Curriculum Progression Maps

Science

Why is the study of Science important?

Our students study Science so they can better understand the physical, material and biological world around them. Understanding Science is about knowing...

How all living things work, including our own bodies. How all living things on this planet work in the same basic way and how all of life depend on each other. Why we must finish a course of antibiotics, how to stay healthy and why, if the Sun goes out, life will continue to exist for millions of years, deep in the oceans.

How the materials around us are like they are. We will explore how humans have changed the world for the better and discover how science can solve the problems we face.

How the physical world works, from things we can't see like the tiniest atoms to the entire Universe itself. Everything from cars and planes to computers and mobile phones all started from understanding how we can make the physical world work for us.

How by knowing how to take measurements from meters and experiments we can find out about the world around us. By understanding the risks and benefits using science students are prepared for any job, and can take their place as a 21st century citizens of the United Kingdom.

How does our story start (Yr7)?

In Yr7 we will explore the idea of cells, progressing from seeing them as the building blocks of life to how they work together in different ways to make our body systems work. We will explore how everything is made from even smaller building blocks, atoms and progress to exploring different atoms and how they react together. We will develop our ideas of forces, waves and our place in the solar system.

How do we develop the key themes at KS3 as we go through yr8?

In Yr8 we will take the ideas from Yr7 and extend them to explore how our body systems need to be kept healthy, how all life on Earth depends on each other and how living things change over time due to evolution. In the material world we will take the ideas of reactions further looking at how specific types of atoms react and how the Earth's basic materials recycle over time. In the physical world we explore the remaining great themes of science, electromagnetism and energy. We return to forces this time to extend our understanding of motion.

As we come to Yr9, the science story broadens in KS4 to bring in new and exciting themes.

Year 9 marks the start of our GCSE course and taking the key themes from KS3 to KS4 involves developing a deeper and more complete understanding of the world around us. Starting in the biological world with how and why cells are different we move through how our body systems work and how we fight disease. In the material world we develop the idea of structure and bonding to understand why materials behave as they do. In the physical world we explore energy and valuable resources, electricity and particles. We need to learn more key facts and develop our maths and literacy skills to cope with the increased demands of GCSE.

Yr10 is the year in which we cover huge topics such as disease, how we can control chemical reactions and how we can use Maths to describe motion itself.

Year 10 widens our scientific view of the world taking a closer look at how the energy from the Sun provides the vital ingredients for all life starting with plants. We then deepen our understanding of how our bodies respond to the environment and how characteristics are passed on through reproduction. In the material world the Yr9 work on basic chemical reactions is deepened to include the energy changes and making predictions about the ways chemicals behave. In the physical world, the key ideas of the atom from Y9 is shown to be incomplete and particles in the atom can change causing radiation. We move to a more mathematical model of motion and waves now both our maths and science skills have improved.

How we finish this part of the story by bringing all the themes together and to prepare for exams in Yr11.

Curriculum Progression Maps

Science

Year 11 is our final year at GCSE and is critical because we bring all the themes back during revision to complete our course. We explore themes that run through each science such as cell, atoms and energy to show how a few basic principles govern everything we can see and measure. Now our maths and literacy skills are even better we attempt the most demanding content and synoptic questions, those that require an understanding from more than one area or topic in science. We are now prepared to be the best scientists we can be and can take our skills to post-16 study or employment.

What skills will Studying Science give you.

- To solve problems from the everyday (wiring a plug) to the most critical (develop a vaccine for Covid).
- To apply a series of concepts, rules and laws to huge variety of situations.
- To develop skills operating and handling complex scientific equipment.
- To use scientific language to communicate key and even vital statistics and facts critical to life and prosperity.
- To use the 'scientific method' to test hypotheses when developing new ideas and products
- To be confident about weighing up scientific evidence on social media and to reject false or unsubstantiated claims.
- To acquire and use confidently a wide scientific vocabulary
- To appreciate the entire Universe and for enjoyment and information
- To develop cultural awareness and knowledge of our scientific heritage

What can I do after leaving Scalby with Science qualifications?

- Use your science skills at home, by understanding key aspects of how the human body works you can keep your family safe and healthy (electrical safety in the house and healthy living, spread of disease and fertility)
- Use your science skills in almost any job place.
- Attend college to study vocational qualifications such as engineering or applied science,
- Attend 6th form to take further qualifications such as A levels.
- Ultimately, you can gain a science degree and or a professional qualification.
- Support and help other people as they study science (such as being a primary school teacher).

What jobs can a student with science do?

The Government website https://nationalcareers.service.gov.uk/job-categories/science-and-research lists 78 different careers you can do with a science background. These include.

- Teacher
- SOCO (Scene of Crime Officer)
- Doctor
- Geoscientist
- Microbiologist
- Analytical Chemist
- Astronaut

Of course, there are so many other jobs that you can do where science is an advantage (due to your problem solving skills and specialist knowledge).

- Armed forces
- Finance
- GCHQ
- Civil Service
- Local Government

What is learning science like?

Through a curriculum with a deliberate focus on enquiry, students are encouraged to ask questions about the physical, biological and material world around them. Examples of key enquiry questions include "Why does metal feel cold when it is at the same temperature as an exercise book made of paper?" and "What happens to my body during puberty?"

The entire curriculum is divided into core units each building on KS2 or KS3 work and each taking the learner that bit further on the Science Journey. The units are short

enough to add variety yet long enough to allow key ideas to be explored properly

The most fundamental laws, ideas and models that underpin our whole understanding are covered whilst developing and enriching students' scientific vocabulary. Although there are lessons on 'Science Ideas" and recall testing of vital facts, there are also practical classes that all students to test their own hypotheses. Students are encouraged to explore dependent and independent variables and apply the scientific model to test if their findings are valid and reliable. Practical work is essential in developing motor skills that many students will rely on once working. Some of the practical skills covered are also found in the most high profile labs across the world.

