



Getting people interested in science

Report of pupils' views

to the Science and Technology Select Committee inquiry into Science Communication



Summary

- Views of 58 primary and secondary school pupils are reported, from four focus groups in different schools.
- Lists are given of what pupils understand by the term 'science' and what scientists do, areas of science pupils find most and least interesting, and of the qualities they thought made a good scientist.
- Pupils described what they knew of the scientific method as testing predictions in experiments, checking results by repetition of experiments and investigations, testing through technology and calculations, checking results with others, and assessing theories with others including the public.
- Most (48 out of 58) were already 'very' or 'a bit' interested in science.
- Pupils could be made more interested in science by doing more practical experiments themselves, at a younger age, by teachers following pupils' own interests in science, and by more contact with real scientists and visits to science centres and laboratories.



- **Some pupils are distracted from staying interested in science through others messing about in science lessons.**
- **Pupils mainly heard about science from television news, followed by television science programmes. They also heard through social media, the radio, the internet, at school, and from friends and family.**
- **45 out of 58 voted that they trusted scientists, although most of those only trusted them 'a bit'.**
- **Main reasons for lack of trust in scientists were that they might make mistakes (and have done so with medicines), they can never fully get rid of risks to people, and they do not agree amongst themselves.**
- **People telling the public about science are most trusted when they are talking about science they have carried out themselves. Less trusted are those on television following scripts and talking about science they haven't done themselves.**
- **27 out of 57 pupils were interested in choosing science subjects to study in the future. Many were interested in studying or working in very specific areas of science, rather than science generally.**
- **Some pupils felt pressure to study science as a subject for clever people, necessary for working in many other areas.**
- **Areas of science pupils thought should be banned were mainly those involving experiments on animals, and development of bombs and harmful materials or technology.**
- **Pupils thought the public, either through local science committees or public votes, should have the final say on what scientific projects are carried out and publicly funded, rather than scientists themselves, universities or organisations employing them, or the Government.**



Introduction

1. **This response is made by Pupils 2 Parliament, a project to enable school pupils to consider and feed in their views to parliamentary, national government and national body public consultations and inquiries. The project has been approved by the Clerks of both Houses of Parliament to use the term 'Parliament' in its title.**
2. **Pupils 2 Parliament aims to bring the particular viewpoint of children and young people to those conducting inquiries and consultations - plus the uniquely fresh and often challenging analysis that children and young people bring to the making of decisions and policies.**
3. **The project also aims to give school pupils the opportunity to learn about and consider key decisions being made by parliament, national government and public bodies, and genuinely to participate in democracy by feeding their views into real national decisionmaking.**
4. **Pupils' views are independently gathered through discussions with groups of pupils led by someone from Pupils 2 Parliament, using material from the relevant consultation or inquiry document to explain the issues. We specialise in putting the issues and**



questions even-handedly, without leading pupils in any way or suggesting any responses. All views therefore come spontaneously from pupils, with no adult prompt.

5. This submission reports all pupil views given, without selection, comment or addition. The views in this submission are entirely pupils' own views, and nothing but pupils' views.
6. Views in this submission came from 58 pupils in four focus groups, two from pupils aged 11 to 16 in secondary schools (John Beddoes Campus, Presteigne, and Newtown High School), and two from year 5 pupils aged 9 and 10 in primary schools (Priory Primary School, Dudley, and Quarry Bank Primary School, Brierley Hill).



How do pupils define science?

7. We asked pupils to say what they saw as being “science”. Here (in no particular order) is their list of definitions:

Finding things out - “finding out everything”

“Questions and mysteries”

Testing things

Studying inside the human body

“Researching things that no-one has noticed before”

“Discoveries and opinions”

Biology, physics, chemistry and electricity

Finding out about space

Digging up things from the past and studying them

Finding out facts from objects

The theory of everything

“Experiments and potions”

“Making medicines out of potions”

“Finding reasons for things and theories, reasons why and how things can be explained”

“Study and analysis of everything that is anything”

Discovering something new – “discoveries and creations”

“Going out of your way to discover something new, without doing anything insane”

Doing experiments

“Everything is science”

“Theories, evidence and discoveries”

Working on medicines and atoms

Crafting new things – “creating new”

New formulas

“Creating and testing new technology to make the world easier for everyone”



What do pupils see scientists as spending their time doing?

