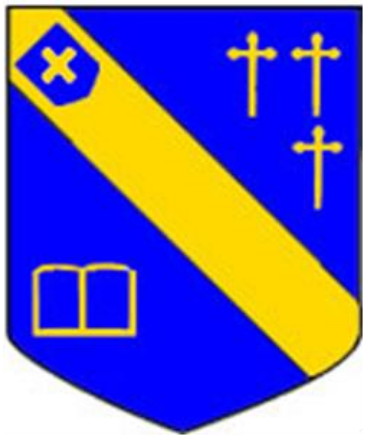
Science Policy

DUKE OF NORFOLK CE PRIMARY SCHOOL



Approved by:	Full Governing Body	Date: Dec 2022
Last reviewed on:	Nov 2022	
Next review due by:	Nov 2025	

Contents

1. Science Curriculum Intent

1.1 Aims of this Policy

This policy aims to:

This document reflects the Duke of Norfolk Primary School's values and philosophy in relation to the teaching and learning of science. It sets out a framework within which both teaching and non-teaching staff can operate and gives guidance on planning, teaching and assessment.

The policy should be read in conjunction with the Curriculum Map and the Vocabulary Map for science.

Our science policy covers all of the statutory expectations as set out in the National Curriculum for England 2016 (DfE). It also reflects requirements for inclusion and equality as set out in the Special Educational Needs and Disability Code of Practice 2014 and Equality Act 2010, and refers to curriculum-related expectations of governing boards set out in the Department for Education's Governance Handbook. In addition, this policy acknowledges the requirements for promoting the learning and development of children set out in the Early Years Foundation Stage (EYFS) statutory framework.

1.2. A.S.K and Our Science Curriculum

SMSC Statement

At the Duke of Norfolk CE Primary School, we recognise that the personal development of pupils spiritually, morally, socially, and culturally, plays a significant part in their ability to learn and achieve. We therefore aim to provide an education that not only provides pupils with the required knowledge and skills in science, we provide opportunities to explore and develop their own values and beliefs, spiritual awareness, high standards of personal behaviour, a positive, caring attitude towards other people, an understanding of their social and cultural traditions and an appreciation of the diversity and richness of other cultures. We use the acronym A.S.K (Attitude, Knowledge and Spirit).

Science provides opportunities to promote the following:

Spiritual development: Through allowing pupils opportunities to appreciate the world around them with awe and wonder.

Moral development: Through helping pupils to understand how changes to the environmental endanger living things, and contemplating the actions of humans in this process.

Social development: Through helping pupils to recognise the need to consider the views of others when discussing scientific ideas, and by working collaboratively, making the most of different strengths and interests within a team.

Cultural development: Through exploring how scientific advances have, and continue to contribute to our lives and culture, and observing how we use science to address many of the world's material problems.

1.3. Intent of Our Science Curriculum

At The Duke of Norfolk Primary School, our **intent** is to give every child a broad and balanced science curriculum which enables them to confidently explore and discover what is around them, so that they have a deeper understanding of the world we live in. We intend to build on children's understanding of the world at the end of Reception by extending their knowledge of biology, physics and chemistry through Key Stages 1 and 2 to enable pupils to be ready for science at secondary school. Our aim is to provide stimulating and challenging experiences help every child secure and extend their scientific knowledge and vocabulary, as well as promoting a love and thirst for learning. At the Duke of Norfolk Primary School, we have a coherently planned and sequenced curriculum which has been carefully designed and developed with the need of every child at the centre of what we do. Through building up a body of key foundational knowledge and concepts, pupils will be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. We want to equip our children with not only the minimum statutory requirements of the science National Curriculum but to prepare them for the opportunities, responsibilities and experiences of later life.

Our aims are also underpinned by the National Curriculum aims, which state:

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

1.4. Science Curriculum Organisation

How the science curriculum is organised:

- The curriculum for **science** is specifically designed for children to build on prior knowledge and skills, and although working on a two-year cycle is split into phases to ensure that the progression remains chronological.
    - Curriculum mapping for science is split into the overarching strands of biology, chemistry and physics. These strands are further split into the following 12 sub-strands;
        - Biology: humans; other living creatures; plants; evolution and inheritance
        - Chemistry: materials and their properties; chemical and physical changes
        - Physics: seasonal changes; forces; light; electricity; sound; earth and space
- **Working Scientifically** skills are incorporated systematically throughout the teaching of these strands, and included by the teacher at the medium term planning stage. These skills (and the related vocabulary) are separated into the following strands: scientific attitudes; planning; observing and measuring; analysis; evaluating.
- Our science curriculum is taught in phases: EYFS and phases 1,2 and 3.
- Within these phases, the strands of learning are taught through units of work, each with an overarching question. **EYFS** teach 11 units of learning which are repeated each year. This learning is explicitly taught

through the 'Understanding the World' element of the Early Years curriculum and reinforced during continuous provision.