There will be frequent assessments and most of these go unnoticed by students because they form part of the everyday learning experience. Teachers will ask "Why do you think that happens?" or "Describe what you have just seen happen and suggest a scientific reason why.. ". This kind of assessment allows the teacher to adapt their lesson to the pace of the students to maximise learning.

There are frequent no-notice mini-tests. These cover the work met in class and any student staying on top of their work in class will find them straightforward. Online background learning is managed through Tassomai. This software is designed to be used little and often and will form the basis of all the homeworks. By combining the online data with the mini-tests teachers can monitor closely the learning that is happening on a week-by-week basis.

There will be longer more demanding exam-style questions on offer and of course full exams such as End of Year exams and Trial Exams and this is essential to give teachers a clear idea of how learning is happening on a termly and yearly basis. This will allow students to be given the most appropriate skills and knowledge ahead of public exams. .

How does Science link with your other subjects?

Science needs skills you pick up in other subjects like Maths and English but it can also really help with other subjects too. Science and Geography have many overlaps such as the rock cycle, tectonic plates, climate change and ecosystems. Science and Life both challenge you to answer difficult moral questions around growing up and ethics in society. Science and PE will both cover how the body works, metabolism and energy. Science and Technology share many ideas so Food Technology is edible (and very well presented) chemistry! Materials behave in ways that science can explain meaning design and technology and science work so well together.

How can you become an expert in Science?

The best way to become a good scientist is to ask questions about the world around you. Why does sugar dissolve? Why can we see though glass but not through metal, why does metal feel cold? Why do some people look so much like their parents? What are stars? Science seeks to answer any question about the physical, biological and material world.

Science is a discipline and is based around fundamental ideas we can test and use to make predictions. Scientists are very careful not to allow their opinions to cloud their judgements but to gather evidence and make informed judgements. That way scientists as Doctors can save lives or as microbiologists can develop vaccines or as engineers can build buildings in earthquake zones or create technology that can be miniaturised in mobile phones.

The basic rules of science have to be learned and you will need to get the scientific language right. There are equations to learn and there are laws and principles to understand. You will also need to handle scientific equipment with care and use with precision. You need to be able to ask scientific questions and know what evidence to accept and what to reject. Above all you need to be curious about how everything works!

How Science delivers Spiritual, Moral, Social and Cultural themes.

- In Yr7 and 8 Students will, through participating in group activities and discussions, develop their interpersonal skills. They will be encouraged to

show respect for each other's opinions and viewpoints as well as for living organisms. The themes and topics covered in this series of lessons will require students to be mindful of the consequences of their actions.

In Yr9

- B1: Is using Stem Cells in medical research and treatment right?
- B1: Is it right to clone humans?
- C1: If atoms are so small we can't see them, are they really there?
- P1: Should we be made to have more energy efficient devices?

In Yr10

- B4: What happens when I exercise?
- B4: If we lived in a spaceship would we need plants?
- C5: Extracting elements using electricity is expensive. Should we do it?
- P4: Radioactive substances are so dangerous, should they be banned?

In Yr11

- B7: Is it right to fish or hunt a species to extinction?
- C9: It snowed today – climate change cannot be happening.
- C9: Climate change is not my responsibility.
- P7: Should all trains use magnetic levitation (MAGLEV)?

The Six Principles of Nurture

Language is a vital form of education

In science we follow the whole school focus on vocabulary. There are so many specialised words or common words used in a different way by scientists that understanding them is so very important. Every topic has critical key words and these are practised throughout the lesson. Students need to show that they understand how to use the words in a scientific way. We use mini-tests regularly and these have our most important key words in them.

We use Frayer Models where appropriate, etymology where appropriate, and we encourage the use of formal scientific language and the correct use of scientific vocabulary during oral questioning.

The classroom offers a safe base

Science labs and spaces can be hazardous. This means students must learn the basic lab rules to keep themselves and others safe. In the science department we have a high expectations with regards to behaviour and engagement in lessons. We follow the Scalby School behaviour for learning system (outlined on page 8 of the student planner), we use a Matrix timetable for students who are causing concern and we use the SLT active patrol if necessary.

Children's learning is understood developmentally

Understanding science needs a lot of building up through simple ideas becoming ever more complex and abstract as deeper insight is achieved. That means study the national curriculum in a logical way starting with the key basic ideas such as energy, forces, cells and atoms. As the curriculum develops students progress at different rates and teachers are sensitive to this, supporting and encouraging and helping when students become stuck.

Students are set according to ability and regular assessment allows changes to groups in consultation with the student and the parent/carer. Each class in the Science Department has an SEN Provision Map which links to the SEN Register and My Profiles.

The importance of nurture for the development of wellbeing

Classroom teaching is supportive and mistakes are used as teaching points. We value incorrect responses as an opportunity to explore

misconceptions. Learning means making mistakes and this is essential! In science we encourage students to answer questions even if they think it might be wrong. The way students answer questions tells the teacher a lot about what has already been learnt.

All behaviour is communication

The school systems are applied fairly and consistently. Good behaviour is an expectation and the calm and productive climate for learning is essential for the best outcomes for all.

Science labs and spaces can be very dangerous and so everyone must take responsibility for the safety of everyone else.

The importance of transition in children's lives

We invite Y6 students into our school to show them what science labs look like. This helps ease anxieties and provides a familiar place for them. When students plan their move to post-16 provision there is guidance and support from their science teachers.

Students move through an important life stage from children into adolescence and this involves physical and emotional changes. In science we encourage discussion about puberty and adolescence in a safe and supportive environment.