WHAT IS SCIENCE?

DELIVERY GUIDE
**Intro**

“What is Science?” is a flexible, fun and interactive session that engages young people in science. It is designed to be delivered by student volunteers in the classroom to 9-11 year olds although it could be adapted to many other environments and ages.

It aims to introduce young people to the multitude of areas of science. Many young people have an almost instinctive reaction against science, without realising that although they may find one aspect of it boring, they actually love another. To many, science is irrelevant, a distance concept that has no bearing on their life.

Through a mixture of games and experiments tied together by a large interactive presentation, young people are introduced to the vastness of science; challenging their assumptions and demonstrating the basic concepts of scientific method.

It is designed to be used in many different circumstances, and although we have provided a rough timetable it can be easily adapted depending on the expertise of the deliverers, budget, time and age/ability of group.

This guide will walk through each aspect of the session. You will then be able to choose which you activities you think to be the most appropriate.

**The Session**

The session has three main components: the ‘Prezi’ presentation, the experiments, and the games. The session is designed to be adapted to your own requirements. We have found a half-day session works well; two or three experiments should be enough, but you could do a whole day, an hour a week or whatever suits the class and volunteer. The amount of time spent on each section of the Prezi will also depend on the ability and interests of the class and the areas of expertise of the volunteer.

The games take place at the start of the session and set a baseline and break the ice for the class. They shouldn’t last too long, but should be fun and lighthearted. The Prezi is the presentation that forms the bulk of the session. Through it the class and the student explore the myriad of different forms science can take. During the presentation there are videos, as well as opportunities for the class to take part in experiments and activities.

When you arrive at your classroom layout everything you are going to need during the session (i.e. feedback etc.) to ensure the session is as efficient as possible and you have more time for experiments!
The Games
These act as both an icebreaker as well as a baseline to find out the thoughts of the young people. The whole session works best if there is no mention to the young people that the session will be about science. That way they won't tailor their answers to these first activities.

N.B. it may be a good idea to ask the teacher when arranging these sessions not to mention that it will be about science.

The Line Game
Resources
- Word cards (optional)
- Numbers (optional)

Method
This is a nice simple game that gets the young people moving around the classroom. It also helps you find a baseline of what the young people think about science.

Designate one side of the classroom as ‘1’ (you can put a laminated number ‘1’ there if you wish) and the other as ‘10’. If you wish to mark out the rest of numbers on the scale between you can, but you don’t have to. Explain that 10 means you really like something and 1 means you hate it. Hold up each of the word cards (or just say the words) and ask the young people to stand at the number that shows how they feel about the subject. Ask them to be honest, and tell them it is fine if everyone hates something for you to like it and vis versa.

The words on the cards are all linked to different aspects of science (sports studies, biology, electronics, maths, etc.) so it is interesting to note when people like a subject like animals yet still hate science. Don’t reveal the link between these subjects yet, just leave it as a fun warm up game.

What is Science?
Resources
- Poster paper
- Pens

Split the class into groups and give each group a piece of poster paper and some pens. Ask the class to write or draw all the things they think of when you say the word science. Tell them it doesn’t need to be neat, just put words and pictures down anywhere. It can be ideas they have from school or from books and films, or anywhere.

There is no right or wrong, just what they think. Encourage them by asking them specific questions as the children may simply say ‘I don’t know.’ Include everyone as they all may have different idea of what science is.
After a few minutes ask them to draw a picture of what they think an average scientist looks like. Tell them how good it is doesn’t matter but they may want to add labels.

You may want to give pointers like:

- What Clothes does a scientist wear?
- Where do they work?
- How does their hair look?
- Are more men or women scientists?
- What equipment do they have?

Once most groups have begun to run out of ideas, ask for one of the groups to read out what they have put. Depending on time you can get some more or even all the groups to give a presentation.

Science Jobs Resources - Leave these for teachers to use another day.

- Activity books

On pages 4-5 of the activity book there is a list of jobs. Go through the list with the class and ask them if they think any of the jobs need/use science. You should get a mixed response to this but give nothing away yourself, just see what they say.

At the end you should say that you think they ALL include science as science is a huge thing that includes many different things. You can now explain that you'll be looking at all the different topics that make up Science, and as you go through them they can see if they can match different jobs with different types of science and write it in their activity book.

The Prezi

Using Prezi

The main body of the presentation uses software called Prezi. Prezi is an online presentation tool that allows the user to create eye-catching presentations that are a lot more interactive, intuitive and flexible than Powerpoint presentations.

Prezi allows the user to create non-linear presentations and to zoom in and out over different sections and content of the presentation.

The arrows at the bottom of the screen will scroll through a set path. These go forwards and backwards through the script below. On the right hand side are buttons to zoom in and out, and you move around the screen by holding the mouse button down and moving it. Clicking on an image zooms in on it. Anything in a box or frame can be zoomed in on.
It is really easy to use but we would suggest spending some time familiarising yourself with the programme before delivering the session. The fact that the presentation is in a Prezi adds a lot to the interactivity of the session so it is important that the deliverer feels confident enough to use it. If there are certain areas of the presentation that the class is more interested in, Prezi will allow you to zoom in to these sections and explore them in more depth.

The content of the Prezi
Below is a list of each of the sciences discussed in the Prezi with a little bit of information. This is to act as a guide for the deliverer to help them in areas that aren’t their speciality. It is advised that the deliverer try and familiarise themselves with as much of it as possible before the session.

It is advised also that the students focus more time on the subjects that they have a strong knowledge and interest in, as enthusiasm is infectious and hopefully your love of a particular subject can help inspire others. However, the class will have areas that they want to know about too so it helps to have read the breakdown below to give you some idea.

