Science
Subject Policy

Intent

Our School Vision

Our vision is that all children at East Markham Primary School will be happy, successful learners who believe in themselves and achieve their full potential. With this always in mind, our school motto is '**Believe, Achieve, Succeed**'.

Our school motto, 'Believe, Achieve, Succeed', and school values, Respect, Empathy, Resilience, Courage and Passion, underpin all areas of school life.

Rationale

Science is a crucial area of learning that allows pupils to develop not just their knowledge of the biological, chemical and physical processes that define our world, but also their ability to inform their own understanding of, curiosity towards and interaction with the world.

Success in science is not just measured in scientific knowledge, but in an individual's ability to apply what they have learned to seek out answers to their questions. Pupils will develop their ability to process information, think critically, develop enquiry-based approaches, and respect both themselves and the natural world in which they live.

Aims and Objectives

We aim to:

- Encourage pupils' enjoyment and enthusiasm for science, including building an appreciation for the way scientific progress has shaped our understanding of the world and the contributions of significant and diverse people throughout history.
- Build upon pupil's innate curiosity, awareness and sense of awe of the natural world.
- Develop the ability to think rationally, critically and give due thought to the methods of determining understanding and beliefs based on investigation, evidence and objectivity.
- Plan a range of engaging, ambitious and conceptually challenging learning opportunities, including investigations and practical activities to develop scientific understanding and knowledge of science.
- Challenge pupils of all levels of ability, ambition, background and disposition cognitively to achieve every success they can, adapting as necessary to ensure that planning is both proactive and reactive in response to changing needs.
- Introduce, model and develop the language, terminology and vocabulary of science.
- Develop pupils' ability to work practically in a range of contexts using scientific enquiry methods.
- Encourage the use of technology and computing to support their learning.
- Take advantage of opportunities found outside of the typical curriculum to enhance and diversify learning about science.
- Promote a healthy lifestyle for pupils physically, emotionally, mentally and spiritually.

- Increase the science capital of our pupils and raise their aspirations for working in STEM related fields and viewing them in a positive light.

Our School Values in Science

	As pupils develop their understanding of the world around them, they will learn about the value and importance of the world's balance, ecological systems and their own selves and those around them. With this understanding, they should come to respect the world through their actions and understand the consequences of them.
	Pupils will develop resilience as they come across problems that require solutions that do not come immediately or require alternative methods. They will encounter setbacks and unexpected results in their investigations and enquiries and that may not fulfil their predictions or answer their questions immediately. They should recognise that continuing to search for answers and using resilience is a key skill in working as a scientist.
	Pupils will develop the courage to work independently and as part of a group as they explore the unfamiliar and the familiar in new and unforeseen ways. They will develop the courage to make decisions that have the potential to go awry in their search for answers to their enquiries, including those about methods, equipment and the approaches they use. They may encounter situations where they must have the courage to accept a different answer or challenge a misconception.
	Empathy is a key skill pupils will develop as they develop their ability to work a scientist as they gradually learn more about the world around them and the conditions for life and various processes, as well as each other. Pupils will move away from thinking about one way of doing things as they learn how various ideas have been challenged and changed, as well as the circumstances that led to those beliefs or misconceptions forming.
	It is our hope that will excellent quality first teaching, pupils develop a thirst for scientific knowledge and a passion for developing their ability to search for answers independently. Science gives all pupils the opportunity to develop their passion in areas of interest in various hobbies, fields and future career aspirations.

Implementation

Teaching and Learning

Our primary curriculum is based upon, but not limited to, the National Programmes of Study for Key Stage 1 and Key Stage 2. In a typical week, an expectation of two hours of teaching time is given to lessons with explicit science-based learning objectives.

Science at East Markham Primary school will include a variety of teaching and learning styles. Science teaching ranges from activities that are whole-class based and teacher led, to cooperative teamwork based group activities, to individual learning. Activities will include a range of practical and investigative methods, focusing particularly on enquiry based approaches and the development of enquiry based skills.

Teaching of science will generally be preceded by a series of activities designed to promote engagement and generate pupil questions. Science teaching is then structured into three equally important parts:

- **Exploring** - Pupils explore a question, statement, problem, idea, artefact, model, living thing or event as a starting point to enquiry. This will involve development of substantive knowledge acting as starting point to developing disciplinary knowledge.