- KS1 teach seven **phase 1** units across a two-year cycle, generally focusing on a unit per term.
- LKS2 teach **phase 2** through 9 units over a two-year cycle, 5 units during cycle one and 4 during cycle 2.
- UKS2 teach **phase 3** through 12 units spread evenly across the two-year cycle. This allows sufficient time to cover the statutory content of science along with enrichment opportunities.
- Whilst the Nursery and Reception cover the Statutory EYFS Framework, mapping for science makes clear the foundations that are to be laid in this vital stage. Where possible, these link to the Seven Areas of Learning and Development.

2. Science Implementation

2.1. Planning

Planning for each unit of work is done on the school's agreed format for Medium Term Planning. This planning format makes explicit the links between prior and subsequent learning, sets out the pedagogical approach, makes clear how learning will be differentiated, and the vocabulary to be secured.

EYFS use a different planning format due to the inter-related nature of their curriculum, but this planning makes clear the science objectives for easy monitoring.

Planning is shared across the phase so that children access the same learning, and teachers share the planning workload.

Planning is stored on the shared server for easy access and monitoring.

2.2. Resources

- Shared science resources are stored in a central store close to the staffroom. EYFS have many of own resources stored in topic boxes in their department and outdoor area.
- The science coordinator is responsible for auditing and ordering resources. Staff should request specific resources via email to the coordinator.
- Non-fiction texts to support science learning and interest are in our school library and also in classroom book corners. EYFS keep relevant books within topic boxes as well as in book areas.

2.3. Teaching and Learning

Learning in science builds each year on knowledge gained in previous years. Strands of learning are repeated throughout the school, with challenge deepening as the children's science knowledge grows. Our teaching is concept led rather than task led, with component learning goals taken directly from the national curriculum. Lessons are planned and delivered using a range of pedagogical approaches, a variety of learning activities, and incorporating differentiation to support all our learners.

Each unit contains practical elements, with the 'Working Scientifically' concepts taught explicitly, then woven throughout all science learning. (Planning, observing and measuring, analysis and evaluating.) Where there is a gap in the learning of individuals or groups, our curriculum map allows specific knowledge to be tracked backwards to enable teachers to plan and deliver accurate, linked learning.

2.4. Inclusion

Teachers set high expectations in science for all pupils. They will use appropriate assessment to set ambitious targets for all, based on our curriculum maps, and plan challenging work for all groups, including:

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

Teachers will plan lessons so that pupils with SEN and/or disabilities can study science, wherever possible, and ensure that there are no barriers to every pupil achieving. The science curriculum is mapped so that learning steps can be broken down to match a child's cognitive stage.

- It might be most appropriate to simplify the component learning aim to suit a child. An example of this could be the Y5 objective "*Know the life cycle of different living things e.g., mammal, amphibian, insect, and bird."* In this case, a child may understand one simple life cycle such as the life cycle of a frog, rather than developing a broader understanding of a variety of life cycles.
- In science, it will often be more suitable to track back through the strand to find an appropriate aim for children to work on. To use the same Y5/6 example, "*Know the life cycle of different living things e.g., mammal, amphibian, insect, and bird",* a child may be better suited to use the phase 1 "*Know the basic stages in a life cycle for animals"* or further track back to "*begin to sort animals into groups"* from EYFS intentions.
- Another method to support learning and understanding is the use of pre-teaching activities, where a child or group of children are given previous opportunities to consider a given challenge before the main lesson, or previously tackle a similar task to build confidence.
- Some children may be able to access the learning simply through provision of a learning scaffold, (such as an additional word bank, sentence starters or a diagram)
- Activities are sometimes differentiated through mixed ability groupings, where more able children deepen their understanding of a concept through explaining their knowledge to others, at the same time supporting the learning of others.

