

Examples of Spiritual, Moral, Social and Cultural Education in Science include:

- Students debating the ethical issues surrounding current issues such as stem cell cloning to cure diseases. This also helps develop a sense of how citizens can influence decision making through the democratic process by considering the way in which controversial scientific techniques are approved.
- Learning about the future implications of the use of finite resources and landscape changes for example by looking at different methods for generating our energy. This also links to local facilities and services should as the nearby power station.
- Learning about theories concerning the creation of the universe and evolution of life with consideration of religious beliefs. This is seen when we study the Big Bang Theory in Year 9 and 10.
- Looking into the future options for the production of electricity, alternative fuels, and methods to reduce pollution with discussion of how these can improve people's lives and the environment in general. Discussion on the impact of wind turbines also develops British Values such as student's sense of respect for others in the community.
- Students investigating the historical impact of scientists from around the world in numerous famous discoveries, for example Marie Curie's discovery of radioactive elements.
- Students considering how scientific perceptions can alter across the planet; from the phases of the moon and visible, the safety of food additives and the local importance of recycling.
- Students will consider local issues that develop British values, such as light pollution in Year 9 in Astronomy or Recycling in Chemistry lessons during Year 9 and Year 10.

Spiritual Development:

Beliefs which inform perspective on life including respect for different people's feelings and values:

Key Stage 3:

Reproduction (Y7) - Focus on people's beliefs around contraception and why people may choose not to use it. Considered from a health point of view as well as religious / belief point of view.

MMR Vaccines (Y7 and again at KS4) - Look at how people's beliefs can be influenced by others and how science is needed to sometimes demonstrate fact over people's opinions.

Key Stage 4:

Biology:

IVF and fertility treatment - Focus on the ethics behind IVF and use informed decisions on people's life situations to decide / debate which couples should be given the limited availability of IVF.

Genetic Engineering and cloning - Use understanding of cloning techniques to evaluate whether embryo cloning should be allowed and to what level. Often carried out in debate form although some groups will complete extra research around the topic.

A sense of enjoyment in learning about ourselves and others and the world around us:

Overall the whole of the science curriculum completely covers this statement as the whole subject of Biology is about learning about ourselves (50%) and how we function or life around us and how it functions alongside the impacts of our interactions with this life. The disciplines of Chemistry and Physics are focussed on explaining the world around us and how things work or why they happen. These subject start from basic explanations to completely explaining the world around us using laws.

The examples below are not complete as the whole of the science specification for each Key Stage covers this SMSC point but these are examples where in lessons the focus is specifically directed towards understanding ourselves and the world around us.

A sense of enjoyment in learning about ourselves:

Key Stage 3:

Year 7 - Reproduction: A look at how life begins and how our bodies are changing. This module is enjoyed by students as this is often the first real time this subject area is breached in school and students are naturally curious about it. Teachers apply strict rules and ensure students are comfortable in the delivery and teaching of this material to ensure that lessons are productive and enjoyed.

Year 7 - Safety in the laboratory: As part of the introductory module students are taught how to keep themselves safe in practical situations during lessons. This is made fun for students by gradually increasing the level of practical activities to test safety skills and build on future enjoyment in lessons.

Year 8 - Diet and Digestion: Students study the importance of a healthy diet and lifestyle within this module and the impacts of a poor diet and lack of exercise on their health. This is made enjoyable by a wide variety of lessons including practical aspects to investigate energy levels in foods and research on health impacts of a poor diet and conditions such as anorexia and obesity.

Year 8 - Microbes and disease: Students have a very hands on approach to studying this module including the growing of bacteria and identifying where bacteria grows all around us. Focus is also brought to how we can protect ourselves against the spread of microbes reinforcing healthy choices in relation to hygiene.

Key Stage 4:

GCSE Science - Modules which focus on learning about ourselves are:

Combined Biology

1. Keeping Healthy - which extends previous work from diet onto BMI and long term impacts of poor diet.
2. Nerves and Hormones - Which extends work from Year 7 in reproduction onto hormones and also explains how our bodies work.
3. Drugs - This is a module student's find particularly interesting regardless of ability. Their understanding is developed on a scientific scale. Students particularly enjoy the investigations into the effects of coke on reaction times.
4. Respiration and Exercise - This is made practical which allows students to develop knowledge in a hands on and fun way. It allows the application of science to everyday events and increases students understanding of what is happening in their bodies during exercise.
5. Genetics - Students often find this a challenge but will enjoy the development of an understanding behind the inheritance of genetic traits and the linking of genetic disorders to carriers etc.