- **Collecting and analysing evidence –** Pupils use scientific enquiry skills and explore how to reach a conclusion through scientific enquiry approaches. They will develop their ability to: observe over time, look for patterns, identify and classify, research using secondary sources or carry out a fair/comparative test, and record and analyse their findings to gather appropriate evidence.

  Supporting these enquiry approaches are enquiry based skills. These include; asking questions, making predictions, setting up tests, observing and measuring, recording data, interpreting and communicating results and evaluating.

- **Reaching a suitable and satisfying outcome -** Children can solve a problem, answer a question, develop an explanation, make and evaluate an artefact, model or system, provide evidence to justify why the outcome is appropriate, or raise more questions to investigate

A typical lesson will begin with previous learning being revisited to lay the groundwork for clear continuity in progression and to help embed learning that lasts ("Sticky learning"). Key vocabulary will also be introduced and references made to the exploration activities conducted earlier. Further exploration activities may take place to provide demonstrations of a concept or serve as the foundation point for questions and further enquiries. The three part structure will be followed and then pupils will begin developing a line of enquiry or practise an enquiry based skill. Lessons may focus on a particular aspect of an investigation or forming a satisfying outcome on their own.

Enjoyment and Engagement

Pupils should be given ample opportunities to develop their awe and wonder for the subject. This will primarily be achieved through engaging lesson content that caters to all levels of need and ability. Teachers will ensure a consistent yet varied range of activities are provided that are attuned to the needs, interests and development of their class or year group. Where possible, teachers will encourage pupils to select and use appropriate resources to support their learning journey.

Pupils are given access to a wide range of reading material which includes age appropriate content relevant to their age group in each class. This may include non-fiction texts such as encyclopaedias or fiction texts that include scientific concepts (marked with a red star.) In this way, the love of reading is promoted and links across the curriculum are established. Pupils will also have access to computing resources for research and investigation, including data-logging equipment. Pupils will be shown how to evaluate these sources of information and make conclusions that are both valid and fair.

Where possible, pupils are given opportunities to apply or enrich their scientific understanding outside of typical science lessons. This may include use of visiting specialists or contextually relevant individuals and groups that have come in to do scientific activities or talk about the role science plays in their lives. This way, the pupils can start to relate what they are learning to their lives outside of the school day. Pupils may

be given the opportunity to work scientifically and learn more on educational visits, such as trips to nature reserves, aquariums or specialist science museums and activity centres. Opportunities with other schools may become available. Where possible, the topics may allow concepts to be explored from different angles and a balance between knowledge, skills and adequate challenge will be maintained.

Learning opportunities for all

All children have equal access to the science curriculum in each year group. The staff at East Markham Primary School are responsible for ensuring that all children, irrespective of gender, learning ability, physical disability, ethnicity and social circumstances, can access to the whole curriculum and achieve their best possible progress. Work will be adapted to meet pupils' needs where it is appropriate, including if additional support is required. Gender and cultural differences will be reflected positively in the teaching materials used. Prior knowledge and ability of pupils will be taken into account, and a suitable cognitive challenge will be ensured for all pupils. Assessment against the National Curriculum allows us to consider each child's attainment and progress against expected standards.

