Radford Academy
A L.E.A.D. Academy

Radford Academy

Science

Curriculum

Depth Map

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Science at Radford Academy

Vision:

At Radford Academy, we want every child to develop a sense of wonder about the world around them. Through science, we encourage children to be curious, ask questions, explore ideas and discover how and why things happen.

Our science curriculum gives every child the opportunity to investigate, experiment and learn from their experiences. We encourage children to think creatively, solve problems and develop the confidence and resilience to keep trying when things do not go as expected.

We want our children to understand that science is all around us and plays an important part in our everyday lives. By the time they leave primary school, we hope they will be enthusiastic and confident young scientists who are curious about the world, enjoy finding out how things work and believe that they can use their knowledge to make a positive difference in the future.

Intent

The Science Curriculum at Radford Academy aims to inspire children to investigate their ever changing world and to equip them with the skills that they will require for this. As a school we encourage children to have high aspirations for their future careers. Science skills, such as observation, classification and analysis, are transferable across many areas of learning and development and provide a firm foundation for later in life.

Our curriculum aims to:

- Provide an inspiring Science education that appropriately supports and challenges every pupil and is inclusive to all.
- To provide a variety of stimulating Science experiences, involving and including the local community, that are meaningful and relevant to each learner.
- To be able to use the skills of working scientifically to become creative problem-solvers and deep thinkers.
- Inspire pupils to develop Science knowledge and acquire the skills of Working Scientifically, to enable them to choose and apply these in relevant situations, both now and in their future career.
- Promote the development of the pupils' personal and inter-personal skills through science investigation and exploration, in order for them to be responsible members of their own community.
- Support the children to acquire knowledge of how their bodies work and how to look after them so that they can lead mentally and physically healthy lifestyles as adults.

Substantive Knowledge

Referred to as scientific knowledge in the National Curriculum, this is knowledge of products of science: concepts, laws, theories and models.

In our Science Curriculum Depth Map, the progression of knowledge is taught in the context of Key Primary Themes and shows how it builds over time to develop pupils' understanding in Biology, Chemistry and Physics
Pupils will build their conceptual knowledge base by:
Knowing more facts;
Giving further examples of the same concept;
Understand and use a wider range of vocabulary;
Use models or concepts to describe their knowledge and understanding;
Make and explain links across areas of science.
Over time, that knowledge will become organised and connected. Constant recall will help pupils to activate prior knowledge and encourage them to make connections between units.

Disciplinary Knowledge

Working scientifically specifies the understanding of the nature, processes and methods of science for each year group and is covered alongside each concept, never in isolation. Our curriculum specifies what procedural knowledge underpins working scientifically.

The National Curriculum states that working scientifically should be 'embedded within the content of biology, chemistry and physics' incorporating a range of scientific enquiries that look at the nature, processes and methods of science.

These types of procedural knowledge should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources.

Our Curriculum Depth Map aims to familiarise pupils with all these types of disciplinary knowledge so that by the end of Key stage 2 they are able to choose the most suitable enquiry type to answer questions.

Implementation

Roles and Responsibilities

The Headteacher is responsible for ensuring that this policy is adhered to, and that:

- All required elements of the Science curriculum have aims and objectives which reflect the aims of the school and indicate how the needs of individual pupils will be met
- The appropriate amount of time is provided for teaching the required elements of the Science curriculum and is reviewed by the governing body
- The school's procedures for the assessment of science meet all legal requirements
- The governing body is fully involved in decision-making processes that relate to the Science curriculum
- The governing body is advised on whole-school targets for science in order to make informed decisions
- Proper provision is in place for pupils with different abilities and needs, including children with special educational needs

The Science subject leader, will:

- Provide professional leadership and management and ensure staff Science skills and knowledge are kept up to date
- Ensure the taught Science curriculum is engaging, age appropriate, challenges all pupils and meets the curriculum aims
- Secure high-quality teaching of the Science curriculum including the quality of the medium and long term plans
- Secure Science curriculum enhancing resources and promote their effective use.
- Improve standards of learning and achievement for all pupils in the Science curriculum
- Promote Science across the school,
- Ensure that this policy is adhered to

Teachers will adhere to this policy and make sure the Science curriculum they provide is commensurate with the aims of this policy

Organisation and planning

With due consideration to the many challenges our children face, our Science curriculum is designed to give them the opportunities they need to develop skills and enthusiasm so they pursue learning for the rest of their lives and become responsible citizens of the future. The development of these Science skills permeates throughout the curriculum.

We have identified a number of key areas that our children need to be given the opportunities to develop and these can be targeted through the teaching of the Science curriculum;

Reading

- Oracy- having the confidence and skills to communicate effectively
- Cultural capital – a curriculum that supports:
- General knowledge – To ensure each child leaves the school with a broad knowledge of the world around them
- Enrichment opportunities – provide a creative curriculum that inspires learning
- These key areas will underpin the learning in all areas of the curriculum.

