Scientific careers and skills

Teacher support guide

ROYAL SOCIETY OF CHEMISTRY

Available from: rsc.li/3lp3ER2

Career support materials

What are they?

The careers support materials have been designed to help your learners understand essential skills for the world of work and to explore the many different types of career that use scientific skills. There are three types of resource supplied:

- career fact files
- skills card sort
- career poster.

This teacher support guide gives ideas and support for using the different resources within your classroom teaching for different age ranges: 4–7 years, 7–9 years or 9–11 years. It doesn't provide detailed lesson plans.

The support ideas that follow also highlight opportunities to practice literacy and numeracy as well as wider working scientifically skills, DT and IT.

How do I use them?

There is no right or wrong way to use the careers resources. We recommend the following ways, and there are lots of good ideas in the pages that follow:

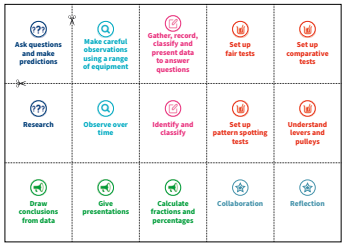
1. **To support you in teaching about careers through engaging science-based contexts.** If you come to the careers resources with your specific topic in mind, the resources will highlight areas of science that you could link to. If you're in this situation, you have the flexibility to choose the scientific context that fits best with your topic.
2. **To support you in teaching science with careers as a 'hook'.** If you come to the careers resources with a focus on your science teaching, the resource will provide ways of introducing careers into the science topics or to give a 'hook' for the topic.
3. **To support you in planning a whole school or whole year group focus on careers.** If you come to the careers resources with a focus on careers, either across the school or within a year group, the resources will support you in finding activities appropriate for each age group.

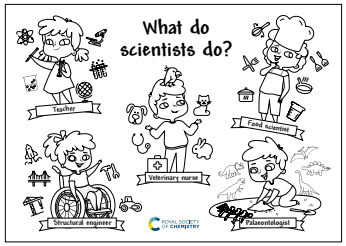
How does each resource work?

The **career fact files** give learners information about different careers linked to curriculum topics and the skills needed for each job. We have provided two versions. One has less text and will be suitable for use with learners who need support with language.

The **skills card sort** is a game learners can play to discuss and agree on the most important skills for different jobs.

The **career poster** is a set of two posters you can use to help learners visualise themselves in a range of scientific careers.





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Further ideas

These career resources provide opportunities for activities around careers that link to primary science and the wider curriculum. There are also many other ways that you can embed careers into your primary curriculum, for example:

- Embed careers within your long-term planning.
- Encourage people to come in to speak to students, eg parents/carers, local community, STEM ambassadors.
- Ask students to draw a scientist and identify possible misconceptions.
- Each year group could be linked to an industry, eg farming, vets, medicine or food science, so by the time learners leave school they have an idea of six different industries.
- Create a careers corner with posters/information/displays.
- Apply for the Careers Mark: https://complete-careers.com/career-mark/
- Use 'Mantle of the Expert' as a teaching technique which uses imaginary contexts to generate purposeful and engaging activities for learning: https://www.mantleoftheexpert.com/what-is-moe/
- Use story books to introduce careers or to base a lesson around, eg 'The City of Ember' links to the electricity topic or 'Flat Stanley' links to medical careers.
- Run a careers week, inviting visitors, or have them record videos explaining their job and science's importance.
- For each unit of study/every half-term, each year group could focus on a related scientist (a key scientist) and then find out about them and use that as a hook for investigations.
- Dress up in the career you have studied.
- Use morning tasks which focus on the careers as learners enter the classroom.
- Link careers work to the Maths – Money unit, where learners spend a day in a career and set up a business, eg set up a farmers' market. This could also link into D&T making (for example) food or items to sell at the market.

Skills checklists

These checklists of skills can be used alongside any of the career resources and also used independently within your careers teaching. For example, you could use them to:

- ask students to carry out a 'skills audit' before you start any of the careers activities supplied, looking at what they consider to be their own strengths and weaknesses or the things they enjoy most or least. See the following page for learner-facing versions of these lists
- ask students to review the skills checklist after carrying out a working scientifically task, ticking off the skills they felt they used in that task
- put learners into small groups, and assign each group a different skill or set of skills from the checklist, then ask them all to design an experiment or part of an experiment to answer the same question using those skills.