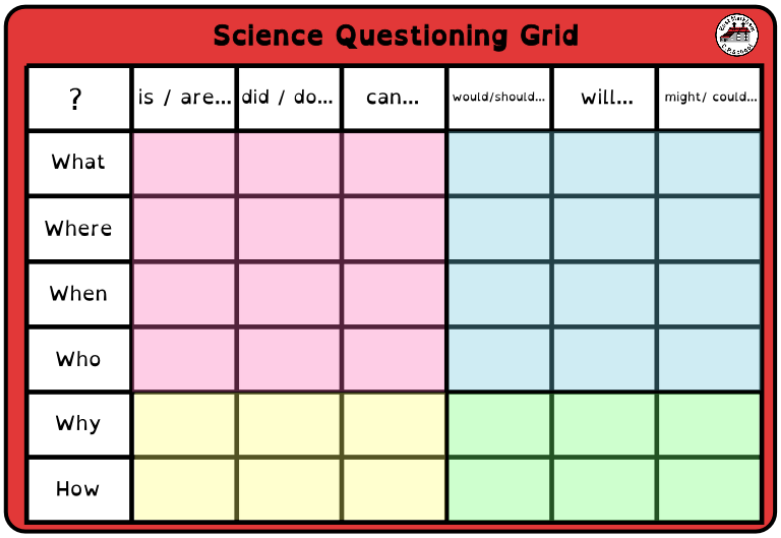
Planning and Progression

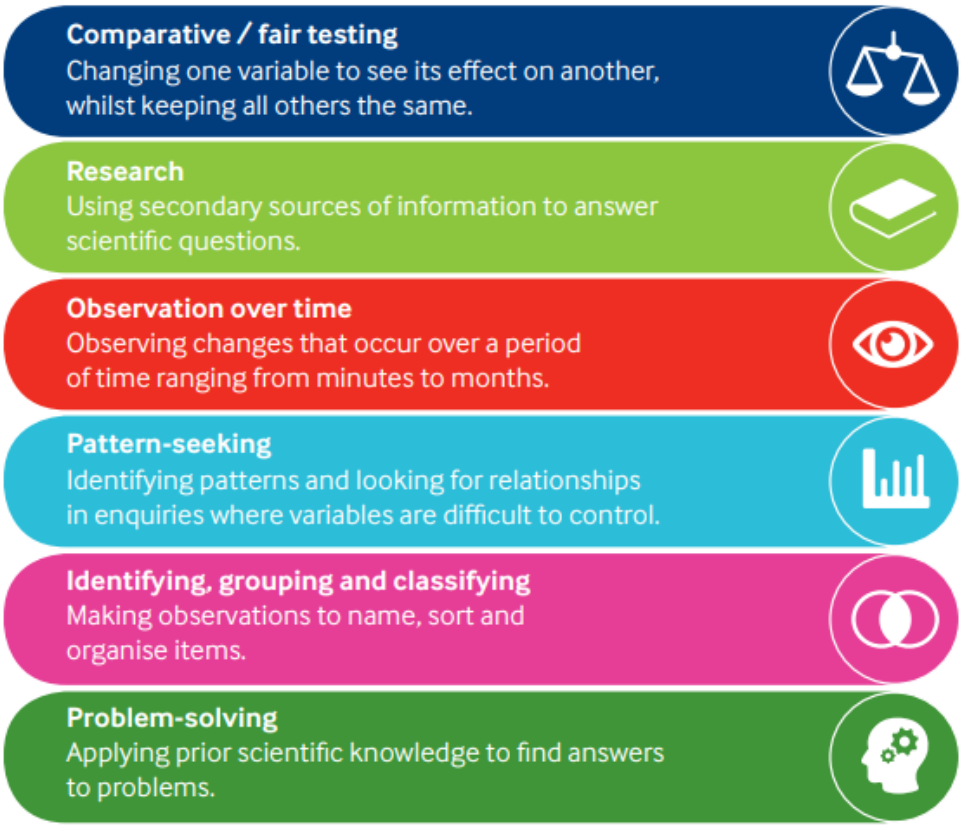
Disciplinary Knowledge/ Working Scientifically

It is important that pupils understand science not just as a collection of facts they need to learn, but as a way through which they can evaluate and understand the world around them. Pupils will be encouraged to think open-mindedly and think critically, and will be given the 'tools' necessary to achieve the ability to ask and answer their own questions. The understanding of 'what' something is will be supported with the 'why' and 'how', with pupils encouraged to discover the answers to these questions themselves, as well as which questions they can ask in the first place.

Teachers will introduce, encourage the use of, and model scientific terminology at every stage of the curriculum, at a level consummate with the age and ability of the pupils. This encourages pupils to articulate their understanding and helps them connect their knowledge to concrete concepts. Some examples of activities that will support their development of vocabulary include compiling a glossary, matching key word definitions or defining a key word relevant to the topic.

