

Subject/Programme of Study: STEMS curriculum

Statement of Intent

STEMS curriculum is designed for students to develop scientific method of thinking as well as collaborative working skills through exposure to enquiry-based activities on a wide breath of topics from the natural environment and how humans interact with it.

Knowledge, skills and understanding

The STEMS Knowledge, skills and understanding is based on 'Working Scientifically' which is a continuous skills based area of the Science National Curriculum. This aims to ensure that children have greater exposure to a range of enquiry types and that they recognize when the various forms of enquiry are taking place.

The focus of STEM is shown below:

Exploring: Discovering what happens through play and exploration.

Observing over time: Often linked to exploring but with a time variable included.

Sorting, classifying, and identifying: Putting things into groups based on their characteristics.

Fair test: Used when we can control all the variables except the one that we are changing.

Pattern seeking: Used when there are too many variables to control and so a true fair test is not possible.

Problem solving: Using the Science that we know to solve a problem.

Researching and analysing secondary sources: Using secondary sources to help answer scientific questions that cannot be answered through practical investigations.

Developing the Scientific method: Pupils will then use their Working Scientific skills to develop the Scientific method which is a transferrable skill across curriculum.

Scientific Method



Pupils will engage in experiment which introduces vocabulary such as hypothesis, guess, predict, explore, experiment, discover, confirm, etc. Experiments will be shared with pupils as well as enquiry tools such as:

- “I wonder what will happen if I?” which allows pupils to share ideas or guesses.
- “What do you think will happen?” which allows pupils to agree on a guess to try (a hypothesis to test).
- “Was it correct?” which will be asked after pupils are allowed to carry out experiments.

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Pupils will work together to engage in activities and carry out experiments, discuss results and make conclusion from experiments. Pupils will learn resilience through problem solving, working as a group and becoming more aware of self among many other ways. This develops their collaborative learning skills.

Specific areas of development are shown below:

Communication Skills: speaking, using active listening, respect and giving and receiving feedback. Pupils will learn that some people communicate better in different ways.

Leadership: taking responsibility for key activities or tasks.

Creativity: problem solving by thinking of new ideas to do tasks or activities.

Organisation: preparation for tasks and time management. Organisational skills are vital to completing any piece of group work.

Collaboration: asking one another for information, evaluating one another's ideas, monitoring one another's work and putting the interest of the group ahead of their own interest.

KS3 STEM YEAR PLAN 2022-23

Group	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
KS3 Y7 *Suggested topics	Creating Outdoor Art	Learning About the Human Body *Community health professional school visit	Wondering about Water	Playing with Sunlight and Shadows	Environment- Reduce, reuse & recycle	Observing Flight *Scientific method in developing airplanes /rockets
KS3 Y8/Y9	Discovering Colour	Conducting Science Experiments *Sensory activities, * Developing scientific method- observation, prediction, manipulation, and measurement	Connecting with Our Community * Children will have opportunities to explore these occupations through pretend play, visits with professionals, and field trips to observe community members in action.	Studying Horticulture *Creating own garden, greenhouse and using hydroponic technique	Exploring Animals living in UK * Animal conservationists visit to school or visiting ZSL zoo	Learning about renewable energy

STEM Content Area description:

1. Creating Outdoor Art

Investigation purpose: In this unit students will explore different ways to create two- and three-dimensional art using natural and recycled materials.

Students will have opportunities to play with size and scale as they create artwork that can be displayed outside. Students will also be exposed to famous artists and introduced to their various techniques.

2. Studying Insects, Arachnids and Earthworms

Hypothesis question: How do insects, spiders, and earthworms help the environment?

Investigation purpose: This unit will focus on the similarities and differences between insects, arachnids, and earthworms.

Students will learn about their body parts, habitats, life cycles, markings, and ways they help the environment. Students will spend time exploring the forest floor and finding insects, arachnids and earthworms in their natural habitat. Depending on interests, students may recreate these habitats in their school by planting a garden to attract butterflies, building an earthworm house, or creating giant spider webs.

3. Connecting with Our Community

Hypothesis question: What can our community teach us about STEM?

Investigation purpose: This unit focuses on exploring the local community, using maps, and discussing occupations and transportation.

Students will study community helpers through a STEM lens, such as learning how engineers work on bridges, horticulturists cultivate gardens, or veterinarians care for animals. Students will have opportunities to explore these occupations through pretend play, visits with professionals, and field trips to observe community members in action. This Investigation Unit also provides opportunities to explore social problem-solving techniques and why caring for one another is important. This unit is an opportunity to introduce Social-Emotional Skills.

4. Environment-Reduce, reuse & recycle

Hypothesis question: Why is recycling important for protecting the Earth?

Investigation purpose: In this unit children will learn about the importance of recycling and protecting the planet

They will discover ways to reuse and repurpose materials. They will practice with sorting and classifying human-made materials and learn how items, such as paper, are made from natural materials. They will also explore their community and learn ways to help others care for their environment.

5. Studying Trees

Hypothesis question: Why are trees important?

Investigation purpose: This unit will focus on trees and exploring their parts, life cycle, and uses.

Students will explore materials that come from trees such as sap, pinecones and acorns, benefits of trees, such as providing shade, oxygen, and homes for animals, and uses of trees, such as supplying wood and making paper. Students will also explore the similarities and differences between coniferous and deciduous trees.

6. Studying Horticulture

Hypothesis question: What makes plants similar and different? Investigation purpose: This unit will focus on plants and gardening.

