Beech Academy
Turning 'I can't' into 'I can'

nexus Multi Academy Trust
Learning together to be the best we can be

Science 5-year Curriculum Plan

Westfield Site

Author: K Johnson

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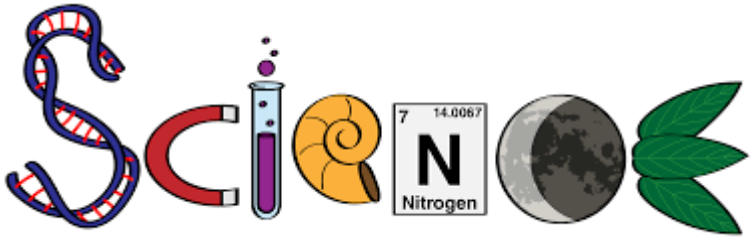

Ambition Integrity Inclusivity Resilience Endeavour

Our Vision

"Turning I can't into I can"

Our Values

Curriculum Intent

"At The Beech Academy, we are committed to ensuring that all of our pupils engage in a curriculum that develops **interest, curiosity** and **creativity**, and **removes barriers**. There is a strong emphasis on developing fundamental skills in **literacy** and **numeracy** alongside developing **conceptual understanding** and **rich knowledge** across a broad range of subjects. The curriculum is enhanced by **high quality experiences** that aim to develop pupils' **cultural capital** and give them first hand experiences that otherwise might not be possible.

Every pupil is recognised as a unique individual and the **curriculum is designed to meet their individual needs**. All of our pupils will develop the skills to become contributing citizens to society and live out our **core values** of Ambition, Integrity, Inclusivity, Endeavour and Resilience on a daily basis. Our curriculum will enhance the social mobility chances of all our pupils to ensure they make lasting contributions to society and enable them to turn "I can't" into "I can".

Curriculum Vision for the Science *Curriculum Area*

"Science at Beech is about providing students the opportunity to develop their knowledge and stimulate curiosity about how the world works along with the skills to solve problems and find answers to their questions through exploration and experimentation."

Science at the Beech Academy is all about stimulating students' interest and curiosity about the world around them. We endeavour to build the students understanding, knowledge and cultural capital through the use of practical investigation and other high-quality experiences.

We firmly believe that lessons should be designed to minimise students' barriers to learning whilst providing every student the opportunity to access the same knowledge and develop the same skills regardless of ability or need - to develop a truly inclusive curriculum whilst stimulating their curiosity about the wider world and developing their skills to find out answers to their questions. As students move through the curriculum, developing their investigative and problem-solving skills, the aim is for students to be able to apply some of these skills to everyday issues and problems that they will face as they move on to further education and adulthood.

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At Beech Academy, we are committed to ensuring that all of our pupils engage in a curriculum that develops interest, curiosity and creativity, and removes barriers. We make sure that we turn "I can't" into "I can".

At the end of Year 11 students in Science will…

Know and understand…

Biology

- The difference between eukaryotes (plant and animal) and prokaryotes (bacteria) - their cell structure and organelle functions
- What the human body and plants are made of; from cells through to tissues, organs and key organ systems
- How cells differentiate to become specialised for their specific function
- How to observe, interpret and record cell structure using a light microscope
- The function of the different organs and organ systems including enzymes, bacteria and blood and the skeletomuscular systems
- How the body works and stays healthy in terms of digestion, metabolism, exercise and diet, including the role of respiration and lifestyle choices
- How the human body and plants fight disease, both naturally and through the use of medical technology
- The role of the endocrine and nervous system is coordinating and maintaining the internal body environment
- The structure and role of organs and organ systems in plants including the processes of photosynthesis and reproduction
- The feeding relationships between organisms including the role and importance of plants
- The factors that determine where a particular species live
- How life has developed on Earth over time through the processes of natural selection, evolution
- How characteristics are passed from parents to offspring

- How our understanding of organisms has changed over time and how this has impacted on the classification of organisms
- The impact of human activities on an ecosystem and its biodiversity including farming techniques, bioaccumulation and deforestation