Pupils are encouraged to ask and answer scientific questions using enquiry based approaches. Teacher questions will be targeted and specific to encourage thought and deliberation. Some will be provided directly by the teacher or given as a basis for an investigation, whilst others will be pupil led and drawn from results of investigations. Pupils will be given the opportunity to address misconceptions in this way, such as through the use of concept cartoons or a research prompt.





Pupils will progress in working scientifically through the use of five key enquiry approaches, as well as problem solving, whilst developing several enquiry-based skills. These are comparative and fair testing, research, observation over time, pattern-seeking, and identifying, grouping & classifying. Practical work should always be purposeful and develop these skills. Supporting these approaches are the enquiry skills: asking questions, making predictions, setting up tests, observing and measuring, recording data, interpreting and communicating results, and evaluating.

Source: PSTT

Pupils will develop the following enquiry skills:

Source: PSTT

Substantive Knowledge

Science is taught independently or as part of a topic. The National Curriculum is used as a basis for planning. Each science topic will build on prior knowledge and skills from preceding year groups, with the 'Working Scientifically' strand embedded throughout the others. Scientific vocabulary and the correct terminology will be introduced and built upon as pupils progress through the school. Teachers are responsible for planning science lessons, and will make sure each curriculum objective for their year group is covered in their scheme of work.

To ensure continuity and progression, teachers will build upon previous knowledge where applicable. For example, a Year 5 lesson on materials and their properties may find it useful to recap the Year 3 objectives for rocks, or light when discussing properties such as hardness and transparency. In the National Curriculum, Science has three branches: Biology (Life Processes and Living Things), Chemistry (Materials and Change), and Physics (Physical Processes) each sequence of work is built upon preceding year groups, however there will be some overlap as the strands become more intertwined in Upper Key Stage 2. In some cases, content from later year groups might be introduced earlier to support understanding or illustrate scientific concepts, approved on a case-by-case basis by the subject leader.

Coverage of the curriculum is expected to go beyond the minimum requirements of the National Curriculum. Planning accounts for understanding and applying objectives, focusing on depth rather than breadth of coverage. Cross-curricular, and inter-disciplinary links are included wherever possible. Content for planning will be pulled from a range of contexts and options in order to give pupils a variety of opportunities to to learn and experience from. In order to promote the love and awe of the world Science can provide, opportunities for enjoyment and encouragement are a primary consideration in lesson planning.