Triple Award Science (Biology)

1. Homeostasis - A look at how the kidney functions, thermoregulation and heart beat to control the internal conditions. This is taken by the most able (Gifted and Talented) students who find some satisfaction in learning an in depth understanding how our bodies work.
 1. The Living Earth
 2. The Physical Environment
 3. Energy and Pollution
 4. Sustainable Development and food production
 5. This is becoming more important within GCSE and at Post 16 studies as it is becoming a more integral part of their course.
 6. Students are also now beginning to complete self assessment sheets within science after books are being marked and following tests to ensure they can reflect on their learning within modules.
 7. Following each practical activity students are required to write a conclusion reflecting on their experience within the practical and sum up their understanding of what they have monitored.
 8. The use of animals in testing for medical advances and when this can be acceptable. Students will represent different organisations and debate the use of animals in drug development.
 9. The thalidomide drug and how it was used without correct testing and the consequences of this.
 10. The publication by a doctor that the MMR vaccine is linked to autism without rigorous scientific testing and the implications of this on the health of a generation of children in the UK.
 11. The use of NHS money to fund treatment associated with obesity and drug / alcohol abuse.

12. The creation of GM food and whether it is right to use it to solve deficiency diseases such as night blindness.
13. Are we right to use technology which is damaging the environment?
14. The use of animals in testing for medical advances and when this can be acceptable. Students will represent different organisations and debate the use of animals in drug development.
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16. The publication by a doctor that the MMR vaccine is linked to autism without rigorous scientific testing and the implications of this on the health of a generation of children in the UK.
17. The use of NHS money to fund treatment associated with obesity and drug / alcohol abuse.
18. The creation of GM food and whether it is right to use it to solve deficiency diseases such as night blindness.
19. Are we right to use technology which is damaging the environment?
20. Biology - One quarter of this module focuses on how human activity is influencing the world around us.
21. Chemistry - Haber process and how it impacts on the environment in both positive and negative ways.
22. Physics - Study the benefits and drawbacks of using X rays in medical science.
23. Study the Space Race in year 7 between Russia and America
24. Study the findings and life of Ernst Rutherford and the work of Geiger in discovering the structure of the atom and the work on radioactive decay

Combined GCSE Science (Chemistry):

Focus within the chemistry module on our impact on the world includes acid rain which is studied using practical investigations on the effect of acid rain on living organisms and again focuses on the use of oil in society and how we could possibly replace it in the future.

Combined GCSE Science (Physics):

A more in depth look (in comparison to KS3) at the usage of renewable and non-renewable fuels and the benefits and drawbacks of both.

GCSE (Chemistry)

A look at how we can isolate metals from the world and the impact and damage this is doing to our environment is made enjoyable by students actually carrying out practical electrolysis activities.

Separate Physics

Students study the need for a new power source and the possibilities of using nuclear fusion or fission. They compare the two and evaluate the potential for both in our lifetimes.

Triple Award GCSE Science:

Using our imagination and creativity to learn and be willing to reflect on our experiences:

This is embedded into our Schemes of Work throughout the key stages. The need to use imagination and creativity are found throughout most modules as they allow students to understand difficult concepts particularly within Chemistry and Physics. This is an ability which is developed using models in science to represent what is actually happening. The use of models is a key skill which is built on from the beginning of year 7 to help student's access science on different levels and really is an integral part of students learning in the subject.

In addition to using models which requires imagination and creativity to understand we also use practical's to enhance understanding based on experiences and to help explain concepts. Thus rather than an exhaustive list here are a few examples:

Year 7 Particle models: Students will carry out a practical investigating and then summarising the properties of solid, liquids and gases. This will then be reflected on and explained using the particle model of solids, liquids and gases which requires student imagination to understand fully.

Year 7 Cell models: Students enjoy completing a totally independent model creating exercise into the different structures of cells and their key parts. They then use these to fully explain the structure and function of cell organelles.

AFL tasks within KS3:

Journey of a Sperm - Students use imagination and creative story -telling to describe and demonstrate their learning experiences of this subject.