Age 4–7

For this age group, the scientific skills to consider are:

- asking simple questions
- making simple predictions
- observing closely
- identifying and classifying
- performing simple tests
- suggesting answers to questions using observations and ideas
- gathering and recording data.

Age 7–9

For this age group, the scientific skills to consider are:

- asking questions and making predictions
- making careful observations using a range of equipment
- gathering, recording, classifying and presenting data to answer questions
- setting up practical enquiries, comparative and fair tests
- drawing conclusions from data.

Age 9–11

For this age group, the scientific skills to consider are:

- asking questions and making informed predictions
- planning and setting up different types of scientific enquiry to answer questions, including identifying and controlling variables
- making systematic and careful observations and measurements using a range of scientific equipment with increasing accuracy and precision using a range of equipment
- gathering, recording, classifying and presenting data using an increasing range of ways, including diagrams and labels, classification keys, tables and graphs.

All age groups

Learners could also consider other learning behaviours, such as:

- collaboration
- concentration
- curiosity
- exploring
- having a go
- problem solving
- reflection
- resilience
- resourcefulness.

Skills checklists – for learners

These versions of the skills are designed to be suitable for learners to use themselves.

Scientific skills age 4–7

- ☐ Asking questions
- ☐ Making predictions
- ☐ Observing carefully
- ☐ Identifying
- ☐ Classifying
- ☐ Performing simple tests
- ☐ Suggesting answers to questions
- ☐ Gathering data
- ☐ Recording data

Scientific skills age 7–9

- ☐ Asking questions
- ☐ Making predictions
- ☐ Observing carefully
- ☐ Identifying
- ☐ Classifying
- ☐ Performing simple tests
- ☐ Suggesting answers to questions
- ☐ Gathering data
- ☐ Recording data
- ☐ Using equipment
- ☐ Presenting data
- ☐ Setting up practical enquiries
- ☐ Setting up comparative tests
- ☐ Setting up fair tests
- ☐ Drawing conclusions from data

Scientific skills age 9–11

- ☐ Asking questions
- ☐ Making predictions
- ☐ Observing carefully
- ☐ Identifying
- ☐ Classifying
- ☐ Performing simple tests
- ☐ Suggesting answers to questions
- ☐ Gathering data
- ☐ Recording data
- ☐ Using equipment
- ☐ Presenting data
- ☐ Setting up practical enquiries
- ☐ Setting up comparative tests
- ☐ Setting up fair tests
- ☐ Drawing conclusions from data
- ☐ Identifying variables
- ☐ Controlling variables
- ☐ Making accurate and precise measurements
- ☐ Presenting data using diagrams and labels
- ☐ Using classification keys
- ☐ Using tables and graphs

Other learning skills – all age groups

- ☐ Collaboration
- ☐ Concentration
- ☐ Curiosity
- ☐ Exploring
- ☐ Having a go
- ☐ Problem solving
- ☐ Reflection
- ☐ Resilience
- ☐ Resourcefulness

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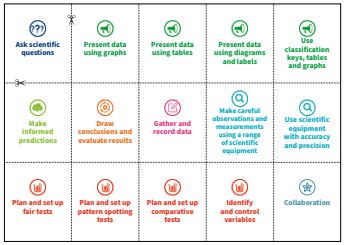
Skills card sort game

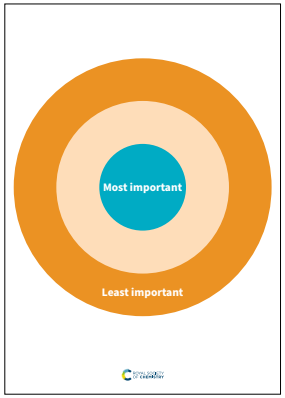
How to use in the classroom?

