



## Brindley Heath Academy Science Policy

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## 1. Curriculum INTENT

“...pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.”

*National Curriculum Purpose of study, May 2015*

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

*National Curriculum Aims, May 2015*

## Aims and Values

Brindley Heath Academy's science curriculum has been designed to:

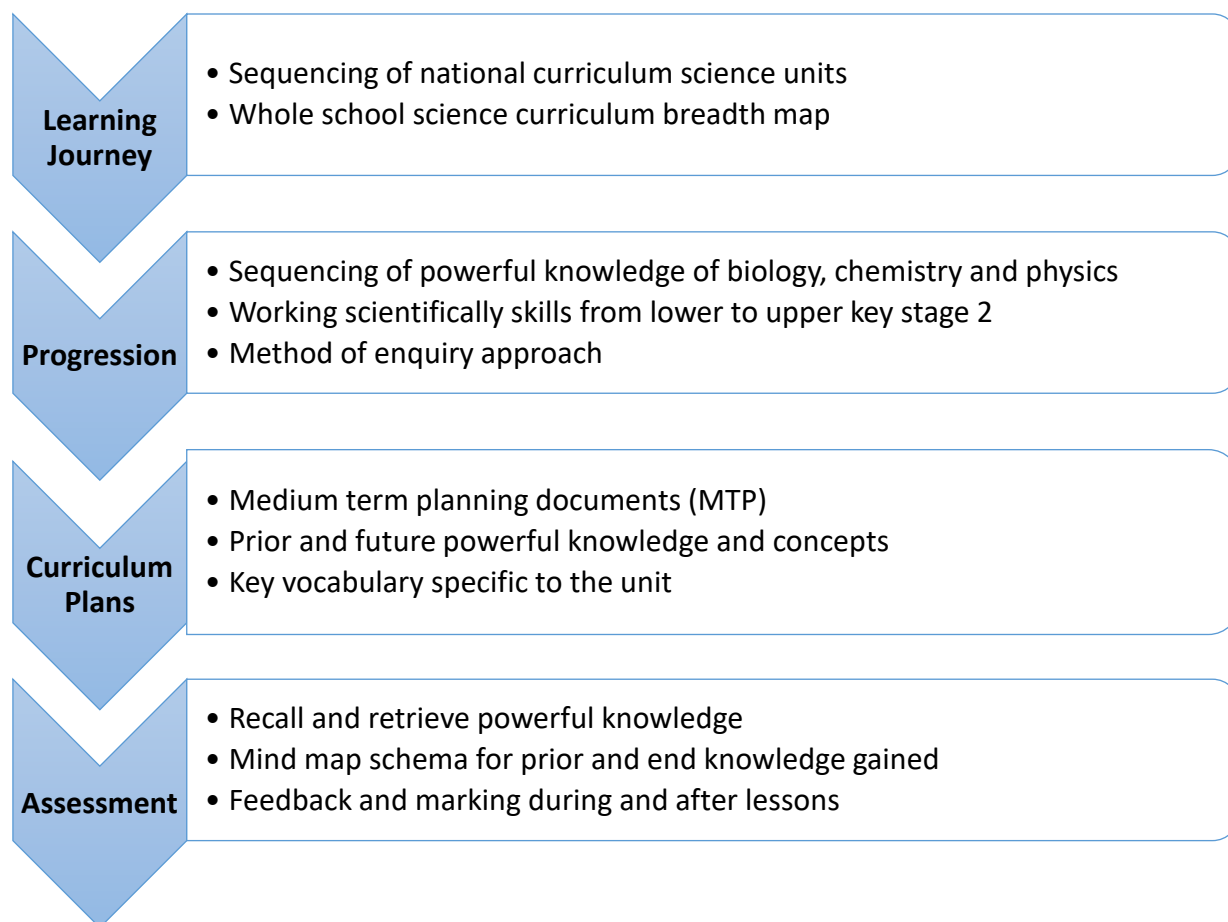
- Ensure a high quality science education that provides the foundations for understanding the world – ***be aspirational.***
- Ensure learners develop an appreciation and healthy curiosity of the world around them promoting ***be respectful.***
- Ensure learners develop secure, powerful knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics – ***be aspirational.***
- Allow learners a curriculum that encompasses the acquisition of knowledge, concepts, skills and positive attitudes to ***be resilient.***
- Enable learners to work as scientists, working scientifically by employing scientific enquiry skills to ***be aspirational.***
- Equip learners with an understanding of the processes and uses of science, the implications of science today and for the future, which will enable them to succeed in life - ***be proud.***
- Allow learners experience positive opportunities to: think, wonder, ask questions, observe, explore, experiment, measure, predict, draw, invent.

