programme of Study and the Scottish equivalent. They bring workplace science into the classroom and contextualise pupils' learning.
- A list of career contexts to provide you with examples to use throughout your teaching with all age groups.
- An adaptable presentation to use to promote science and maths in your school or college particularly when students are making qualification choices.
- Two sets of assembly materials which can be used in different ways, such as, role plays for students or a simple speech.

how to use the CD ROM

On the disc you will find a short introduction screen and from there you will access the main menu. This screen grab shows how the various resources are presented to you.

The themes are colour coded

- Nature
- Entertainment & culture
- Leisure & lifestyle
- Education & communication
- Business & industry

A description of what the videos and activities contain for each of the featured jobs can be found on pages 6–10 of this booklet.

Assembly materials and other teacher tools are listed here below the ten featured jobs.

For information about: the Assembly materials, the Options presentation and the Career examples list see page 11.

TOPIC FEATURED JOB	RESOURCE	DESCRIPTION
▶ Nature:		
Chief scientific officer	Video case study Activity info [pdf]	Conservation for birds of prey... more > ACTIVITY: Measuring animal population
Weather forecaster	Video case study Activity info [pdf]	Uses of weather forecasting... more > ACTIVITY: Use of pressure in... more >
▶ Entertainment & culture:		
Theatre technician	Video case study Activity Info [pdf]	Building and moving theatre props ACTIVITY: Using pulleys to lift loads
▶ Leisure & lifestyle:		
Glass artist/Jewellery designer	Video case study Activity info [pdf]	Using kilns to fire glass... more > ACTIVITY: Metal compounds ... more >
Bakery manager	Video case study Activity info [pdf]	Being a food scientist, ... more > ACTIVITY: Properties of packaging
Physiotherapist	Video case study Activity info [pdf]	Working in football, bones in... more > ACTIVITY: Measuring fitness... more >
▶ Education & communication:		
Primary school teacher	Video case study Activity info [pdf]	Importance of making science... more > ACTIVITY: Designing experiments... more >
Science journalist	Video case study Activity info [pdf]	Range of writing, travelling to... more > ACTIVITY: Investigating current... more >
▶ Business & industry:		
Timber framer	Video case study Activity info [pdf]	Designing and building frames,... more > ACTIVITY: Properties of different... more >
Client development manager	Video case study Activity info [pdf]	Working in business sales,... more > ACTIVITY: Building a database... more >
▶ Assembly material:		
Swimsuit technology	Assembly notes	Speech, presentation and role play
Forensic science	Assembly notes	Speech and presentation
Options presentation	Presentation [ppt]	Why study science or maths?... more >
Career examples list	Teacher notes [pdf]	A list of ideas, ordered by area... more >

	SUBJECT(S)	CURRICULUM	select down loads
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RESET CHECKBOXES | DOWNLOAD SELECTION

Play the videos

You can choose to play the video directly from the disc, just click the arrow icon to launch the video player.



Alternatively you can choose to download the video to your desktop – the file will be downloaded as a Windows Media video.

Preview the documents

Before deciding what you might want to download you can also preview the Adobe Acrobat (PDF) documents or Microsoft PowerPoint (PPT) files directly from the CD by clicking this icon.

Download the files

To choose the files you wish to download simply tick the check box buttons in the 'select downloads' column.

Once you have made your selection click the arrow button named 'Download selection'. You will be given the opportunity to decide where to save the downloads.

how to use the videos and activities

Each of the ten sets has three components:



video



practical activity



associated jobs activity (spider diagram)

Each theme is intended to be taught over one, two or three science lessons, following the simple pattern:

watch video – carry out practical – complete spider diagram

However, this is not a rigid structure that must be adhered to. You could, for example:

- choose to show more than one video to demonstrate the breadth of science in the workplace
- use a video to introduce a different topic or activity
- carry out the associated jobs activity directly after watching the video, or in a separate lesson.

And the resource doesn't have to be used in science lessons. The various components could be a useful addition to careers lessons, maths lessons or personal, social and health education (PSHE).

Notes:

Pupils with special educational needs (SEN) or with English as a foreign language (EFL) may need more guidance, or more lesson time to complete some activities.