Inclusion

Teachers set high expectations for all pupils. They will use appropriate assessments to set ambitious targets and plan challenging work for pupils of all abilities, including:

- More able pupils
- Pupils with low prior attainment
- Pupils from disadvantaged backgrounds
- Pupils with SEN
- Pupils with English as an additional language (EAL)

Teachers will plan lessons so that pupils with SEN and/or disabilities can study every aspect of the Science curriculum, wherever possible, and ensure that there are no barriers to every pupil achieving.

Teachers will also take into account of the needs of EAL children. Lessons will be planned so that teaching opportunities help pupils to develop their English.

For further information see our 'SEN' policy.

Impact

Governors monitor whether the school is complying with its funding agreement and teaching a 'broad and balanced curriculum' which includes Science, through:

- School monitoring visits
- Engagement and full governors' meetings
- Science leaders report
- Newsletters that contain curriculum information

The Science subject leader will monitor the way Science is taught throughout the school by:

- Evaluating long and medium term plans
- Learning walks
- Book scrutiny
- Data analysis
- Pupil interviews

The Science subject leader is responsible for monitoring the way in which resources are stored and managed.

Teachers are responsible for accurately assessing the Science curriculum. Assessments will be moderated by the Science subject lead.

This policy will be reviewed annually by the headteacher, Science subject leader and governors. At every review, the policy will be shared with the full governing body.

How are our Academy values are visible in our Science Curriculum



Children at Radford Academy are taught belonging through the Science curriculum by:

- Representing the diverse backgrounds of scientists and their achievements in science.
- Celebrating events including the international day of Women and Girls in Science.
- Providing the children opportunities to engage with science in their local community including visiting Windmill Gardens and partnering with the local university to grow different produce.
- We provide adaptions and additional support to help children access the science curriculum.

BRISTISH VALUES

Democracy: Children are given time to debate scientific questions and have lots of opportunities for paired work and discussion.

Rule of law: Following the safety rules when conducting a scientific investigation. Understanding what a fair test is.

Individual liberty: Giving the children choices and independence when investigating an enquiry question. Looking at healthy choices through the animals including human's lessons.

Mutual Tolerance: Children will work with children with different viewpoints and they will be taught about a diverse range of scientists.

Democracy: They will show democracy through a citizen project.

Protected Characteristics

- Our History Curriculum also includes elements of protected characteristics particularly about the role of women.



Children at Radford Academy are taught curiosity through the Science curriculum by:

- Having access to enrichment opportunities including visitors, visits and using technology such as VR headsets to promote curiosity about science.
- Have opportunities to ask questions and investigate different science topics.
- Link back to prior learning and ensure opportunities to develop awe and wonder.
- Working scientifically including pattern seeking, observing overtime and grouping and classifying will also help children to be curious about the world around them.



Children at Radford Academy are taught Aspiration through the Science curriculum by:

- Allowing the children to develop the skills that a scientist would have through the progression in disciplinary skills.
- Have a good understanding of the careers, particularly successful women, that they could do as a result of their enjoyment of science,
- Developing critical thinking and problem-solving skills that can be used in different scenarios.



Children at Radford Academy are taught Interaction through the Science curriculum by:

- Providing opportunities for oracy and partner talk including through discussion, debates and presentations.
- The use of enquiry questions helps the children to engage with a science topic by asking and answering questions about a source.
- Providing stem sentences and subject-specific vocabulary to help structure arguments and discussions.



Children at Radford Academy are taught Self- discipline through the Science curriculum by:

- The children engaging with enquiry questions and being able to manage their own critical thinking and tackle complex problems.
- When completing tasks and answering the composite question the children will need to manage what they include in their response.
- They will also need to manage their time effectively when completing tasks.
- Ensuring that learning behaviours are in line with the Behaviour Curriculum/ Pedagogy Policy.

Whole School Science Progression

Biology						
Plants						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
• Know the basic parts of a plant- leaf, petal, pollen and flower. • Know that plants grow and change.	• Know a variety of common wild and garden plants, including deciduous and evergreen trees. • Know and describe the basic structure of a variety of common flowering plants, including trees.	• Understand and describe how seeds and bulbs grow into mature plants. • Know and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• Know and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. • Know the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. • Understand the way in which water is transported within plants. • Understand the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Sexual)		Progression from animals including humans unit Describe the process of reproduction in plants asexual reproduction spider plants.	• Know a variety of common wild and garden plants, including deciduous and evergreen trees • Know and describe the basic structure of a variety of common flowering plants, including trees.