***Be you, a SCIENTIST in the making!***

## 2. Curriculum IMPLEMENTATION

Our whole school approach to the teaching and learning of science involves teachers creating a positive attitude to science learning within their classrooms and reinforce an expectation that all pupils are capable of achieving high standards in science.

*Diagram 1 – Curriculum Overview*



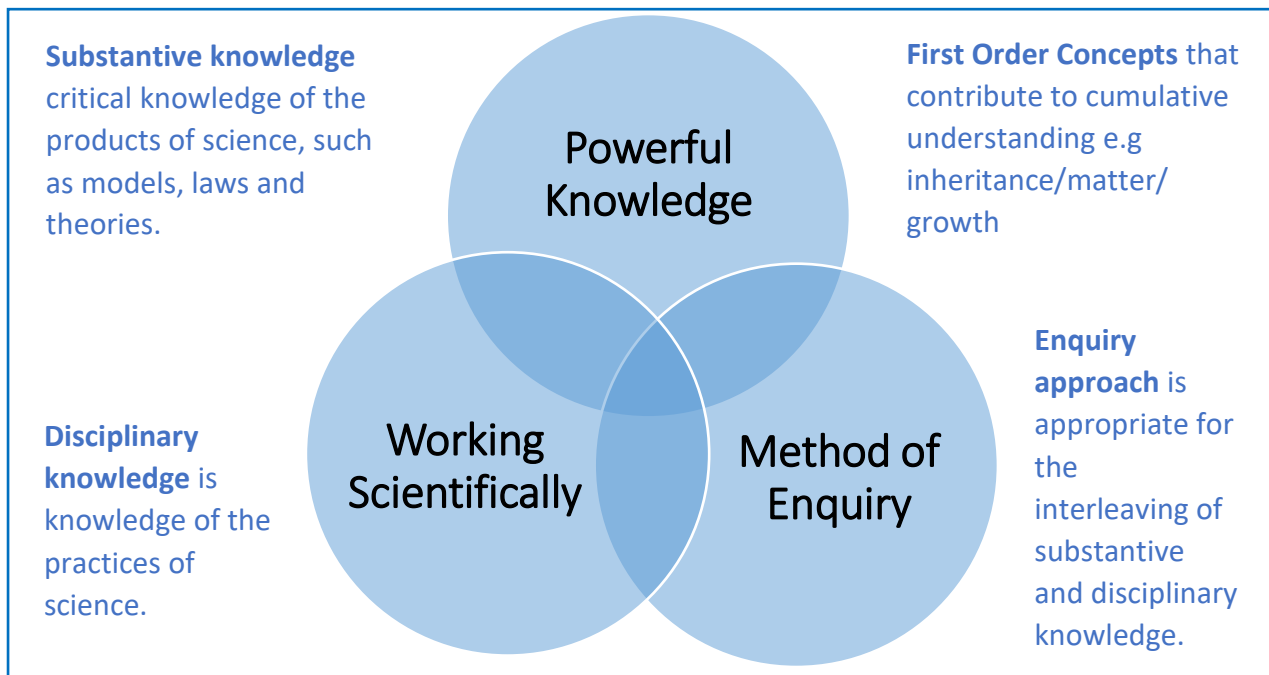
### 1. Learning Journey

- As teachers we need to know and understand the Science Curriculum as a cohesive whole. We need to be able to make connections to prior and new learning.
- Our science curriculum meets the national curriculum programmes of study and is enriched further so it is bespoke to the needs of our school.
- Our coherently planned and sequenced science curriculum is research informed. It connects and builds on prior knowledge leading to progression and depth overtime.
- For some units the order of teaching is not significant but links can be made e.g. Year 3 Plants, Rocks and Light units. Some units are conceptually more challenging and therefore are best taught later on in the school year e.g. Year 4 Sound unit and Year 6 Evolution and Inheritance along with Light. Other units content require them to be taught in a specific order to build on knowledge and concepts e.g. Year 5 Living things and their habitats is to be taught before Animals, including humans and Forces is better taught before Earth and Space to support pupils understanding of gravity and links with forces.
- Science curriculum coverage and sequence of units can be found in our Whole School Science Curriculum Breadth Map (*Appendix 1*).