If you are teaching the Scottish curriculum: Some detailed instructions may limit opportunities for pupils to attain higher level targets. Teachers may wish, for example, to take out the tables for recording results before handing out worksheets.

the teacher notes

Extensive teacher notes are provided for each set. They include five sections:

1. Curriculum links

This shows where the activities can fit with the 2008 KS3 Programme of Study and the Scottish 5-14 Science Curriculum.

2. The Video

This provides a synopsis of the video and suggestions for engaging the class before and after viewing.

3. The Practical

Here you will find **equipment lists** and **health and safety** guidance, as well as the **underlying science** and a **possible approach** (suggestions for introducing and managing the practical session).

4. Possible extensions

This section provides possible extension activities, including ideas of how the video could be used to introduce other topic areas.

5. Associated jobs

This resource brings workplace science into the classroom. But it can't cover all jobs! So, for each theme we suggest a spider diagram exercise. By placing the featured interviewee at the centre, you can encourage pupils to think about the numerous associated jobs and then discuss which need science skills. The further the spider diagram branches out, the wider the range of jobs. Pupils will see that, through lines of communication and working together, science permeates a huge range of careers.

And if you'd like more ideas for contextualising your science lessons, there is a list of *Career examples* given on this disc and available through **www.futuremorph.org**.

the pupil sheets

The pupil sheets all vary slightly but, generally, provide a brief introduction to the activity and how it relates to the video, followed by step-by-step instructions.

the themes

The activities have been chosen to give a spread across biology, chemistry and physics but the videos often touch on other areas of science. They could, therefore, be used to introduce other topics. Furthermore, many of the activities lend themselves to cross-curricular work.

The ten activities and videos have been given themes which relate to sections of *My Future Finder* on the Future Morph website where additional material on the range and impact of science and maths can be found.

theme: nature

1. Featured job: Chief scientific officer, Hawk Conservancy Trust

Practical activity: Investigate capture-mark-recapture method

Video could also be used to introduce

- variation in living things – differences between raptors and other birds, and between species of raptor, related to their particular environmental niches
- interdependence of living things – Campbell mentions that changes in raptor populations indicate changes lower down the food chain



- investigating behaviour – Campbell talks about the importance of studying raptors in the wild
- human influences on the environment – effects of farming practices on raptors, contrasting past decline with more recent recovery.

Cross-curricular opportunities

History: hunting with hawks etc. for sport and to catch food

Geography: raptor habitats in the UK and worldwide

Maths and IT: collecting and analysing data

2. Featured job: Weather forecaster



Practical activity: Investigate air pressure

Video could also be used to introduce

- use of measuring equipment and units
- data collection and manipulation – Chris mentions observers who pass weather measurements to the Met Office
- studying patterns in scientific data to make predictions.

Cross-curricular opportunities

Geography: La Niña (mentioned by Chris) and El Niño

ICT: automatic sensing equipment; data transmission and analysis; computer modelling

theme: entertainment & culture

3. Featured job: Theatre technician

Practical activity: Explore the use of pulleys to lift heavy objects

Video could also be used to introduce

- properties of materials – Suresh points out that scenery with a steel frame may be lighter than a wooden one, despite density
- the role of science in an arts-based organisation
- the importance of planning, design and use of data (e.g. material properties) – Suresh discusses designing stage scenery, taking into consideration how to move it, and where to store it off-stage.



Cross-curricular opportunities

Drama, art and CDT: designing a set for a school production, including choice of materials and construction methods

Maths: calculating areas of flats, volumes of props and storage space required

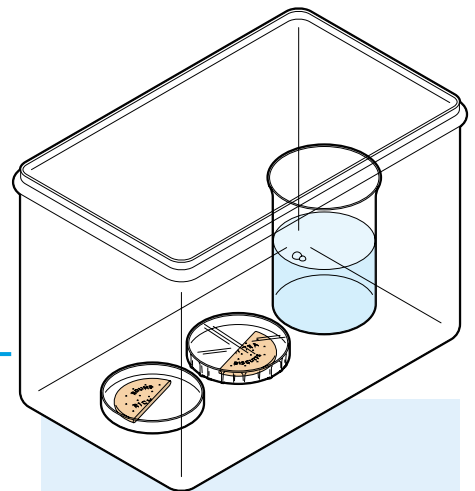
theme: leisure & lifestyle

4. Featured job: Bakery manager

Practical activity: Compare the effectiveness of packaging materials

Video could also be used to introduce

- concept of quality control – Emma discusses:
 - ▶ starting materials and products
 - ▶ accurate measurement of quantities
 - ▶ importance of size and thickness for perfect cooking
- role of packaging as a barrier to contamination and water vapour
- hygiene (in medical situations as well as food preparation)
- use of science in local authority monitoring – Emma mentions environmental health inspectors and trading standards.