8. Here is the list of things they would expect to see different scientists doing if they were to visit them at work:

Making things
Making medical cures and potions
Working with electrical equipment
Testing blood to find out what made people ill
Using the internet
Studying fossils
Using a computer
Testing rocks and fossils
Working in a laboratory
Wearing goggles and working with chemicals
Finding out which chemicals make explosions
Looking through a microscope
Testing medicines on rats
Doing experiments
Testing materials from space
Searching DNA
Identifying new species
Checking if things people have said are true and updating information
Looking inside animals
Preparing for a space project
Studying equations
Doing calculations
Checking how well and safely something can be done
Typing and writing reports
Studying the weather
Studying things like sleep and the effects of drinking coffee
Carrying out investigations
Writing on a clipboard
Studying germs and new cures
“Gathering evidence for their point”
“Focusing carefully on different things”.



What sort of person makes a good scientist?

9. This is the pupils' list of answers to this question (again, not in any particular order):

Someone who can multitask
Patience
Ability to look at complicated things and understand them
Being hard working
Being academic
Organisation
Ability to write a good report



Experience
Ambition
Ability to consider a question quickly
Being skilled at what they are to do
Knowing how to find out answers to questions
Intelligence
Enthusiasm
Being interested in your science
Logical thinking
Imagination
Resilience
Being an engineer
Luck
Looking smart
Ability to explain things to others
Optimism
Dedication to their work – one said “would rather work than go on holiday”
Being good at science but at other things too
Being clever
Liking to find out things
Enjoying the job
Having fun at work and so sticking to it
Good at making predictions and doing experiments
Not minding if the experiment goes wrong
Someone who finds easier and safer ways to do science
“Always trying new stuff out”.



What methods do pupils expect scientists to use to tell if they've got something right?

10. We asked this question to look at pupils' thinking about scientific methods.
11. Pupils said that scientists must try to prove things by backing them up with evidence. They must keep doing something until they do have evidence.
12. Many pupils talked about scientists finding things out and testing predictions by doing experiments. They also described making sure of the results of experiments or investigations by repeating them many times. As one pupil summed it up; “doing a prediction then keep testing it over and over again”.
13. Many said it is important to check findings to see if they are right; “check and compare”. Apart from repeating experiments and investigations to see if you get the same results again, some described checking the results of mathematical calculations by working the analysis in reverse and seeing if it worked when done the other way around.
14. Many spoke of experiments to test medicines on animals before humans, in case things go wrong and harm humans, but many were very uncomfortable about doing



experiments on animals. Some spoke of types of experiment (eg on road safety) which could be done using dummies or robots.

15. Pupils also described scientists using the internet to get information and to check their findings with what others had found. Video evidence from YouTube could also be used. Scientists could test their theories and findings by seeing how many people agree with them, comparing them with the theories of other scientists, and check them with the public. They should check their sources.
16. Other scientific methods described by pupils were space exploration by picking up signals from a quiet area, studying fingerprints to solve crimes, asking professors and teachers for information, studying dead animal and human bodies, and testing whether medicines work. Many spoke about testing and investigating things using specialised devices and using new technology. Pupils described using computers to analyse things.



How interested are pupils in science?

17. We asked the pupils in all four of our groups to tell us how interested they already were in science at the time of our visit.
18. The majority were interested in science, 20 voting that they were very interested, and 28 that they were 'a bit' interested in science.
19. 6 said they were 'not much' interested in science, and 4 that they were not at all interested in science.



What would make pupils more interested in science?

20. Pupils gave us two major ways of getting them more interested in science. One was to give them more involvement in doing more practical and real experiments at a younger age. The other was to ask which areas of science pupils were most interested in learning about, and then teaching those areas. Examples of how pupils put these ideas were: "more experiments in school"; "more interactive and hands on science"; "more advanced stuff at a low age"; "more testing things"; "actually doing it rather than just getting facts"; "less writing and actually doing something"; "teachers following our ideas". Some wanted a real laboratory in primary school, with sensible precautions, rather than poor overhead pictures.
21. Another idea was getting pupils more involved with real science and scientists – "linking schools with science". This might be by visiting laboratories to see people doing actual experiments, through scientific trips, meeting teachers of science, having more scientists visiting schools, watching a scientist build a simple robot then trying it yourself. Some had experienced a visit to their school by a "lab in a lorry", giving them the chance to see and take part in interesting and fun experiments, and had found this



fascinating. More young people could also be involved in real tasks of finding things out.