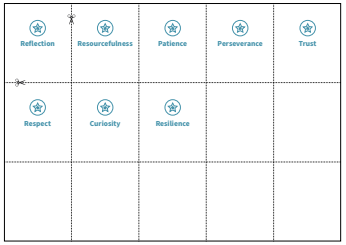
- Start by giving your learners the skills cards appropriate for their age group.
- Discuss the skills listed and ensure all learners understand what is meant by each skill.
- Put learners into small groups, each with a set of skills cards and a target.
- Start the slides, showing the first image. You will probably need to talk through the first example with the class, ask them what skills do they think are most/least important for that career and why. Ask them to place the skills cards in the appropriate place on the target (middle for most important, outside for least important).
- Then give them 5 minutes to look at each slide and do the same for each career.
- You could get groups to capture each target using a camera.
- At the end you could ask:
  - Were there some skills that were important to lots of careers?
  - Where there any skills that weren't important at all?
  - Which career did they think they might be interested in?
  - Which skills did they think they are best at?
- Use a diamond nine type approach to sort the skills cards into most to least important and record this in their books.

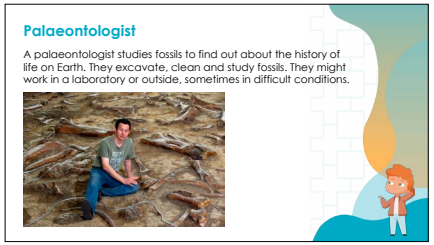
What materials are provided?

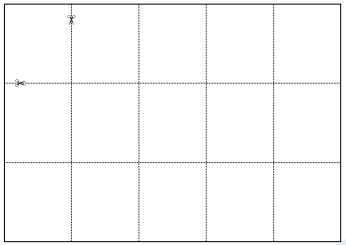
- A4 'target' – ensure there is one per group
- Skills cards – one set per group
- Slides of different careers (pictures and titles)











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Age 7–9, 9–11

Career posters

How to use in the classroom? Age 4–7

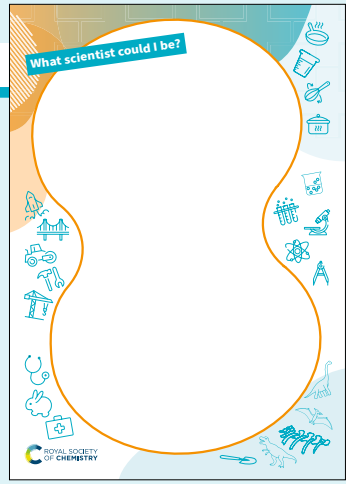
- Give each learner their own colouring in poster.
- Talk briefly through the different characters in the poster and make sure learners know what each of the careers shown is.
- Before they start colouring in, you could talk as a class about the different careers and ask them what sort of skills (you could use the skills cards here) would be helpful for the different roles.
- Give learners time to colour in the characters.
- The class could then discuss which one (or more) of the careers looked most interesting to them.
- The poster could also be a good home learning item for learners to discuss with parents and colour in.
- You could then create a display with the finished posters.
- You could use the completed posters to play games such as:
  - **Taboo:** learners pick a career and describe it without naming it.
  - **21 questions:** one learner selects a career and others ask questions to guess which one it is. Only yes/no answers are allowed.
  - **I-spy:** instead of giving the first letter as a prompt, give a piece of equipment or clothing the person needs, and other learners have to guess which it is.

What materials are provided?

- Two posters for different age groups
- Colouring in side: age 4–7
- Draw yourself side: age 7–9

How to use in the classroom? Age 7–9

- Give each learner their own draw yourself poster.
- Talk about the different types of careers they can think of that use science, using the prompts on the poster or the work you have already done on careers.
- Ask learners to draw themselves in the space in the middle, doing a job they think would enjoy or be good at. Prompt them to include clues about the career they have chosen such as clothes or equipment.
- The class could then discuss why they chose that career and what skills they have that mean they'd be good at it.
- The poster could also be a good home learning item for learners to discuss with parents.
- You could create a display with the finished posters.
- You can link this work in with drawing self portraits within your curriculum planning.



Career fact files

How to use in the classroom?