Cross-curricular opportunities

D&T/Home Economics: effects of varying ingredient quantities and rolled-out thickness when baking biscuits

CDT and IT: designing food packaging

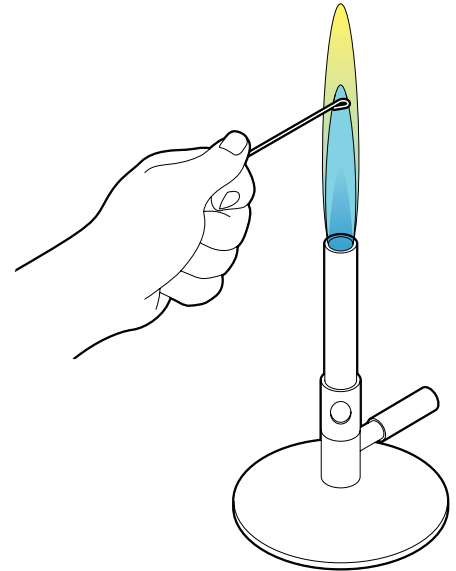
theme: leisure & lifestyle

5. Featured job: Glass Artist/Jewellery designer

Practical activity: Make and colour borax glass beads

Video could also be used to introduce

- properties of materials – Nina compares effects of heat on glass and ceramics (melting point, coefficient of expansion, need for annealing)
- light and colour, reflection and transmission – Nina shows a sample of dichroic glass
- colour mixing – compare and contrast overlaid glass (or coloured stage gels) with paints, printer inks and TV screen phosphors
- controlling equipment – Nina talks about programming her kilns.
- importance of maths and science even in an arts business



Cross-curricular opportunities

Art: designing a coloured glass panel – and possibly constructing out of coloured tissue paper/ plastic film, overlaying to create extra colours

History/cultural understanding: invention/discovery of glass and colouring methods

CDT: methods of mounting glass jewellery in metal

IT: computer control of equipment

6. Featured job: Physiotherapist

Practical activity: Conduct physical fitness tests

Video could also be used to introduce

- wider aspects of physiological measurement, body development and natural variation
- links between health and lifestyle
- body systems (skeletal/muscular, cardiovascular) – Nick points out the commonly-broken metatarsals.



Cross-curricular opportunities

PE/Sport: survey of sports injuries, and their relative incidence, how physiotherapy helps

theme: education & communication

7. Featured job: Science journalist



Practical activity: Investigate filament light bulbs and write an article

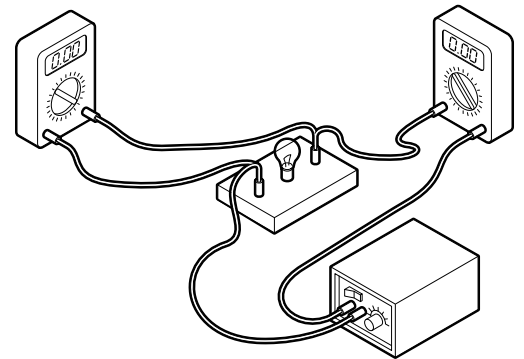
Video could also be used to introduce

- the wide range of topics that involve science – Helen discusses diverse examples
- usefulness of familiarity with wide-ranging aspects of science – enables Helen to pick up on potentially interesting stories
- communication and note-taking during investigations – discuss what methods Helen might use.

Cross-curricular opportunities

English (listening and writing skills): research a science article by talking to a scientist; then write it up for a specified audience

Art/IT: range of scientific knowledge required to produce illustrations for publications and special effects for films



future morph
become someone

activity sheet 13

theme education & communication
job: Tim Gadd, Key Stage 3 Teacher, St George's Primary School

In the video, Tim talks about teaching science in primary schools. He says that practical work is important because it's enjoyable. He also says it's best if practical work relates to everyday life.

