**Area of study: 1.1 The skills of scientists (Topic Area 1: What scientists do)**

**Lessons**

| **Lesson number** | **Specification coverage** | **GLH** | **Lesson aims and outcomes** | **Lesson ideas, key words and activities** | **Useful resources** | **Student independent learning – ideas and useful resources** |
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| 1 | 1.1.1 The skills scientists use to carry out research into the natural world and developing new technologies: * **Analysis**
* **Communication**
* **Problem solving**
* **Creativity**
* **Open-mindedness**
* **Scepticism**
* **Logic**
* **Observation**
* **Objectivity**
* **Pragmatism**
* **Curiosity**
 | 1 | By the end of the lesson students should:* + know what each skill involves.
	+ understand how these skills are used by scientists.
	+ know reasons why these skills are important in science.
	+ understand how to recognise when scientists are employing these skills in their work.
 | Start the lesson by asking students to identify any skills that scientists may use. To help students with this, you could: * Show students one or more of the linked videos and ask what type of skills they may have to do those jobs.
* You could also show slides 1-3 on the AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPoint with some job descriptions.
* Ask what type of skills each of the jobs might have in common.

Responses could be provided in a variety of ways (interactive [Mentimeter](https://www.mentimeter.com/features/word-cloud), mini whiteboards, group discussion with answers brought together on the board). The slide of scientific investigations and image of scientist in a lab (AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPoint slides 4-6) could be displayed to prompt this discussion. Display the names of the skills. Discuss the meanings of each of these as a class. Students need to make a note of each of the definitions. Students could also then give an example of how scientists demonstrate each skill. You could model how they might do this, for example: communication – demonstrated by scientists sharing data with each other and sharing their results and conclusions with other members of the scientific community and eventually the public. Students can then spend time individually, as a pair or a group and then during class discussion ranking these as a diamond 9 lab (AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPointslide 8) activity, justifying the reasons why each of these skills are important. Students choose an example of a scientific career from the slides (AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPoint They choose which skills are important and why they are particularly important for that career. Students could choose from the list of jobs available, research them and create their own career fact file - template available ([AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPoint slides 16-18](https://d.docs.live.net/71269cd8e6da3ff2/Documents/OCR%20work/AAQ%20APPLIED%20SCIENCE/Scheme%20of%20learning%20F181%20Science%20in%20Society/1.1.1%20Scientific%20skills.pptx)). Students could extend this by identifying which of the skills are transferrable to other STEM careers (non-research scientists) and/or which are the most common skills required across all the careers displayed. | [What is a scientist? video](https://youtu.be/GfZJlFQNdIU)(youtube.com)[Why is science important? video](https://www.youtube.com/watch?v=iAie37olFaY) (youtube.com)[What is science/ scientists/types of scientists video](https://youtu.be/WcpDN_N2sDA)(youtube.com)AAQ\_Applied\_Science\_F181\_1.1.1 Scientific skills PowerPoint(teachcambridge.org)[Mentimeter word cloud generator](https://www.mentimeter.com/features/word-cloud)(mentimeter.com)A free account needs creating. Students would need access to ICT for this task.There are some videos below which could be shown for students to understand the role of research scientists. [Career Talks: Research Scientist](https://www.youtube.com/watch?v=uRreC41dGz4)[Day in the Life of a Research Scientist](https://www.youtube.com/watch?v=biS7e79xZcs)[A day in the life of an Astrophysicist at Oxford University](https://www.youtube.com/watch?v=XW_qIqLhPkI)[A week in the Life of a UK Biomedical Research Scientist | King's College London](https://www.youtube.com/watch?v=QzyTOYxRo7s) [A day in the life of a museum scientist | Natural History Museum](https://www.youtube.com/watch?v=y5PJO4gLQc8)(youtube.com) | Students could complete summary notes (a mind map or flash cards) summarising the main skills required by scientists and where these are important. Students could also come up with a mnemonic to help them remember the names of each of the eleven skills. Students could also research a particular scientist and their associated discovery /invention and give examples of how each of the skills they have identified in this lesson would be used in that role.  |

**Subject knowledge support for this area of study**

| **Subject knowledge enhancement** | **Details** |
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| **Underlying knowledge and understanding** | At the start of the lesson, students should already know that science involves a range of skills including **creativity** (designing experiments), **observation** (through experiments) and **analysis** (understanding and forming conclusions from experiments) as they will have practised these skills themselves throughout their school science lessons. These will then be built on within this unit of Applied Science where students will learn about the other skills involved such as **problem solving** and how these are required for the **flexibility** and **adaptability** of scientific investigation, as well as how scientists use **logic** and **scepticism** to form **conclusions** based on their own and others’ work.  |
| **Common misconceptions** | Students often think that a research scientist works alone, follows a method independently and achieves a successful result from which they can form an obvious conclusion. It is worth discussing the leap between results and the conclusions of new scientific knowledge). They might think that all science involves wet-practical work or field-work of some kind. Another misconception is that most scientific breakthroughs have arrived through serendipity or accidentally, and not through pain-staking research based on the wealth of accrued knowledge over time. |
| **Key concepts** | Students should know the main skills that scientists require when carrying out research/new development careers. These include **analysis, communication, problem solving, creativity, open mindedness, scepticism, logic, observation, objectivity, pragmatism, curiosity**.Students also need to know how these might be presented within the role of a research scientist, for example, how scientists make observations and obtain results and from this, form a logical conclusion. Alternatively, that the scientists do not get the expected results and have to re-attempt their work having been creative and solved the problems that they faced.Specification point 1.1.1 links to 4.1.1 Communicating science to the public using the media and 4.1.2 Communicating science between experts, as well as 4.4.2 – Bias in science communication.  |
| **Subject knowledge enhancement for teachers**  | Read:[Scientist Skills: Definition and Examples](https://www.indeed.com/career-advice/resumes-cover-letters/scientist-skills) (indeed.com) [Skills for a scientific career](https://www.embl.org/about/info/embl-fellows-career-service/blog/2022/03/skills-for-a-scientific-career/) (embl.org) [Research scientist (life sciences) job profile](https://www.prospects.ac.uk/job-profiles/research-scientist-life-sciences) (prospects.ac.uk)[Career Map: Research Scientist](https://www.energy.gov/eere/wind/career-map-research-scientist) (energy.gov)  |