- Use them as a hook within a science topic lesson (eg introduce the broad topic, look at the career fact files for jobs linked to the learning of that topic, then move into teaching the topic content).
- Use them to teach a lesson on careers, looking at different careers and the type of skills you need for each one.
- Use them to teach about skills alongside the skills cards. You could ask students to conduct a 'skills audit' before then looking at the career fact files and identifying a range of careers that interest them and use their personal skills strengths.
- Use them as a hook for a theme of learning across the curriculum. For example, you could use the fact files to learn about careers within the states of matter topic and then expand this across your teaching within English, D&T, maths and geography.
- Use them to develop lifelong learners who seek to develop their learning skills.
- Use them to develop personal bests.
- Use them for learners to generate questions and lead their own enquiries.

Curriculum links

Age 4–7

- Everyday materials

Age 7–9

- Rocks and soils
- States of matter

Age 9–11

- Properties and changes of materials

What materials are provided?

- Four fact files (with two versions of each) focused on different careers linked to the topics:
  - Everyday materials (years 1 and 2)
  - Rocks and soils (year 3)
  - States of matter (year 4)
  - Properties and changes of materials (year 5).
- We have provided two versions of each fact file. One has less text and therefore would be suitable for learners who need language support.

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On the next pages in this How To guide you will find more detailed suggestions on using each fact file within your curriculum teaching both within science and across the curriculum.

Age 4–7, 7–9

Everyday materials

Introducing the topic

In approaching this topic, learners will develop an awareness that materials make up everything around us. You could kickstart the topic with a huge bag of treasure to hook the learners and encourage vocabulary development.

Inventor

- **English:** Learners could invent their own coat. They could then draw and label it and write instructions for how to use their invention.
- **Art:** Learners could use art to showcase their own invention ideas. They could create their own collages using a range of materials.
- **Book links:** Using *We're Going on a Bear Hunt* by Michael Rosen, learners can go on a material hunt and then create a new version of the story using the materials they've found. Use *Paddington* by Michael Bond as a hook to investigate testing different materials to make Paddington Bear a new 'Macintosh' waterproof coat (linking to the inventor, Charles Macintosh).

Toy maker

- **English:** Learners could invent their own toy. They could then draw and label it and write instructions for how to use their toy.
- **Mathematics:** Learners could order a selection of toys from longest to shortest or heaviest to lightest.
- **History/Computing:** In linking to the History of Toys topic, learners could research materials used in the past to make toys and how it has changed over time. The learners could also create a timeline.

Structural engineer

- **English/Design and Technology:** Learners to design, make and evaluate houses from different materials. This could link to the *Three Little Pigs* and the learners could help them by making a strong and stable structure.
- **English/Design and Technology:** Learners could be given a selection of materials to build a bridge and become a 'structural engineer'. The materials could include classroom resources (eg art straws, glue and card) or outdoor materials (eg sticks, stones and leaves). This could link to *The Three Billy Goats* with the learners building a bridge to offer an alternative route for the goats to get to safety.

Rocks and soils

Introducing the topic

In approaching this topic, refer to the learners as 'geologists' while they study rocks, fossils and soils. There should be opportunities for the learners to discover, handle and investigate for themselves.

Geologist

- **Mathematics:** Learners could use the properties of different rocks to create *Top Trumps* cards. They could then compare, order, classify and find the difference when using the cards.
- **Book links:** *The Pebble in my Pocket: A history of Earth* by Meredith Hooper.
- **Geography:** Learners to investigate rocks in their local area. A local church offers a good opportunity to observe rocks, including those used in buildings and gravestones, and explore how and why they might have changed over time.
- **Art:** Learners could make a cast fossil or an amber fossil.
- **PE:** Learners could develop a dance to showcase the formation of rocks.
- **Computing:** Learners could develop their understanding through research of secondary resources.

Wider Link:

- **Minecraft:** Some learners who have played the game may have good knowledge of rocks such as granite, quartz and obsidian.

Soil scientist

- **Science:** Learners to use their soil knowledge when studying plants. They could run a range of investigations surrounding plant health.