Procedure

Developing a primary science lesson

Your task is to think up, then try out, a science lesson for 10-year-old primary pupils. The lesson should involve about 45 minutes' practical work for a group of three pupils.
Remember, primary schools have no science labs and only limited equipment. It is often possible to use simple everyday items instead.

1 Choose one of the following topics:

- A How to tell the difference between metals and plastics
- B Ways to separate various mixtures of two substances
- C Why the moon appears to change shape over a month
- D Identifying creatures found in pond water

2 Discuss the types of experiments or investigations that 10-year-olds could do with limited equipment.

3 Choose four simple experiments that they could do in about 45 minutes:

- one experiment for each pupil to do individually – three in total
- a fourth one for them to do together

Continued >

8. Featured job: Primary school teacher

Practical activity: Devise a lesson for primary school children

Video could also be used to introduce

- how science helps us understand everyday happenings – Tim asserts this, and applies it in his teaching
- the idea that there are science aspects of many other subjects.

Cross-curricular opportunities

Citizenship: the role of parents in education the importance of science education

Human geography/Multiculturalism: education in other countries

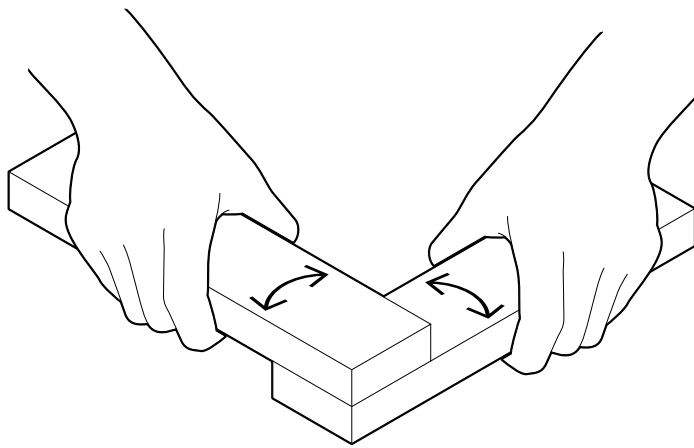
theme: Business & industry

9. Featured job: Timber framer

Practical activity: Test properties of different types of wood

Video could also be used to introduce

- advantages/disadvantages of natural and man-made materials
- the importance of accurate measurement and processing
- use of measurements including angles
- type, direction and size of forces – Marc mentions calculating load at the design stage.



Cross-curricular opportunities:

CDT: help with wood samples and/or equipment for the practical using a CAD program (Mark mentions design of timber joints)

History: comparison with traditional timber-framed buildings

10. Featured job: Client development manager

Practical activity: Create a database

Video could also be used to introduce

- importance of collecting and recording data from investigations
- principles for deciding data required, and format for recording it
- importance of team work and sharing information – Henry talks about the rest of his sales team.

Cross-curricular opportunities:

ICT: access to computer network required pupils also need prior knowledge of databases

Maths: formulae for calculations to be performed in database cells

Geography: collecting data about the population



also available on the CD ROM...

Assembly materials

An assembly can raise the profile of science in your school, and help pupils recognise the roles of science in society. The assembly materials provided here aim to help pupils become more aware of the role of science in their lives and their need for scientific understanding in the world outside school. The two sets can be used in different ways, such as, role plays for pupils or a simple speech.



Options – adaptable presentation

An adaptable presentation to use to promote science and maths in your school or college particularly when students are making qualification choices. The presentation covers reasons for studying science and maths, the skills they develop and some case studies. It also provides a template for you to explain the GCSE or Standard Grade options.



Career examples list – teacher notes

A list of career contexts to provide you with examples to use throughout your teaching with all age groups. The list is broken down into six areas of science each with a series of job examples and the science topics they link to. These can be used to provide examples at any time and we have left space for you to record any ideas of your own.

website

The Future Morph website will be regularly updated with more resources and ideas for you and your pupils to explore. Sign up through the website for updates and to be notified when new material is added.

We hope you find this resource useful and if you would like to send us feedback please email: **futuremorph@sciencecouncil.org**



With thanks to:

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