22. Some secondary school pupils said they would be more interested in science if it was easier to get the right subjects to study for a science career, and if less experience was needed to get into science jobs. Some felt that schools are responsible for lack of interest in science, and need to make science teaching more interesting to more young people, not only the more academic pupils. Science teachers also need to concentrate more on less confident pupils. Science teaching needs to be “fun and exciting”. More money should be invested in science teaching in areas like Wales.
23. Some told us that pupil interest in science depends very much on the individual teacher and how good they are at explaining things. Some are good, others not, and that can decide whether their pupils develop an interest in science. One pupil said they understood more from their Dad as he uses scientific words better. Some found their teaching boring. Another said that in school, “I would like to be interested in science, but I’m just not engaged in it”.
24. Ideas to improve science teaching were to focus on exactly when in the week and in the day science lessons were held, to pick the times pupils were most likely to concentrate, more practical work, following pupils’ own interests, and linking science topics with other subjects in the curriculum, jointly teaching the science and other aspects of interesting issues. One described this as “cross campus science”.
25. Many gave examples of particular aspects of science they would be especially interested in. These were: explosions, making potions, dinosaurs, safe chemistry, hydrogen monoxide, experiments involving bugs, electrical devices and experiments, and children being able to go into space in the future (and not just those who had lots of money).
26. Other ideas included having special science weeks at school, daily science sessions, school science clubs, doing fun science activities, repeating famous scientists’ experiments, and having scientific “bring and make” days.
27. Some pupils (in different groups) said that they would be more interested in science if they were able to concentrate and learn during science lessons. Science lessons were especially easy for disruptive children to disrupt, and this often happened and spoilt others’ interest in doing science. One suggestion to counter this was to teach science in smaller mixed groups where it is harder to mess around.
28. Some – but not many – pupils had heard of the recent “Big Bang” science fair for children and young people in Birmingham the previous month. The schools were within travelling distance of Birmingham. None had attended it.



What bits of science do pupils find the most interesting?

29. Apart from the interests already reported, pupils gave us the following answers to what they had found most interesting in the science they had done or heard about. This is therefore a list of science topics that 58 children and young people had found definitely interesting to hear about.

- “Seeing how stuff reacts”
- Answers to common questions and “real world myths”
- Physics
- Chemistry
- Practical experiments
- Seeing how a theory works in practice
- Food science
- Space
- Atomic physics
- Human biology – how the body works
- The scientific part of sex education
- How medicines are made
- Robot technology and developing human-like robots
- Robotic limbs
- Flight and air transport
- Electricity
- Microorganisms
- Dinosaurs
- The search for life on Mars
- Space travel
- Jungle survival
- The Moon
- Potions, medicines and chemicals
- New forms of life
- Classifying objects
- Constructing houses
- Disasters
- Exploring new things
- Earthquakes and volcanoes
- Delicate chemicals.



What bits of science do pupils find the least interesting?

30. We then asked the opposite, to get a list of what children and young people had found least interesting to learn about. Some topics of course came up as both most interesting (to some) and least interesting (to others).

- Earthquakes and volcanoes
- Dinosaurs



- “Writing it all down in our books”
- Writing structured reports
- Copying things out
- Taking notes
- Learning about people in science
- The Sun, stars, planets and the Moon
- How the body works (teeth were a particular part of the body that many did not want to know about)
- Very small space probes (just being “the size of a mini-fridge” didn’t make these interesting)
- Animals
- Different types of insects
- The Earth
- How to build a brick wall
- Microorganisms
- The eye
- Snakes
- Robots
- Physics
- Photosynthesis
- Science exams that don’t relate to what has been learned for them
- Biology
- “Doing extremely basic things”
- Remembering equations
- Cells
- Gravity
- “Studying onion skins”
- Magnets
- Plants
- Sports science
- Areas of space not yet explored.



How do pupils hear about scientific discoveries?

31. The Committee is interested in how people get their information about science. We asked the pupils which were the main ways they heard about scientific facts and discoveries.
32. The most usual way to hear about science was through the television news, either the main news or on CBBC. This was followed by science programmes on television, such as Newsround or It’s not Rocket Science.
33. Some heard about science through social media and blogs, mobile phone apps, from friends, or through radio news or science quiz programmes. Others found science information on the internet, and a few by word of mouth from others or their family. A few said their main source of information about science was at school, from



teachers or displays in classrooms. A few others mentioned learning about science discoveries through YouTube or from a newspaper. “Gossip”, stories pupils had read, a song about the Moon, and science described in advertisements were also mentioned.



Do pupils trust scientists?