Biology						
Animals Including Humans						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
• Know the five senses of the human body. • Know the parts of the body • Know that animals including humans grown and change	• Know and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. • know a variety of common animals that are carnivores, .herbivores and omnivores • understand and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets) • know and label the basic parts of the human body and say which part of the body is associated with each sense.	• understand that animals, including humans, have offspring which grow into adults • understand and describe the basic needs of animals, including humans, for survival (water, food and air) • understand and describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	• understand that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat • know that humans and some other animals have skeletons and muscles for support, protection and movement.	• know the simple functions of the basic parts of the digestive system in humans • know the different types of teeth in humans and understand their simple functions • understand and interpret a variety of food chains, identifying producers, predators and prey.	• know and describe the changes as humans develop to old age.	• know the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • understand the impact of diet, exercise, drugs and lifestyle on the way their bodies function • know and describe the ways in which nutrients and water are transported within animals, including humans.

Biology						
Evolution and Inheritance						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
						• understand that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • understand that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • understand that animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Biology						
Living thing/Habitats						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Know and explore some habitats.		• understand and compare the differences between things that are living, dead, and things that have never been alive • know that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • know and name a variety of plants and animals in their habitats, including micro-habitats		• understand that living things can be grouped in a variety of ways • understand and use classification keys to help group, identify and name a variety of living things in their local and wider environment • understand that environments can change and that this can sometimes pose dangers to living things.	• understand and describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • know and describe the life process of reproduction in some plants and animals.	• Understand and describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals • Know and give reasons for classifying plants and animals based on specific characteristics.

		• Know that animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.				

Chemistry						
Rocks						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
			• Know, compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • Know and describe in simple terms how fossils are formed when things that have lived are trapped within rock know that soils are made from rocks and organic matter.	•	•	•

Chemistry						
Materials						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
• know that some things sink and some things float. • Know that some materials might change when water is added.	• Know and distinguish between an object and the material from which it is made • know and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • know and describe the simple physical properties of a variety of everyday materials • know, compare and group together a variety of everyday materials on the basis of their simple physical properties.	• know and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • understand how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.		• Know, compare and group materials together, according to whether they are solids, liquids or gases • Know that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) • know the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.	• know, compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets **RECAP PHSYICS** • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • understand and give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • understand and demonstrate that dissolving, mixing and	

					changes of state are reversible changes • understand and explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	

Physics						
Light						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
<u>Know that shadows are formed</u>			• know that they need light in order to see things and that dark is the absence of light • know that light is reflected from surfaces • know that light from the sun can be dangerous and that there are ways to protect their eyes • know that shadows are formed when the light from a light source is blocked by an opaque object • find patterns in the way that the size of shadows change.			• know that light appears to travel in straight lines • understand and use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • Understand that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • Know and use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Physics						
Forces						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
Know and use magnets			• Know and compare how things move on different surfaces • know that some forces need contact between two objects, but magnetic forces can act at a distance • know that magnets attract or repel each other and attract some materials and not others • know and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials		• Understand and explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • understand the effects of air resistance, water resistance and friction, that act between moving surfaces • understand that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	

			• know that magnets have two poles • know and predict whether two magnets will attract or repel each other, depending on which poles are facing.			

Physics						
Sound						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
			•	• know how sounds are made, associating some of them with something vibrating • know that vibrations from sounds travel through a medium to the ear • find patterns between the pitch of a sound and features of		

				the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it know that sounds get fainter as the distance from the sound source		

Physics						
Electricity						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
			•	• identify common appliances that run on electricity • know and construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers		• Understand that the brightness of a lamp or the volume of a buzzer is directly related to the number and voltage of cells used in the circuit • know and give reasons for

				• know whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • know that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • know some common conductors and insulators, and associate metals with being good conductors.		variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches • know and use recognised symbols when representing a simple circuit in a diagram.

Physics						
Seasonal changes						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
• Know and describe how the environment changes throughout the seasons.	• Understand changes across the four seasons • Know and describe weather associated with the seasons and how day length varies.		•	•		

Physics						
Earth and space						
Reception	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
•	•		•	•	• Know the movement of the Earth, and other planets, relative to the Sun in the solar system • know the movement of the Moon relative to the Earth • know and describe the Sun, Earth and Moon as approximately spherical bodies • know and use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	

Curriculum enrichment (trips, visitors, themed events etc)

Reception
Dentist visits
Granny sweets
Termly investigations

Year 1
Windmill Gardens
Local area walk
Termly investigations

Year 2
Windmill Gardens
Termly investigations

Year 3
Making healthy pizzas – linked to D&T
Magna Science centre
Termly investigations

Year 4-
Windmill Gardens
Local area and Forest school visit
Termly investigations

Year 5-
Visits from various scientists
Termly investigations

Year 6
Science fair
Termly investigations

The Foundations for Learning Science in the Early Years

The foundations for learning science begin in the early year's classroom. At BHPS, our curriculum aligns the EYFS area 'Understanding the World' with the Science National Curriculum. In Foundation, children experience a combination of direct teaching and child led exploration to achieve an understanding of scientific concepts. Children's interests and curiosities are equally valued and fostered and therefore we have included a continuous provision element to summarise the potential learning that may arise within the environment.