Chemistry

- The different ways in which materials can be grouped according to their structure and properties
- How the structure of a material affects its properties
- How and why mixtures can be made and separated
- How metals can be extracted and used according to their properties
- How metals have been made more useful through the development of alloys
- The uses and problems associated with polymers
- The reactions of acids with metals, alkalis and carbonates to produce salts and different gases
- How these different gases can be tested/identified
- How to represent chemical reactions using formulae and equations including combustion, thermal decomposition, oxidation, displacements and neutralisation
- How mass is conserved during reactions
- Different reactions that cause an energy change in their surroundings
- How and why the rates of reactions can be increased
- The structure and composition of the Earth including the rock cycle
- How and why the Earth's atmosphere has changed over time and the impact of human's activities on the current atmosphere, including the carbon cycle
- The use of fossil fuels and the fractions produced from crude oil
- The need for, and production of, clean drinking water
- The structure of the atom and how this relates to the Periodic Table (BTEC)
- Ionic compounds – their properties and how they are formed (BTEC)
- How scientists use symbols and formulae to represent materials and their reactions

Physics

- The different forms of energy, their measurement and how they can be transferred in different situations including heat energy transfers
- How to calculate the efficiency of different energy transfers including power ratings and work done
- The types of non-renewable and renewable energy resources available to us
- Forces (contact and non-contact) and their effect on objects including Hooke's Law
- How to calculate the speed of an object and the factors that can affect its stopping distance
- Using distance-time graphs to interpret speed and journeys
- The meaning of current, voltage and resistance in relation to electrical circuits
- How to build circuits and measure current and voltage in order to calculate resistance
- The different between alternating current (a.c.) and direct current (d.c.) and how it is produced
- The components of a plug, including their function
- How to calculate the energy used by electrical appliances and therefore the cost of electricity
- How static electricity is formed and works (simply)
- The features and behaviour of magnets and electromagnets
- How magnetic fields are formed and used
- The different wave types and their features including how they travel
- How the different wave types behave around objects and materials
- How wave changes lead to changes in sounds
- How waves are reflected and refracted (light & sound) including specific applications such as sight and cameras
- How to calculate the speed of different waves
- The different sections of the electromagnetic (EM) spectrum, their uses and dangers
- Radioactive decay – how it occurs and the different forms it can take, including their uses and dangers

- How we use physics in everyday activities such as predicting weather and monitoring changes in our environment (BTEC)
- The structure and composition of the Solar system and the Universe
- How and why the Earth experiences days, nights, years and seasons
- The effect of gravity on Earth and across the Solar System

Be able to…

- Use scientific vocabulary, terminology and definitions
- Use SI units and IUPAC chemical nomenclature unless inappropriate
- Use and derive simple equations and carry out appropriate calculations
- Interconvert units
- Use an appropriate number of significant figures in calculations

Demonstrate the ability to design an investigation, take measurements, present data and identify patterns and relationships. Students should be able to:

- Plan a simple investigation, identifying the techniques or equipment needed and the method to be followed
- Evaluate risks present in practical investigations
- Make a simple prediction about the outcome of the investigation
- Use appropriate techniques, equipment and materials safely to take simple measurements or observations that are meaningful and valid
- Make and record observations and measurements in an appropriate and safe way
- Display observations and data using an appropriate method
- State what has been found out during the investigation (drawing a conclusion) and use scientific explanations to develop hypotheses
- Evaluate methods and suggest possible improvements and further investigations