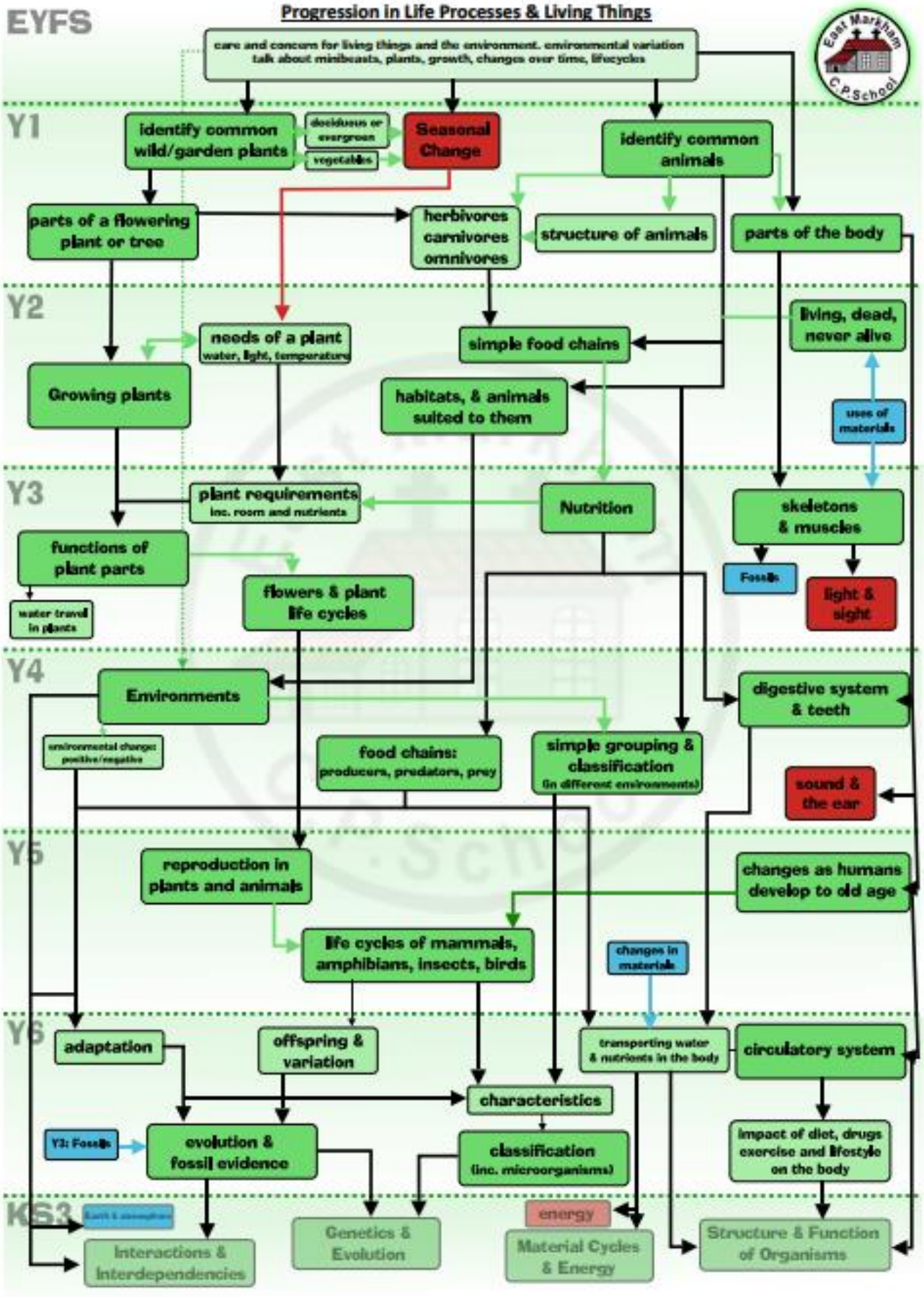
Foundation Stage

In the Foundation stage, science is a key part of the topic work covered throughout the year under the areas of Communication and Interaction (listening, attention and understanding), Personal, Social and Emotional Development (managing the self), and especially Understanding the World (the natural world). Children will be supported to develop this knowledge alongside skills and understanding that will help them to form key concepts and sense of the world around them. A wide range of learning opportunities will support them to gain this understanding, including the safe use of tools and equipment, encountering living creatures and organisms (including plants) and arrange of objects in their natural environments and familiar situations. They will undertake practical 'investigations' and 'experiments', working with an extensive range of materials and objects.