## 2. Progression

*"In high-quality science curriculums, knowledge is carefully sequenced to reveal the interplay between substantive and disciplinary knowledge. This ensures that pupils not only know 'the science'; they also know the evidence for it and can use this knowledge to work scientifically." (Ofsted Research Review: science April 2021)*

Diagram 2 - Interleaving of substantive and disciplinary knowledge



### Powerful Knowledge

- Powerful knowledge is highly connected scientific concepts that are tightly linked. They build on knowledge by a logical assembly of knowledge over time throughout the key stage. *(Some parts of knowledge are more powerful and important than others, they are dependent on more than one thing.)*
- Substantive knowledge being the critical powerful knowledge of science models, laws and theories, which are the most powerful knowledge that contributes to the cumulative understanding of first order concept. Along with disciplinary knowledge that is the practices of science.
- Powerful knowledge is the cornerstone of the curriculum and it should be built upon as children progress through school. However, it's not just about memorising facts. Children need to be able to apply their learning to answering deeper questions.
- The curriculum is designed to ensure there is a balance across breadth and depth. The children will return to these concepts repeatedly, within a period of study, within a year and across Key Stage 2.
- The schema for scientific knowledge is built by the way the science curriculum is organised. The correct sequencing of knowledge that is built on gradually.
- As with other subjects, we need to teach and use vocabulary and abstract terms. They need to be reinforced and returned to over time, and used in sentences to ensure thorough understanding.
- Opportunities for recall and retrieval of powerful knowledge are built into each lesson to ensure that our children know and remember more.
- Children should return to the enquiry question and reach a final conclusion. This must be supported by teachers using discussion and collaborative learning strategies.

### Working Scientifically

- We place an emphasis on teaching the substantive knowledge first which then enables the children to use disciplinary knowledge of working scientifically. It is at this point that the children start to think like scientists.
- As teachers, we need to be very explicit about which working scientifically skills from the National Curriculum we are addressing in lessons to ensure these skills are being developed throughout the children's school career.
- Working scientifically skills encourage children to use working scientifically skills.

Diagram 3 – Core Working Scientifically Skills

<b>Planning</b>	<ul style="list-style-type: none"><li>• Asking questions and recognising that they can be answered in different ways</li><li>• Engaging in practical enquiry to answer questions</li></ul>
<b>Obtaining and Presenting</b>	<ul style="list-style-type: none"><li>• Making observations and taking measurements</li><li>• Recording and presenting evidence</li><li>• Communicating their findings</li></ul>
<b>Considering Evidence and Evaluating</b>	<ul style="list-style-type: none"><li>• Answering questions and concluding</li><li>• Evaluating and raising further questions and predictions</li></ul>

- Lower Key Stage 2 are working on securing the '**The Blossoming Scientist**' working scientifically knowledge and skills and Upper Key Stage 2 are working securing the '**The Maturing Scientist**' working scientifically knowledge and skills as shown on the science SOLO skills progression LKS 2 Years 3 & 4 and UKS 2 Years 5 & 6 (*Appendix 2 & 3*).
- As teachers we need to demonstrate how to use scientific equipment, and the various working scientifically skills in order to embed scientific understanding.

### Method of Enquiry

- Our science curriculum allows children to have sufficient time and subsequently develop the following six scientific enquiry approaches:
  - comparative / fair testing
  - research
  - observation over time
  - pattern seeking
  - identifying, grouping and classifying
  - problem solving

Diagram 4 – Scientific Enquiry Approach Symbols



- The symbols are shared with children to explain the type of enquiry approach for lessons.
- A range of resources should be used with the children, these will include written texts, online STEM interactive resources and objects. Some types of resources are better for certain units.

- There are numerous science books for the children to read on relevant science units. These are part of our school library and teaching resources that support the research based enquiry lessons.
- Children should be made aware that interpretations of research and evidence are constantly changing as new discoveries are made all the time. Furthermore, science is reinterpreted as public perspectives change for example awareness and understanding of scientific discoveries. Explain to children that “We used to think ..., now we think...”
- Some units are better suited to certain enquiry approaches than others, some units require more practical investigation enquiry strategies. The type of enquiry approach used must be relevant and practical enquiry purposeful once substantive knowledge has been gained.

### 3. Curriculum Plans

Medium term planning has been created using a number of different sources to support teachers with their science lessons. Medium term planning documents contain the following:

- show all of the concepts underpinning a unit
- powerful substantive knowledge relevant to the unit
- working scientifically skills and linked SOLO taxonomy I can statements
- prior and future National Curriculum programmes of study
- enquiry approach for each key question
- key vocabulary specific to the unit
- Useful links, challenge (stretch) and suggested ideas

Children are given opportunities to talk about their learning; use key scientific vocabulary; discuss and explain their science investigations or enquiries. In science teaching, we aim to stimulate the children’s interest in science to prepare them for future life and potential careers. We recognise and value the importance of encouraging children to develop their own lines of enquiry, following their learning and others’ (scientists and inventors) work in the field.