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5 Year Curriculum Plan	Autumn Term	Spring Term	Summer Term
Nurture 1	The Lion, The Witch & The Wardrobe – CS Lewis/ Shackleton's Journey – William Grill Introduction to Science Materials Our planet Particles	Charlotte's Web – EB White/Wind in the Willows – Kenneth Grahame Living things & habitats inc. classification Intro. To plants	The Twits/Esio Trot – Roald Dahl Cells The human body inc. nutrition & digestion
Nurture 2	Owen & the Soldier – Lisa Thompson Forces Electricity & magnetism Moving & turning	The Jungle Book – Rudyard Kipling Adapting to survive Plants & photosynthesis Reproduction	The Magic Paintbrush Light Sound Investigation skills
Nurture 3	Around the world in 80 days – Jules Verne/Michael Palin Space Energy & energy resources The Earth	Alice in Wonderland – Lewis Carroll/Wizard of Oz – L. Frank Baum Atoms, elements, compounds & mixtures Acids & alkalis	Stig of the Dump – Clive King/Greta & the giants – Zoe Tucker Metals & alloys Chemical reactions
Westfield 1&2 Pathway 1	**BTEC L1 in Applied Science** ASc14: Exploring Chemistry	**BTEC L1 in Applied Science** ASc6: Carrying out a scientific experiment	**BTEC L1 in Applied Science** ASc13: Exploring Biology
	BTEC L1 in Applied Science ASc15: Exploring Physics	**BTEC L1 in Applied Science** Extra unit chosen by staff/students	
Westfield 1&2 Pathway 2	**ELC Component 1** The Human Body	**ELC Component 3** Atoms, elements & mixtures	**ELC Component 5** Energy, forces & matter
	BTEC L1 in Applied Science ASc14: Exploring Chemistry	**BTEC L1 in Applied Science** ASc13: Exploring Biology	**BTEC L1 in Applied Science** ASc15: Exploring Physics
Westfield 1&2 Pathway 3	**ELC Component 1** The Human Body	**ELC Component 3** Atoms, elements & mixtures	**ELC Component 5** Energy, forces & matter
	ELC Component 4 Chemistry in our world	**ELC Component 6** Electricity, magnetism & waves	**ELC Component 2** Environment, evolution & inheritance

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5 Year Curriculum Plan – the rationale

Nurture 1 Science at Beech Academy - Westfield

The Beech Academy Nurture 1 Science curriculum prepares all pupils to consolidate and complete their knowledge from KS1 and KS2. it develops the knowledge of:

- **Materials** – types, properties & uses of different everyday substances
- **Our planet** – the Earth as a planet
- **Substances & Particles** – the study of materials & how they behave
- **Living things & habitats inc. classification** – grouping, identifying & studying where organisms live
- **Introduction to plants** – what plants need to grow & thrive
- **Cells** – the building blocks of life and how they look
- **The Human body including nutrition & digestion** – the basics of how the body survives & functions

The skills it focuses on:

- Using basic scientific equipment
- Using Bunsen burners safely
- Measuring using different equipment
- Health & Safety in the lab

Our pupils are studying these topics because it provides the foundations in some of the key scientific concepts that run through the Science curriculum at Beech. Topics from KS1 & KS2 are predominantly covered in Nurture 1 combined with some topics from KS3 since many students in Nurture have less prior knowledge compared to those in Year 7.

The topics are studied in this order because it allows concepts to be revisited and linked together and provide a foundation on which to start building up the students' schema.

Nurture 2 Science at Beech Academy - Westfield

The Beech Academy Nurture 2 Science curriculum continues to consolidate and complete their knowledge from KS2 and KS3 whilst at the same time building on the topics taught in Nurture 1. It develops knowledge of:

- **Forces** – how forces affect objects & different types
- **Electricity and magnetism** – circuits, magnets & how they interact
- **Adapting to survive** – how organisms adapt to survive competition & their environment
- **Reproduction** – how humans & plants reproduce
- **Light** – the behaviour of light around objects & how we use light to see
- **Sound** – how sounds are produced & heard

It further develops knowledge of:

- Plants & photosynthesis
- Scientific investigations

The skills it focuses on:

- Using scientific equipment accurately
- Measuring using different equipment
- Health & Safety in the lab
- Making simple predictions

Our pupils are studying these topics because it provides further foundations in other key scientific concepts and skills from KS1/2 not covered in Nurture 1 and begins to spiral and build on those that were.

The topics are studied in this order because again it allows concepts to be revisited from KS1/2, Nurture 1 and earlier in the year as well as making further links to develop the students' schema.