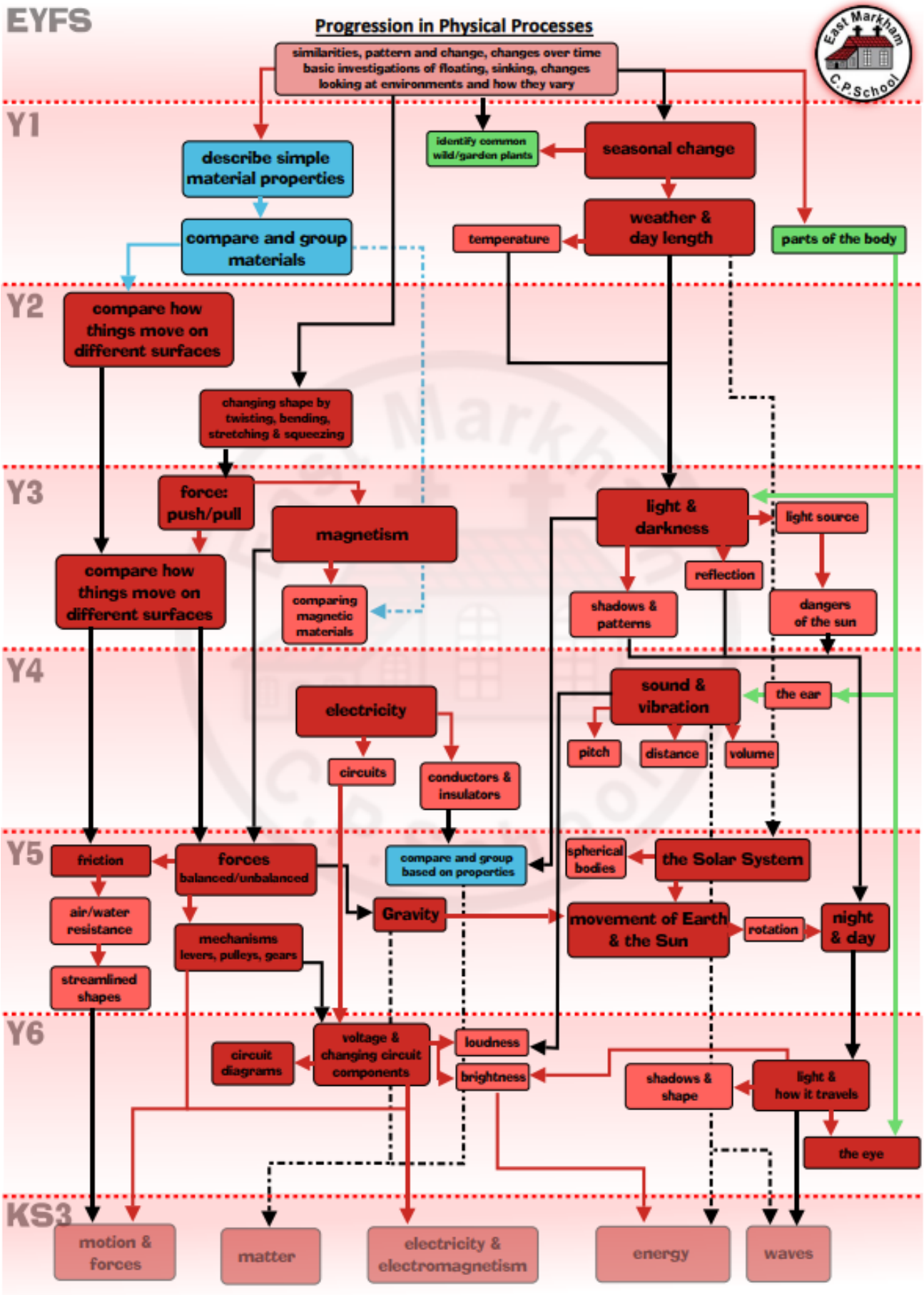
National curriculum objectives by year group.

	Life processes and Living things	**Materials and change**	**Physical processes**
All	*Working scientifically*		
Year 1	• *Plants* • *Animals including humans*	• *Everyday materials*	• *Seasonal change*
Year 2	• *Living things and their habitats* • *Growing plants* • *Offspring, diet, exercise and basic needs*	• *Uses of every day materials*	
Year 3	• *Plant parts and their functions.* • *Nutrition* • *Skeletons and muscles*	• *Rocks, fossils and soil*	• *Light and shadows* • *Forces and magnets*
Year 4	• *Classification* • *Changing environments* • *Teeth, the digestive system* • *Food chains*	• *States of matter* • *The water cycle*	• *Sound* • *Electricity*
Year 5	• *Life cycles and reproduction* • *Changes in humans as they age.*	• *Properties and changes in materials*	• *Space* • *Forces and their effects*
Year 6	• *Classification by characteristics* • *Circulatory system* • *Impact of drugs, lifestyle and diet on human body* • *Nutrients and water transportation* • *Evolution: offspring and adaptation*	• *Evolution: fossils*	• *Travelling light* • *Circuit variation*

Progression in Life Processes & Living Things




EYFS
Progression in Materials, Properties & Change
East Markham C.P.School
similarities, pattern and change, changes over time
similarities and differences in materials and objects
basic investigations of properties and changes in state
Y1
distinguish objects from materials
describe simple material properties
identify and name materials (inc. rock)
compare and group materials
temperature
Y2
compare how things move on different surfaces
changing shape by twisting, bending, stretching & squeezing
living, dead, never alive
suitability of materials for different uses
Y3
skeletons & muscles
compare & group types of rock
compare how things move on different surfaces
forces: pushes & pulls
fossil formation
soil composition
compare & group magnetic materials
light: transparency
Y4
compare and group solid, liquid gas
Changes in state & temperature
water cycle: inc. evaporation & condensation,
electrical conductivity
Y5
compare and group based on properties
solubility
separation
reasons for uses of materials based on tests
reversible changes physical change
irreversible changes chemical change
Y6
electricity: changing circuits
evolution: evidence
KS3
Earth & atmosphere
the periodic table
particular nature of matter
chemical reactions