Designing an insulated home - students use creativity along with previous learning in science lessons to create an insulated model home and compete in a competition to test their models and thus their own understanding. Students then summarise which homes were the best designed and why using their experiences and knowledge.

Key Stage 4:

Combined Science

Variation of tasks in KS4 are designed to ensure that students are using their creativity and imagination within the learning of the different topics.

Willingness to reflect on our experiences:

Within the science syllabus students carry out practical investigations and from the first few lessons in science they will be taught how to interpret results and make conclusions. In addition to this they will also be encouraged to make evaluations of their own practical performances and how they could make experiments more reliable.

Moral Development:

The ability to recognise difference between right and wrong and applying it to our own lives.

Within the science curriculum 'How Science Works' material is embedded into the curriculum which covers many moral and ethical issues that face scientists due to our technological advances. It is a requirement that we spend adequate time on these areas and a proportion of each exam will be linked to them. This is because of the need to have rounded scientists who can be accountable for their actions.

Key areas covered in the syllabus which recognise the difference between right and wrong within the science curriculum are:

Understanding the consequences of our actions.

This is covered throughout the science curriculum in detail on a personal level: What are the consequences of my actions on myself and others? It is also covered on a species level:

What are the consequences of our actions on the world around us?

What are the consequences of my actions on myself and others?

Whilst the below is only a small list the areas that these cover are vital in the healthy lifestyle development and choices students will make in life. More emphasis is definitely put onto the student rather than just learning material during these lessons.

KS3:

Year 7: Teenage pregnancy and the consequences of this and underage sex is looked at and discussed.

Year 8 - Diet and exercise and consequences of this not being balanced is looked at in depth.

GCSE Combined Biology

Keeping Healthy Module - This whole module focusses on the impact of diet, exercise and drugs on our health. It also looks at contraceptive hormone treatment and considers the positives and negatives of this on health.

Additional GCSE Physics - Investigating stopping distances and factors that affect these in relation to driving cars unsafely will be the starting point for student's thoughts in this area. This is vital as often two years later students are learning to drive.

What are the consequences of our actions on the world around us?

With an increasing importance placed on the environment and how actions of everybody impact it this is a common part of the science curriculum including the need to try and make more informed decisions to reduce the impact we have on the world.

Year 7 - Energy module. Students study the importance of fossil fuels to human society and the impact their usage is having. This is probably the first real time that students start focussing on particular aspects of pollution in the world around us.

Year 8 - Photosynthesis module - What are the consequences of deforestation? This is linked to not buying recycled paper and the potential devastating impacts of deforestation is researched by students.

GCSE Combined Physics - Students research the consequences of different energy source usage from renewable energies and investigate if the use of 'green' energy is actually as environmentally friendly as it is claimed.

GCSE Chemistry - Within the course students consider the impact of multiple chemical and industrial processes on the environment - including the combustion of hydrocarbons and the impacts of global warming and acid rain on the environment. The production of ammonia during the Haber process and usage of excessive fertilisers on food chains are considered in detail.

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SOCIAL DEVELOPMENT:

Willingness to participate in different social settings, co-operating well with others and resolving conflicts effectively.

Using social skills in different contexts - with people from different Religious, Ethnic and Social backgrounds.

Group work is a regular feature of SOW in our science department and teachers are encouraged to use seating plans so students are not sat with friends but individuals who will push each other and support each other well.

Cultural Development:

Understand and appreciate the range of cultural influences that shape our heritage.

Students study the different scientists that have brought about our understanding of science during the entire curriculum from year 7 to year 11. For example scientists study the following scientists:

This makes up again the proportion of the syllabus called How Science Works and is a vital content towards the examinations of GCSE. Students are expected to be able to interpret and explain the findings of these key scientists.

A willingness to participate in and respond to Artistic, Musical, Sporting, Mathematical, Technological, Scientific and Cultural opportunities.

Within the Science curriculum mathematical, technological, sporting and scientific opportunities regularly present themselves. For example:

Mathematical Opportunities - The SOW for all 3 Key Stages includes high levels of numeracy and all examinations at GCSE and A Level require a numeracy level to complete. All 3 aspects of science depend on this as science is built on mathematical formulae.

Technological Opportunities - The department teaches numerous areas within the syllabus where technology is linked and explained scientifically. To increase this we have specific STEM activities within the curriculum.