Students will create their own garden and determine what they want to grow based on the season, how they will need to care for their plants, and learn about hybridization.

Students will also learn about gardening, farming, and how we gather, ship, and grow food around the world. Students will look at how food is grown in large quantities outside of their seasons and natural habitat (e.g., Hydroponics). Students will have the opportunity to design and create their own mini sustainable gardens/greenhouse.

7. Wondering about Water

Hypothesis question: Why is water important?

Investigation purpose: Because children use water every day, this unit focuses on helping them learn more about water and its purposes.

Students will explore the water cycle, look at maps of bodies of water, discuss the types of water, and how water changes from solid to liquid to vapor. Students will have opportunities to experiment with water pressure, water conservation, and properties of different types of water. They will also study the ecology of water and its importance for people, animals, and plants.

8. Conducting Science Experiments

Hypothesis question: How does the scientific method help me make and prove my discoveries?

Investigation purpose: This unit will focus on exploring chemistry concepts.

Students will further their use of the scientific method by developing hypotheses and testing them through experiments. Through these sensory activities students will explore how materials transform, such as liquids becoming solids or gas; and learn about chemical reactions and catalysts. Students will discover the “magic” of science as well as the explanations as to why the reactions occurred. Students will also learn about scientists and other STEM occupations.

9. Exploring Sound

Hypothesis question: How can I make different sounds?

Investigation purpose: This unit focuses on the sense of hearing and helping students explore different sounds.

Students will explore sounds they hear in nature, human-made sounds and sounds they can create using their own bodies or voices. Students will have opportunities to create their own instruments and to explore musical concepts such as melody, pitch, rhythm, tempo, dynamics, and timbre. They will also play with words in sounds, exploring phonological awareness, onsets and rimes, alliteration, and poetry.

10. Playing with Sunlight and Shadows

Hypothesis question: How do we use light to create shadows?

Investigation purpose: In this unit students will explore light and shadows, discuss times of the day, and how to use sundials to tell time.

Students will also play with two-dimensional (2D) and three-dimensional (3D) shapes and how shadows turn 3D objects into 2D reflections. They will explore ways to use shadow puppets to create theatre productions. Students will also explore the role of the sun in the universe, as well as its influence on animals, plants, and seasons.

11. Discovering Colour

Hypothesis question: What creates the colours we see in our environment?

Investigation purpose: In this unit, Students will have opportunities to explore the colour spectrum through refracting light, colours found in nature, and by creating their own colours.

Students will discover how to describe, sort, match, and mix colours to create new ones as they play with prisms and create rainbows, as well as explore the absence of colour (black and white). This unit focuses on the role colour plays in nature such as in camouflage and photosynthesis. Students can use natural colours to create their own dyes for artwork. Children will also explore the concept of 'eating a rainbow' and how fruits and vegetables of different colours provide nutrients for the body.

12. Observing Flight

Hypothesis question: What makes things fly?

Investigation purpose: In this unit, students explore things that fly including animals (birds and insects – especially butterflies and moths), materials found in nature (maple spinners) and human-made materials like kites, airplanes, and helicopters.

Students can design and create their own airplanes/rockets using the Scientific method: make hypothesis on what is most important for airplanes to fly; look up designs; create airplane; have a flying competition; then make conclusion about their hypothesis from how their airplanes flew (correct or incorrect hypothesis and finally decide on how to improve airplanes/rockets).

Students will explore aerodynamics and what makes things fly, how wind and gravity work. Students will explore migration and observe birds and butterflies in their natural habitat as well as learn about their body parts and make comparisons between living and human-made things.

13. Exploring Animals living in UK

Hypothesis question: How can we help and protect animals that live in our community?

Investigation purpose: This unit will focus on the different animals that students may be able to see in their environment.

Students will have the opportunity to see and learn about different animal in the UK by having animal conservationist coming into school or visiting ZSL zoo. Students will learn about these

animals and their natural habitat as well as ways they can protect the animals. Students will explore animal tracks, animal homes, and animal diets including those of herbivores, carnivores, and omnivores.

14: Learning About the Human Body

Hypothesis question: How do our bodies work?

Investigation purpose: This unit is about helping students to learn about themselves and others, comparing similarities and differences, learning about body parts and body systems, and exploring their world using their five senses.

Students will learn ways to stay healthy including nutrition by learning to make nutrition plans for specific needs, having community nurses, doctors or dentists coming in to speak about health issues affecting pupils 11-16 and ways to stay safe. Students will look at their bodies as tools and machines and explore how they can move and create different actions.

14. Learning about renewable energy

Hypothesis question: How can we get sustainable energy without damaging our environment.

Investigative purpose: This unit is focussed on the many debates about reducing greenhouse gases and how renewable energy sources might form part of the answer.

Students will watch video clips such as those showing how steam is used to drive turbines in power stations which burn fossil fuels. Pupils will then look at how turbines can be adapted to be driven by alternative energy sources and examines the advantages and disadvantages of energy sources such as wind, solar, biomass, hydroelectric power, tidal and geothermal power.

Most people agree that renewable energy is a good thing, but how do people react when a wind farm and other renewable energy farms are proposed to be built near them? The activity in this unit puts students into different roles which will influence how they react to the proposed wind farm, solar farms, hydroelectric plants etc.

Students will have the opportunity to set up mini renewable energy kits but will have to make choices of which kit to use based on the environmental conditions as well as think about the impact these could have on the community or environment.