EYFS
Progression in Physical Processes
East Markham C.P.School
similarities, pattern and change, changes over time
basic investigations of floating, sinking, changes
looking at environments and how they vary
Y1
describe simple material properties
identify common wild/garden plants
seasonal change
compare and group materials
temperature
weather & day length
parts of the body
Y2
compare how things move on different surfaces
changing shape by twisting, bending, stretching & squeezing
Y3
force: push/pull
magnetism
light & darkness
light source
compare how things move on different surfaces
comparing magnetic materials
reflection
shadows & patterns
dangers of the sun
Y4
electricity
sound & vibration
the ear
pitch
distance
volume
circuits
conductors & insulators
Y5
friction
forces
balanced/unbalanced
compare and group based on properties
spherical bodies
the Solar System
air/water resistance
Gravity
movement of Earth & the Sun
rotation
night & day
mechanisms levers, pulleys, gears
streamlined shapes
Y6
circuit diagrams
voltage & changing circuit components
loudness
brightness
shadows & shape
light & how it travels
the eye
KS3
motion & forces
matter
electricity & electromagnetism
energy
waves

Cross Curricular

The ability to think scientifically is pervasive to all aspects of life and to encourage this, frequent opportunities to tie science together with the other areas of the curriculum, or highlight the links within it should be given.

Here is an example of how cross curricular links may be made between subjects (*but it is not an exhaustive list*):

Other N.C. Subject	Examples of links	Example activity
English	*Reading a variety of fiction and non-fiction texts from a variety of genres.* *Speaking and listening* *Writing* *Use of vocabulary and terminology*	*Conducting research on an idea, scientist/engineer or concept through books, the internet or science based children's magazines.* *Giving oral presentations about results from presentations, or engaging in a debate about scientific ideas and misconceptions generated from a concept cartoon.* *Writing and reading instructions, such as following a methodology, or a detailed report on findings from an investigation.*
Maths	*Statistics and interpreting data* *Calculations* *Time and measurement*	*Drawing and interpreting graphs and charts such as scatter graphs, line graphs, pictograms, Pie charts, Venn diagrams and bar charts.* *Calculating the average, or mean from a selection of numerical data.* *Measuring how much of a quantity if left after each stage of an experiment.* *Taking measurements over a period of time.*
Computing	*Technology* *e-safety and research skills*	*Data-logging software to record data and create tables and graphs.* *Learning how to browse the internet safely and how to discern reliable, truthful and valid information when conducting research using digital secondary sources.*
P.S.H.E./ Citizenship	*Opportunities for good citizenship.* *Living healthily* *The environment* *Spiritual, moral, social and cultural development*	*Taking part in and listening to others win debates. Taking in turns and understanding the perspectives of others and how they formed their opinions and beliefs.* *Understanding what the body needs to be healthy and why it needs it, promoting healthy lifestyle choices regarding diet and exercise.* *Learning about ecological issues and how we can safeguard the word for ourselves and future generations.*
The arts	*Music* *Art and Design*	*Learning about the physical processes involved in hearing, including pitch, tone and volume and how they are created.* *An understanding of materials and their properties can enhance the choices made with artistic media; for example the permeability and solubility of different adhesives and paints.*
Design and Technology	*Cooking and nutrition* *Technological knowledge and designing, making and evaluating*	*Learning about seasonality of growing foods, as what are the attributes of a balanced diet upon health.* *Chemical reactions and the making of new materials* *Learning about the materials and forces that can influence the design, form and function of an object and understanding the reasons for why such choices are made in design*
History and Geography	*Use of topic based prompts to inspire science based learning* *Volcanoes, mountains, water cycle, environmental issues*	*Examples:* *Use of Longboats/triremes/submarines to prompt an investigation on buoyancy, streamlined shapes, forces…* *Rainforest as springboard for discussion on environmental issues, food webs and chains, plants, habitats and adaptations…* *Historical dances/rationing in WW2, linked to keeping healthy, P.E. Links, exercise and heart rate, balanced diet…* *Volcanoes and the water cycle.*

Impact

Assessment and Marking

Each year group will be assessed against the National Curriculum objectives for their respective year groups. Throughout the school, teachers will assess whether children are working at, above or towards the expected level for their age based on their understanding and application of the content of the National Curriculum. Progress and attainment is communicated to parents through parents' afternoons and reports given at the end of the year.