Paleontologist

- **English:** Learners could write narrative or use a comic strip to show their understanding of the journey of a fossil from its original form to being fossilised.
- **Book links:** *Stone Age Boy* by Stoshi Kitamura and *Stig of the Dump* by Clive King.
- **History:** Learners to explore the Stone Age era and look at how rocks shaped everyday life as well as why rocks are so important to offering a gateway to understanding the history of changes in Britain from the Stone Age to the Iron Age. This could link to researching the role of archaeologists too.
- **Design and Technology:** Learners could design, make and evaluate a model Stonehenge. In their journey to making the model, they could investigate a variety of materials to find out which would be best to use.
- **Computing:** Learners could research Mary Anning using the book *Stone Girl Bone Girl: The Story of Mary Anning of Lyme Regis* or the BBC Teach True Stories: Mary Annin: https://www.bbc.co.uk/teach/class-clips-video/true-stories-maryanning/zn7gd6f

States of matter

Introducing the topic

In approaching this topic, ensure learners understand what a solid, liquid and gas is before engaging in sorting activities.

Food scientist

- **English:** Learners to write a critic's test taste review for drinks companies as to how to improve the taste of their fizzy pop.
- **Mathematics:** In comparing and grouping materials according to whether they are solids, liquids or gases, learners could 'go food shopping'. Learners to have a shopping bag and sort the contents into three hoops: solid, liquid or gas. This could include monetary values and link to Maths – Money. Which items are more expensive? Solid, liquids or gases?
- **Geography:** Learners could explore the Mayan civilisation and how they used beans to create chocolate. To go deeper, learners could investigate the trade routes.
- **Art:** Learners to use chocolate to create art. For instance, the learners could melt the chocolate and use a piping bag to create a picture or creatively write their name. They can then observe the changes from solid to liquid and then back to solid. Learners could also create bubble art and think about the different states of matter involved in the process.
- **Design and Technology:** Learners could prepare a dish that includes melting or freezing ingredients such as chocolate. Learners could also design, make and evaluate their own fizzy pop using a range of ingredients and explore which ingredients dissolve.
- **Science/Working Scientifically:** In using the 'Dancing Raisin Experiment', learners could be tasked to think deeply about the skills they are using, and which careers might need to use the same skills.

Nanotechnologist

- **Computing:** Learners could become nanotechnologists in using coding skills. There are various platforms to do this on. For instance:

  https://microbit.org

  https://www.purplemash.com/

  https://hourofcode.com/uk/learn

Medicinal chemist

- **English:** Learners could write their own instructions for how to make potions or medicines.
- **Book links:** *George's Marvellous Medicine* by Roald Dahl and Quentin Blake. *River Story* by Meredith Hooper and Bee Willey.
- **History:** Learners could explore the history of medicine. For instance, the Ancient Egyptians, use of the River Nile, the Ancient Greeks, understanding of the four humours and the Romans, public health.

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Year 4

Career fact files Curriculum links: States of matter

Properties and changes of materials

Introducing the topic

In approaching this topic, it is vital to build upon prior knowledge. Learners in years 1 and 2 will have tested materials. In year 3, they will have done so in relation to properties of rocks and how materials respond to magnets and forces. In year 4, learners will have looked at the conductivity of materials.

Battery researcher

- **Design and Technology/English:** Learners to use different batteries to create a light-up card or object or to power a vehicle. Learners could then write a nonchronological report about their battery-powered design.
- **Mathematics:** Learners could investigate renewable and non-renewable energy sources and display their findings in a Venn diagram.
- **Geography:** Learners can use a world map to identify the major battery-material producing countries.

Physical chemist

- **English:** Learners to write an advert for wrinkle-free cotton, explaining how Ruth Benerito improved cotton products and how it can change your life!
- **Book links:** *The Borrowers* by Mary Norton and *Kensuke's Kingdom* by Michael Morpurgo (see https://www.stem.org.uk/resources/community/collection/341333/kensukes-kingdom-properties-materials) both offer a way to provide meaningful context.
- **Science:** Please visit the following link for more ways to link to physical chemists: https://edu.rsc.org/primary-science/primary-science-videodemonstrations/4013260.article

Colour technician

- **Art and Design/History/English:** Learners could learn how natural dyes can be created from plant materials and make their own natural dyes and use them to dye cotton. From this, learners can create a period outfit for a peg doll and then write an information booklet about medieval clothing and hats for men and women, rich and poor.
- **Art:** Learners to experiment with different dyes and how they change the colour of different materials.
- **Forest School:** Learners to use natural, plant-based dyes (eg turmeric or beetroot) to create tie-dye clothes.

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Year 5

Career fact files
Curriculum links: Properties and changes of materials