Never be afraid to admit you don’t know. It is much better to admit it if asked a question about something unfamiliar to you then to give a wrong answer. You can always encourage young people to do their own research either as part of a follow up session with the teacher or at home. You can even write a list of “things to find out more about” on the whiteboard/poster paper throughout the session to give to the teacher before you leave.

The list below is the order that they come in on the Prezi. It is also marked where the experiments should be placed. Remember unless you are running a full day event, you probably won’t have time to do all of them so pick which ones would best benefit the class, possibly by checking with the teacher beforehand. It may be wise to bring the resources for an extra activity or two then you planned however, just in case you have spare time at the end.

It starts with a picture of the Hubble Ultradeep Field – a picture of less than 1% of 1% of the night sky taken by the Hubble Telescope. Everything we know is inside the universe, and everything is *dramatic zoom out*

Science!
Divided into 3 – Physics – how things work; chemistry – what things are made of; biology – living things
Biology: The study of Living Things

Anatomy and physiology:
This is the basis for a lot of medical science and research about diseases. People study the normal function of a body part, then research how it might go wrong and cause an illness – this is called pathology.

The presentation then zooms in to show DNA, a cell, a tissue, an organ and an organism, showing how each structure gets larger and more complex. The video shows a representation of what the inside of a cell might look like, showing that it is a dynamic living thing rather than a simple building block for a bigger plant or animal.

Sports science:
is a practical application of anatomy and physiology, which is about optimising performance. It aims to make people better at certain activities whilst avoiding injury. The video shows sports science students and the kind of experiments they may do.

Evolution:
The theory of evolution is based on the idea of ‘survival of the fittest’ and adaptations. The theory was proposed by Charles Darwin in the 19th century following his study of finches, where he noticed that each different kind of finch had a different-shaped beak which allowed it to eat a certain food.

Palaeontology:
Who likes dinosaurs? Palaeontology is the study of prehistoric animals which are now extinct, such as dinosaurs and early mammals like mammoths and sabre-toothed tigers.

Ecology:
is the study of how animals and plants live together to make up habitats and ecosystems. Animal behaviour and welfare are important for people who work with animals such as vets and zookeepers. Zoos often have breeding programmes which help to increase the population of endangered species and release them back into the wild. These principles are also used by marine biologists.

Microbiology:
This involves looking at living things which are so small they can only be seen through a microscope. This is important for understanding bacteria. Not all bacteria are bad for us and we have millions living in our gut and skin. A pathogen is the name for any microorganism which can be harmful.

To finish, the presentation runs through some areas where science is used in the real world, such as engineering. The final circle is for maths, which ties all the sciences together.

Engineering:
The design, building and maintenance of almost EVERYTHING. Go through the various kinds shown; cars (formula 1 video included), marine – big ship, HUGE engine, wind farms, factories, bridges, planes, spacecraft (ignore ISS video for now). Finish on electrical engineering (iStuff) leading into
Experiments

We have provided a range of experiments, **we currently just run the plant experiments during the biology session**, however teachers are also encouraged to come back to these sessions and run the rest of the experiments at a later time to reinforce the learning.

**Biology experiment - Plants**

**Overview**
This experiment has less of an immediate impact, but instead can be set up and observed over a period of time. Food dye is placed in a cup of water with a plant (either celery or a flower with white petals). It shows how plants absorb liquid through their roots as over time the colour of the food can be seen creeping up the plant.

**Equipment**
- White flowers with a stem or celery sticks. Cut a few cm off the bottom.
- Cups (*make sure they stand up with the plant in it before you get to the school*)
- Water
- A few different colours of food dye.
- Newspaper

**Method**
This experiment is easy with either each pupil working separately or in pairs. The flowers or celery sticks are placed in a cup of cold water. A few drops of food colouring are added to the water. They are then placed out of the way and can be checked up on over the course of the day/week. Slowly the pupils should be able to see the line of colour rising up through the plant.

**Notes**
It worth putting newspaper down on the desks first in case of spillages! There are many other experiments that can be done with this as a base, to do with how quickly plants absorb water. You could place half the plants in the sun and half in shade. Half somewhere hot and half somewhere cold. This is more an activity for a longer session or over a longer period of time than just the session.
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Ending the session

Questions
Once you have been through the Prezi the pupils are invited to ask questions or make comments. It is likely that you will be asked questions you won’t know the answer to. It is important to admit that you don’t know but encourage them to research it themselves.

Evaluations
It is always good to end a session with evaluations for both the pupil and the teachers to make sure that the sessions are achieving what you hope they are doing. Explain how these forms will help make the sessions even better for any future sessions and how it is important that they give honest answers, even if they think something different to their friends. You can keep the forms anonymous so that the can feel more comfortable be honest.

Final talk
This is the last chance to really press home some important messages. Hopefully by this point they will all be very excited and possibly overwhelmed by the session. It is nice to show them the clip of the International Space Station flying over the earth that ends the Prezi. You can talk about no boundaries and international cooperation, scientists working together to create a better world. You can talk about the variety of different types of scientist and reiterate that there are so many types of science that there is bound to be something you would be interested in. Anyone can be a scientist.

Warnings
Some topics can be risky topics in certain, especially religious, schools. The most obvious one is evolution but could also be reproduction (although the Prezi doesn’t go into human reproduction, you may be asked questions). It is advised that you treat these subjects carefully, as well as treading carefully when discussing the scientific method of not taking things on faith, but holding them up to examination as that can be misinterpreted as an attack on religion. If in doubt, take your cue from the class teacher.

Follow up
Encourage them and the teacher to revisit the Prezi and to do any of the activities/experiments that you didn’t have time for. Also remind them that if they enjoyed a particular topic, then they can go out and research more about it on the internet or local library. Leave a copy of this guide for the teacher.
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