Science is assessed through the use of pre-assessment carousels at the start of each topic which provide the opportunity to revisit prior ideas and learning, identify misconceptions, identify strengths and weaknesses, identify the needs of lower performing pupils from existing data and for use as opportunity to gather pupil questions. A range of evidence including pupil books, discussion and observation will be collected for assessment judgments. Resources such as the PLAN framework provide exemplification of the expected standards and model evidence that can be used in assessment.

Packs containing relevant assessment materials and resources are found in each classroom corresponding to year group. Materials should be returned to them afterwards to prevent risk of loss. Additional resources can be found on the secure shared staff drive.

Marking

At East Markham Primary School, Science books will be marked according to the school's marking and feedback policy (please consult the relevant document for more information).

Frequently, work done in science lessons is of a practical or oral nature and it is expected that there will be some variation in marking procedure. Wherever possible, written work is marked regularly and clearly to correct spelling, misconceptions or support understanding. Marking may also be present to celebrate a pupil's attainment or their successes. Pupils may be asked to self-assess or peer assess their own or other's work if an appropriate occasion requires it. It is important the same standards of English and maths are expected of the pupils in their science books.

Misconceptions and incorrect spellings of scientific vocabulary and terminology must be addressed. This may be teacher feedback given orally or written, and in some cases may take the form of pupils correcting their work with an appropriate instrument, for example blue editing pens. The highest standards of presentation and commitment to their work are expected of the pupils and will be modelled and demonstrated by the teacher.

Resourcing

Equipment for science is primarily held centrally within the 'science area' of a KS2 classroom towards the back. Where it is practical and feasible to do so, science equipment kept externally in locations such as the 'container' should be kept within clearly labelled containers sealed from the air in order to protect it from moisture and damage and extend the equipment's longevity. Where storage in the container is not pragmatic (perishables and electronics for example), it may be found kept securely within the school or with the science coordinator. Health and safety measures should be followed, using the appropriate CLEAPSS guidance.

Data loggers are to be kept within the appropriate storage box, placed securely into the foam slot for protection. The charging cable will be kept within the same box. Teachers should ideally make sure the devices are charged prior to using them in their activity, as they lose charge over time.

Role of the Subject Coordinator & Monitoring

At East Markham Primary School, the science coordinator will be responsible for supporting teachers deliver the science curriculum, and for maintaining high standards and aspirations regarding the subject. They will ensure continuity and progression of science throughout the curriculum, as well as promoting the aims and objectives of the science policy, making sure they align with the school's vision and values.

The science coordinator will be responsible for keeping up to date with any changes and developments in the science curriculum, attending training where necessary to maintain high standards. They will then communicate these developments back to the larger part of the staff through training or other appropriate means of communication. The subject leader will be responsible for making sure adequate equipment and resources are available to deliver the subject.

The science coordinator should strive to ensure all content knowledge gaps in understanding are addressed and the staff feel comfortable and prepared enough to deliver the science curriculum, equipped with relevant and appropriate pedagogical strategies. Staff have frequent opportunities to work with the subject coordinator and complete reviews and audits of their subject knowledge and pedagogical practice.

The subject coordinator may review books or resources to make sure they have a strong overview of the state and successes of the subject across the school and allow them to review accurately. Pupils' voice is also taken into account with questionnaires, surveys and interviews with pupils informing how planning is adapted to ensure the best outcomes.

Monitoring may take the form of:

- Learning walks
- Lessons observations
- Teacher questionnaires, interviews and feedback
- Pupil voice, including discussion, questionnaires, interviews and evaluation
- Resource and subject audits
- Science book scrutiny