34. The Select Committee wants to know how far the public trusts scientists and what they say.
35. The majority of our pupils said they did trust scientists to some extent, although most said they only trusted them a bit. 11 voted that they trusted scientists a lot, 34 that they trusted them a bit.
36. Commenting on this vote, one reason for lack of trust in scientists was that they make mistakes in developing medicines, perhaps by not paying enough attention to what they are doing, which can be extremely serious. “One mistake can make someone die”. Some pupils gave examples of medicines their families had found did not do what they were supposed to do, of surgery that was incorrect and exploiting people, and of famous people whose death had involved the effects of medicines they had taken.
37. Another reason was that scientists can never be certain about risks – “even if they have tested something, there could still be a tiny risk”.
38. A third reason for lack of trust was that scientists always argue over things, so you never know who to believe.
39. One comment was that whether or not you trust a scientist ~”depends on where the source is of the scientific fact”. Pupils in one group discussed well known scientists and science communicators on television. They most trusted scientists who were well known for only talking about their own theories and research, like Einstein in the past and Stephen Hawking now, and whose theories had been found correct by other scientists. They were less trusting of scientists who appeared a lot on television talking about other areas of science than their own work, where what they said on television was probably scripted.



How many pupils are interested in choosing science subjects to study in the future?

40. The Select Committee is interested in getting more people studying science and going into science jobs. We asked pupils whether or not they were interested in choosing to study science, technology, engineering or maths subjects in the future.
41. 27 said they were interested in studying one of these subjects in the future, 13 that they were not interested in studying one of these, and 17 said they didn’t know at present.



42. Some pupils said they were simply not very interested in science. But those who said they were definitely interested were very clear about which areas of science they wanted to study and work in. They were interested in particular types of scientific work, not just 'working in science'. Examples were "engineering as opposed to science", food science, medicine, design technology, digital science and logic systems. Some were very clear that they didn't like "STEM" subjects generally, but were very interested indeed in particular fields of possible future work in one of these areas.

43. Some felt that they were "pushed" into studying science because they were told they needed science for most things in the future, or because choosing to study science shows you are clever. As one put it, "people scare you into doing it".



Are there any sorts of science pupils wish scientists to do more?

44. Here is the list of areas of science pupils thought should be focused on more by scientists and science funding in the future:

- Potions and chemicals
- The environment
- Medicines
- Treatments for smoking
- Digging up and identifying things from the past
- UFOs and alien life
- Getting evidence on myths and legends
- Safety testing of children's toys
- Getting evidence about history
- Developing more powerful drugs
- Cancer research
- Research on illnesses
- Biology
- Sports science
- Food science
- Dissection studies to discover more about animals and humans
- Astronomy
- Digital science
- Science education
- Thorium reactors.



Are there any sorts of science pupils believe shouldn't be allowed?

45. We also asked pupils to identify any areas of scientific work which they thought should not be allowed in the future. Here is their complete list:



- Animal testing (the most common area identified)
- Testing on humans
- Development of bombs and explosives
- Plastic surgery for vanity reasons
- Making things purely to scare people
- Making deliberately dangerous chemicals
- Making medicines out of animals
- Anything that uses endangered species so could stop more of that species being produced
- Development of “bad drugs”
- Sending animals into space
- Including scientists in books which might make them seem bad
- Research that might spread diseases
- Development of robots, as they might take us over
- Cigarettes and anything addictive
- Any lack of care with medicines that may make them not work.

46. There was a strong opposition to using animals in experiments. One pupil commented that any list of areas to be banned had to have exceptions, and proposed that all scientific projects should be decided “on a case by case basis on ethical judgements”.



Who should decide what scientists work on and spend money on?

47. We asked pupils to vote on who should have the final say in choosing the areas and problems scientists work on and that money for science should be spent on. We offered four alternatives – scientists themselves, following ‘academic freedom’, or the universities or organisations that employ the scientists, or the Government, or the general public directly.

48. The majority of pupils (34) thought that the general public should have the final say on what scientists do and don’t do, and what the available money should be spent on. Second came the scientists themselves, with 11 votes. Third, with 10 votes, came the universities or organisations that employ the scientists, and fourth, with 3 votes, came the Government. There was a view in one group that although the Government does “know what it is doing” in science, its guidance will always be too vague for specific projects, so it is not the best decider on particular or small projects.

49. Ways for the public to make decisions about science could include setting up local public committees for smaller decisions, and holding public votes on very big decisions, or on small but still very important issues. There is also a monitoring role as well as a decision role, whoever makes the initial decisions, which could be carried out by people not involved in the original decision.



The last word

50. The last word goes to the pupil who defined science as:

“having fun while creating and discovering”



51. I am grateful to the Heads and staff of the four schools for letting me hold these focus groups with their pupils, and especially grateful to the people (members of staff at Newtown, Priory and Quarry Bank and the senior pupil at John Beddoes) who worked hard to take notes of the views of pupils at each group. Above all I am grateful to the pupils themselves who gave their thinking, views and ideas for this report.

Dr Roger Morgan OBE

Pupils 2 Parliament

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