Our EYFS curriculum ensures sufficient coverage of Key Primary Themes including plants, animals, environments, everyday materials and seasonal changes. The sticky knowledge is explicitly taught and then embedded through pedagogical approaches appropriate for EYFS including exploration, observation and investigation. Our Foundation unit is a vocabulary rich environment where adults enhance children's scientific language through a purposeful play-based approach.

Learning is carefully sequenced, considering the small steps children need to achieve the ELG and considers the interplay between conceptual and procedural knowledge that children need in order to access the National Curriculum. KS1 staff draw upon the Understanding of the World ELG assessment to support future teaching. The ELG assesses only a small proportion of the learning children experience. As KS1 teachers begin Component of Learning s, they teach and assess initial knowledge that children may have acquired previously

Foundation	Autumn Term		Spring Term		Summer Term	
	1	2	3	4	5	6
Topic title	**All about me**		**Traditional tales**		**Life Cycles**	
Link to Science Key Concept	Senses		Materials		Plants Animals including humans	
Sticky knowledge	• Know the 5 senses • Talk about 3 stages of the lifecycle baby child grown up		• Know the names of different materials and which material would be best for the three little pigs. • Know what would be a good material for a coat for Little Red Riding Hood. • Mix potions and talk about the changes (Room on the Broom) • Visit the forest school to talk about habitats from the Gruffalo story.		• The children talk about bean plant and the life cycle of a caterpillar. • Talk about the different plants around school and know their name • Talk about the different parts of a plant (leaves, pollens stems and petals •	
Links to continuous provision	• Explore different senses.		• Explore how materials can be changed		• Explore plants and animals in the natural environment.	

	• Tell you what I can see, hear and feel when I am outside.	• Observe, measure and record how materials change when heated and cooled. • Explore a range of materials, including natural and human made materials. • Make objects from different materials, including natural materials	• Compare different environments eg. The woodland and the school grounds.
Working scientifically	• Use senses and observe closely. • Can talk about the things observed in the environment. • Solve problems by trying many different ideas. • Respond to new experiences • Watch and replicate how others do things. • Repeat activities.	• Notice similarities and differences. • Use skills they have been taught within their play • Use a trial and error approach • Think of their own ideas • Plan how they will explore or play • Solve problems using some given solutions – considering the most appropriate idea • • Make independent choices of materials • Concentrate on achieving something that's important to them	• Draw and discuss different things observed. • Learn how to take care of other living things • Question things that happen • Use equipment and tools carefully • Solve problems by independently thinking and trying solutions • Correct their mistakes themselves • • Make connections in their learning • Think of their own explanations
Vocabulary	Senses Change Baby Grown up		

How do we assess in Primary Science

During the lesson sequence:

The lesson design sequence enables teachers to assess the children's understanding at 3 planned points. Although teacher assessment will be continuous through observing the children engaging with the content taught.

- The first point of assessment is during the link it activity. The link it activity will focus on previous content and will link to one of the golden threads of knowledge to ensure that the children have understood previous content. (If it is clear the majority of children have not retained previous content then their will need to be some teaching to bridge the gap- If only a few children have retained this will be addressed in the lesson and these children will become the focus children).
- The second point of assessment will come after the practice it stage of the lesson- The children will be given two questions that they will need to answer. This can be in the form of a kahoot quiz or through the use of the whiteboards. (If the majority of children do not answer the questions correctly, they will remain and the main teaching points will be reviewed again. If only a small number are unsuccessful they will remain in the carpet and receive additional support from the teacher).
- The final assessment point will be during the review it stage. There will be two questions which can be in the form of a quiz or diagnostic question to address which children have understood the lesson. Names will be recorded of those who were unsuccessful and these children will receive and additional pre teach before the next lesson in the sequence.

After the unit

At the end of the unit the children will independently answer the composite question introduced at the start of the unit. Teachers will assess the content for historical accuracy and then award the final grade which will be recorded on DCPro. Names of children who have not achieved ARE will be recorded on a separate sheet.

To test the children's working scientifically skills we have selected an assessment from TAPS (Teacher assessment in primary science) which will be completed at the end of each unit.

Working scientifically will also be teacher assessed through the various activities that the children will undertake.