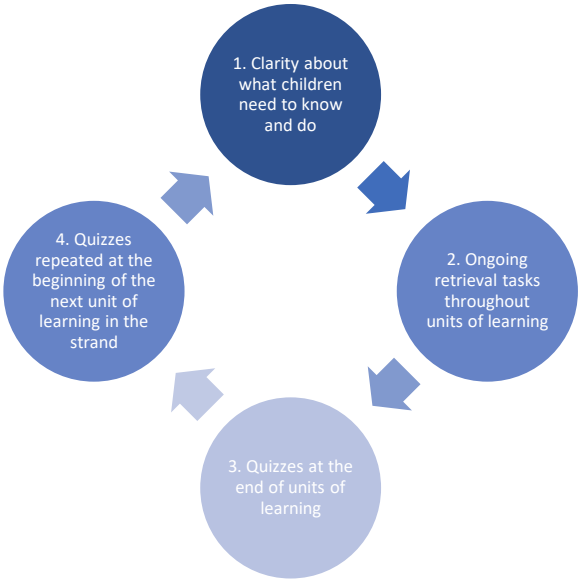
Where there are physical barriers, appropriate adaptions will be made to ensure children can access the learning. Teachers will seek advice and support from the SENDCo when necessary.

Teachers will also take account of the needs of pupils whose first language is not English. Science lessons will be planned so that teaching opportunities help pupils to develop their English, and to support pupils to take part and achieve.

Further information can be found in our statement of equality information and objectives, and in our SEN policy and information report.

2.5. Assessment and Recording

In order to check that children are progressing in science, (that they know more, can do more, and remember more), and that our teaching and learning is matched well to the children's needs, we continually employ a range of formative and summative assessment strategies.



Clarity for teachers and children about what they need to know and do, supports learning, and makes criteria for assessment clear. Our curriculum maps provide clear composite and component knowledge and skills to underpin this.

Ongoing retrieval tasks are completed throughout a unit of learning which support children to move learning into their long-term memories. These tasks also help teachers to spot gaps in learning, address misconceptions, and adapt their teaching accordingly.

Summative quizzes at the end of a unit of learning help teachers to check on learning of composite knowledge. We know that assessment close to the point of learning can be misleading, so we repeat these quizzes at the beginning of the next unit of learning in the strand. This not only allows teachers to check that learning has been secured (at some distance from the point of learning) but supports children to retrieve knowledge/mental models in preparation for subsequent learning.

2.6. Roles and Responsibilities

2.6.1 The governing body

The governing body will monitor the effectiveness of this policy and hold the headteacher to account for its implementation.

The governing board will also ensure that:

- A robust framework is in place for setting curriculum priorities and aspirational targets for science
- Maintained schools only: Enough teaching time is provided for pupils to cover the National Curriculum and other statutory requirements
- The school is complying with its funding agreement and enough teaching time is provided for pupils to cover the requirements of the funding agreement

- Proper provision is made for pupils with different abilities and needs, including children with special educational needs (SEN) in science
- The school implements the relevant statutory assessment arrangements
- It fulfils its role in processes to disapply pupils from all or part of the National Curriculum, where appropriate, and in any subsequent appeals

2.6.2 Headteacher

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

- All required elements of science, including those aspects which school chooses to offer, have aims and objectives which reflect the aims of the school and indicates how the needs of individual pupils will be met
- The amount of time provided for teaching science is adequate and is reviewed by the governing board
- Where appropriate, the individual needs of some pupils are met by permanent or temporary disapplication from all or part of science
- They manage requests to withdraw children from science, where appropriate
- The school's procedures for assessment of science meet all legal requirements
- Proper provision is in place for pupils with different abilities and needs, including children with SEN

2.6.3 Subject Lead for Science

The science leader will:

- Be the advocate for science in school
- Provide advice or guidance to staff, when necessary
- Keep abreast of local and national developments in science and disseminate relevant information to staff
- Provide or source appropriate CPD to all staff, or targeted groups/individuals, as required
- Set a timetable of monitoring and evaluation (see Monitoring) to monitor effectiveness of science and use to inform action planning and subject development
- Report findings of monitoring to SLT and Governors regularly
- Feedback monitoring to staff in a timely and professional manner
- Monitor to appropriate storage and responsible use of stock
- Co-ordinate any display of science work.
- Ensure the subject leader file is kept current
- Collect a portfolio of children's work, including photographs of, and examples of pupils' work

2.6.4 Teaching and Learning Staff

Teaching and learning staff will:

> Ensure that the science curriculum is implemented in accordance with this policy

> Engage actively with professional development and feedback in science in order to improve teaching and learning

3. Impact

3.1 Expectations

By the end of year 1, children should be able to:

- identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals
- identify and name a variety of common animals that are carnivores, herbivores and omnivores
- describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)
- identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.
- distinguish between an object and the material from which it is made
- identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock
- describe the simple physical properties of a variety of everyday materials
- compare and group together a variety of everyday materials on the basis of their simple physical properties.
- observe changes across the four seasons
- observe and describe weather associated with the seasons and how day length varies

By the end of Year 2 (Phase 1), children should be able to:

- explore and compare the differences between things that are living, dead, and things that have never been alive
- identify 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
- identify and name a variety of plants and animals in their habitats, including microhabitats
- describe how 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.
- observe and describe how seeds and bulbs grow into mature plants
- find out and describe how plants need water, light and a suitable temperature to grow and stay healthy
- notice that animals, including humans, have offspring which grow into adults
- find out about and describe the basic needs of animals, including humans, for survival (water, food and air)

- describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene
- identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses
- find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

By the end of Year 4 (Phase 2), children should be able to:

- identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- explore 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
- investigate the way in which water is transported within plants
- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.
- identify 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 .
- identify that humans and some other animals have skeletons and muscles for support, protection and movement. recognise that living things can be grouped in a variety of ways
- explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- recognise that environments can change and that this can sometimes pose dangers to living things. describe the simple functions of the basic parts of the digestive system in humans
- identify the different types of teeth in humans and their simple functions
- construct and interpret a variety of food chains, identifying producers, predators and prey
- compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- describe in simple terms how fossils are formed when things that have lived are trapped within rock
- recognise that soils are made from rocks and organic matter.
- compare and group materials together, according to whether they are solids, liquids or gases
- observe 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)
- identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
- recognise that they need light in order to see things and that dark is the absence of light
- notice that light is reflected from surfaces
- recognise that light from the sun can be dangerous and that there are ways to protect their eyes
- recognise 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 changes
- compare how things move on different surfaces
- notice that some forces need contact between two objects, but magnetic forces can act at a distance
- observe how magnets attract or repel each other and attract some materials and not others
- compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
- describe magnets as having two poles
- predict whether two magnets will attract or repel each other, depending on which poles are facing.
- identify how sounds are made, associating some of them with something vibrating
- recognise 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
- recognise that sounds get fainter as the distance from the sound source increases.
- identify common appliances that run on electricity
- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- identify 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
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognise some common conductors and insulators, and associate metals with being good conductors.

In addition, by the end of Year 4, children should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes

- using straightforward scientific evidence to answer questions or to support their findings.

By the end of Year 6 (Phase 3), children should be able to:

- describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
- describe the life process of reproduction in some plants and animals.
- describe the changes as humans develop to old age. 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
- give reasons for classifying plants and animals based on specific characteristics identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- describe the ways in which nutrients and water are transported within animals, including humans. recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. 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
- 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
- give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- demonstrate that dissolving, mixing and changes of state are reversible changes
- 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.
- describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- describe the movement of the Moon relative to the Earth
- describe the Sun, Earth and Moon as approximately spherical bodies
- use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- recognise that light appears to travel in straight lines
- 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
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes

- use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram. identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

In addition, during years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
  recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

3.2 Monitoring and Evaluation

The subject leader will create an annual timetable of monitoring and share it with SLT at the start of the academic year. This will include the planned methods of monitoring, the suggested dates, and the focus of monitoring, which may be informed by the School Improvement Plan, or the science action plan.

3.3 Methods of Monitoring

Methods of monitoring science may include:

Lesson observations (to be agreed as part of the formal Performance Management process) or informal learning walks

Interviews or questionnaires with children

Interviews or questionnaires with staff/parents

Looking at books or recorded work

3.4 Purpose of Monitoring

The purpose of monitoring is so that subject leaders, SLT and Governors can answer the following questions:

What are the standards in science across the school?

Does the science curriculum meet our statutory requirements?

Does the science curriculum keep up-to-date with local and national changes?

Is the science curriculum effectively organised and applied for our context?

Is the science curriculum being implemented effectively and in line with this policy?

Where is there evidence of high-quality teaching and learning? What is enabling this?

Where is there evidence of inconsistent quality in teaching and learning? What is the barrier?

Do we have sufficient resources to implement science effectively?

What is the current picture in science? What enhances provision? What are the barriers?

What are the development priorities for science?

Is assessment in science effective? How do we know?

What are the priorities for staff development?

Are resources being effectively and responsibly managed?

3.5 Recording and Reporting Monitoring

Subject leaders may report findings in their monitoring in the following ways:

- Feedback meetings with SLT
- Written report on agreed monitoring proforma
- Written feedback to teaching staff
- Collated data from surveys/questionnaires
- Newsletters to children/parents
- Updated action plans with impact evidence

Governors monitor coverage of National Curriculum subjects and compliance with other statutory requirements through:

- Meetings with subject link governor (1-2 times per year)
- Written report/Presentation to governors – annually

3.6 Policy Review

This policy was written by Kellie Wilson (DHT) and Anna Clarke (subject leader) on 13th October 2022.

This policy will be reviewed by the subject coordinator every three years, unless required sooner, and then ratified by the governing body.