### 4. Assessment

- As teachers we need to give opportunities for children to recall and retrieve powerful knowledge. These are built into each lesson to ensure that our children know and remember more.
- At the start of a new science unit teachers gather children’s prior knowledge in the form of a mind map (schema) which informs future planning. Once the unit is completed an end of unit the children create a mind map (schema of knowledge) this shows the powerful knowledge gained.
- Feedback and marking are tools to judge children’s attainment and progress during and after lessons. This is linked to key learning objectives for the lesson.

### Resources

The science resource boxes are relevant to particular units covered within certain year groups contain a selection of subject specific resources. Other storage trays are a bank of general resources required for science enquiry and investigations throughout the school year and for use across the key stage. They are currently being stored in the cupboard off the hall.

A wide variety of online resources support planning, resourcing and inform our research based curriculum. (Appendix 4)

## Health and Safety

When working with science equipment and materials during practical investigations and activities teachers should ensure that children understand the hazards and learn how to control them, ensuring the safety of themselves and others. It is our aim to ensure that all children feel safe and secure in science lessons and do not come to any harm. Children are actively encouraged to carefully follow the teacher's instructions and the following basic rules.

## Enriching the curriculum

*"As pupils learn science, they also learn about its uses and significance to society and their own lives. This will highlight the significant contribution science has made in the past.....They will also learn about the continuing importance of science in solving global challenges such as climate change, food availability, controlling disease and access to water." (Ofsted Research Review: science April 2021)*

- A wide range of extra-curricular activities including trips, visitors and experiences days need to be carefully planned to support learning and undertaken at the right point in the learning journey.
- These are purposeful, broaden the curriculum and link with the knowledge being taught in class.
- Regular events, such as home learning projects and science week, provide broader provision and the acquisition and application of knowledge and skills.
- Children's cultural capital is built up systematically overtime through knowledge and experiences.

## Meeting the needs of all children

Learning is designed to allow all children to achieve to a high-level by tackling challenging enquiry questions, facilitated through varying levels of support, scaffold and stretch. The science SOLO taxonomy progression grids (*Appendix 2 & 3*) will support staff to plan progressive learning opportunities which deepen over time.

### Strategies for Support and Scaffold:

- recalling, naming, identifying, listing and ordering knowledge and facts
- referring to a single source or reduced number of sources
- presenting information through non-text based formats e.g. illustrations, diagrams, prepared tables, oracy discussion with an adult
- providing definitions of scientific terms
- pictorial and visual presentation of information
- high-quality, differentiated texts

### Strategies for Stretch:

- planning by generating theories, creating enquiries, evaluating and reflecting on the most effective
- formulate the most appropriate scientific enquiry, judge and justify choices using scientific knowledge
- predict variables, reflection on systematic observations, analyse by making links between information and/or evidence
- assemble and record findings in different ways in order to help answer the question posed
- hypothesise and reflect on data or information and use this to inform future investigations, questions and the enquiry process
- evaluate, consider and summarise how scientific understanding has changed due to new evidence

## Role of the Subject Leader

It is the responsibility of the science subject leader and senior leadership team to monitor the standards of children's work and the quality of teaching in science. The subject leader is also responsible for supporting colleagues in their teaching, for being informed about current developments in the subject, and for providing a strategic lead and direction for the subject in school and leading relevant CPD. The subject leader monitors the budget, resources, science units, enrichment activities to support learning. Time is given to the subject leader to reviewing samples of children's work, training staff, liaising with subject leaders from other schools and organising enrichment opportunities.

## 3. Curriculum IMPACT

*"Pupils are able to explain the material world and 'develop a sense of excitement and curiosity about natural phenomena'. By learning about the practices of science, pupils learn how scientific knowledge becomes established through scientific enquiry. By learning this, pupils appreciate the nature and status of scientific knowledge." (Ofsted Research Review: science April 2021)*

- Our approach to teaching science results in a fun, engaging, high-quality science education, that provides children with the foundations and knowledge for understanding the world.
- Children will have a wider variety of skills linked to both scientific knowledge and understanding, and scientific enquiry/investigation skills.
- Children will have a richer vocabulary which enables the children to articulate their understanding of taught concepts.
- Children should be able to explain what they are learning and how this relates to previous learning.
- Progress will be assessed through Pupil Voice, book looks, learning walks and monitoring of planning.
- School assessment systems will support the evaluation and impact of teaching on pupils in Science.
- The impact of the curriculum design will lead to children leaving school achieving Age Related Expectations.

*"Children will have the foundations for a range of diverse and valuable careers that are crucial for economic, environmental and social development." (Ofsted Research Review: science April 2021)*

Children are unique individuals and each has the potential that we need to unlock. Our school values are be respectful, be aspirational, be resilient, be proud, be you, be Brindley Heath and through our curriculum we enable this to happen.

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