Nurture 3 Science at Beech Academy - Westfield

The Beech Academy Nurture 3 Science curriculum continues to consolidate and complete their knowledge from KS2 and KS3 whilst at the same time building on the topics taught in Nurture 1 and 2. It develops knowledge of:

- **Energy and energy resources** – the different types of energy and how they are transferred; the different resources we use to get energy into the home
- **Atoms, elements, compounds & mixtures** – what materials are made from & how we can separate them
- **Acids & alkalis** – how we use, identify & neutralise them
- **Metals & alloys** – the properties of metals and how we make them more useful
- **Chemical reactions** – the signs of a reaction & the different types

It further develops knowledge of:

- **Space** – looking at the Solar system and beyond

The skills it focuses on:

- Using scientific equipment accurately
- Measuring using different equipment
- Evaluating risks
- Making simple predictions
- Recording and presenting data
- Drawing conclusions from observations

Our pupils are studying these topics because it provides further foundations in other key scientific concepts and skills not covered in Nurture 1 and 2 and begins to spiral and build on those that were. The topics covered this year are solely from the KS3 curriculum which means students are then being prepared to move on to Entry Level and/or BTEC in KS4 – providing the foundation on which they can build.

The topics are studied in this order because again it allows for some concepts to be revisited both from Nurture 1 and earlier in the year. It also provides students the

opportunity to meet more abstract and complex knowledge that builds upon the various topics they have studied over the previous two years,

Westfield 1/2 Science at Beech Academy - Westfield

The Beech Academy Westfield curriculum is designed to follow one of three pathways depending on the ability and needs of each cohort.

Pathway 1

In Pathway 1 students follow a more traditional KS4 approach, studying for the BTEC Level 1 Introductory Certificate in Applied Science over two years. This involves the completion of two core units and three sector specific units. The core units are completed as part of the BTEC IT course that they study in the same timeframe so the focus in Science is very much on the sector specific units. These include:

- ASc13: Exploring Biology (classifying & identifying organisms)
- ASc14: Exploring Chemistry (chemical reactions used in making soap)
- ASc15: Exploring Physics (researching physics topics & making circuits)
- ASc6: Carrying out a scientific experiment

This allows for coverage of all three disciplines of Science at the KS4 level as well as further developing their skills in investigative and practical work. An additional unit may be covered depending on timescales and the interests of the students, with the best three topics claimed for. This course provides students an opportunity to start along a more vocational pathway where exams may not suit, but still has the potential to progress on to further education and training.

Pathway 2

In Pathway 2 students complete 3 components from the Entry Level Certificate course in their first year to allow them to further build up their understanding of key scientific concepts and achieve the Single Award in this course. The components studied include one Biology, one Chemistry and one Physics unit to allow for the breadth of scientific knowledge to be covered. These are:

- Component 1 – The Human Body
- Component 5 – Energy, Forces and Matter
- Component 3 – Elements, Compounds & Mixtures

In their second year, students then move on to the BTEC Level 1 Introductory Award or Certificate in Applied Science where they require at least one sector specific unit to achieve the Award and three to achieve the certificate. The units are the same as those covered in Pathway 1 since the content of these units complements and does not repeat the Entry Level topics covered in their first year.

Pathway 3

For those cohorts where it is felt that a Level 1 course is inappropriate, students will complete the Double Award Entry Level Certificate in Science which allows for coverage of the KS4 curriculum content at a foundational level. The six components required are as follows:

- Component 1 – The Human Body
- Component 3 – Elements, Compounds & Mixtures
- Component 5 – Energy, Forces and Matter
- Component 4 – Chemistry in our World
- Component 6 – Electricity, Magnetism & Waves
- Component 2 – Environment, evolution, and inheritance

The same three components are taught in the first year regardless of whether the cohort follows pathway 2 or 3 since this allows a decision to be made at the end of the students' first year as to which pathway they then follow for their final year, depending on how well they are coping with the demands of the Entry Level course.

Regardless of pathway all students work to develop their skills in:

- Planning an investigation including choosing equipment and designing a method
- Evaluating risks in practical work
- Making simple predictions
- Taking simple measurements
- Recording and analysing data in appropriate formats
- Carrying out and presenting mathematical and statistical analysis
- Stating what has been found out during the investigation (drawing a conclusion) and using scientific explanations to develop hypotheses
- Evaluating the investigation and data in terms of accuracy, precision, repeatability, and reproducibility as well as for its success in justifying the initial prediction.

The three pathways are designed to provide students the opportunity to achieve qualifications whilst at the same time breaking down the barriers that may prevent our students from achieving them as a result of their needs and/or abilities.