



What is Mastery in Science?

There are a lot of different interpretations of what is meant by a mastery curriculum, so in the Otter Valley Federation we want to make it clear in our principles for science what we are trying to achieve. In our curriculum mapping we have identified the skills needed to be a top scientist and we have identified both the knowledge and the skills (working scientifically) in the programme of study to ensure that children meet a broad and balanced knowledge base and develop these skills throughout their school career.

By clearly identifying the key concepts that need to be understood we can revisit and check that children have understood and that they have remembered them. The key to achieving mastery is being able to apply the concepts to problem solving and challenging investigations. This involves frequent low-level assessments of course work rather than a written end of unit test. The key skills are outlined below:

By the end of KS1

I ask relevant questions.
I can set up simple practical enquiries, comparative and fair tests.
I can make accurate measurements using standard units, using a range of equipment, for example thermometers and data loggers.
I can gather, record, classify and presenting data in a variety of ways to help in answering questions.
I can record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.
I can report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
I can use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests
I can identify differences, similarities or changes related to simple scientific ideas and processes.

By the end of lower KS2 (Year 4)

I can plan enquiries, including recognising and controlling variables where

necessary.
I can take measurements, using a range of scientific equipment, with increasing accuracy and precision.
I can record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models.
I can report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions.
I can present findings in written form, displays and other presentations.
I can use test results to make predictions to set up further comparative and fair tests.
I can use simple models to describe scientific ideas
I can identify scientific evidence that has been used to support or refute ideas or arguments.

By the end of KS2 (Year 6)

I can ask questions and develop lines of enquiry based on observations.
I can make predictions using scientific knowledge and understanding.
I can plan and design investigations and experiments to make observations and test predictions.
I can identify independent, dependent and control variables and other factors to be taken into account when collecting evidence and data.
I can select appropriate techniques, apparatus, and materials during fieldwork and laboratory work, working safely.
I can make and record observations and measurements using a range of methods for different investigations.
I can evaluate the reliability of methods and suggest possible improvements.
I can present observations and data using appropriate methods, including tables and graphs.
I can interpret observations and data.
I can present reasoned explanations.
I can evaluate data, showing awareness of potential errors.
I can identify questions arising from results of investigations.

How will mastery be achieved?

Going for the best, to honour God and inspire each other.

There are four main principles:

- To establish an entitlement for all pupils;
- To establish expectations for teachers of this subject;
- To promote continuity and coherence across the school;
- To state the school's approaches to this subject in order to promote public, and particularly parents' and carers', understanding of the curriculum.

" I have not failed.....I have just found 10,000 ways that won't work!"

Thomas Edison

The knowledge is delivered through a two year rolling programme in order to meet these statements:

By the end of KS1

Name and locate parts of the human body, including those related to the senses, and describe the importance of exercise, balanced diet and hygiene for humans.
Describe the basic needs of animals for survival and the main changes as young animals, including humans, grow into adults.
Describe basic needs of plants for survival and the impact of changing these and the main changes as seeds and bulbs grow into mature plants.
Identify whether things are alive, dead or have never lived describe and compare the observable features of animals from a range of groups.
Group animals according to what they eat, describe how animals get their food from other animals and/or from plants, and use simple food chains to describe these relationships.
Describe seasonal changes.
Name different plants and animals and describe how they are suited to different habitats.
Use their knowledge and understanding of the properties of materials, to distinguish objects from materials, identify and group everyday materials, and compare their suitability for different uses.

By the end of KS2

Name, locate and describe the functions of the main parts of the digestive, musculoskeletal, and circulatory systems, and can describe and compare different reproductive processes and life cycles, in animals.
Describe the effects of diet, exercise, drugs and lifestyle on how their bodies function. Name, locate and describe the functions of the main parts of plants, including those involved in reproduction and transporting water and nutrients.
Use the observable features of plants, animals and micro-organisms to group, classify and identify them into broad groups, using keys or in other ways.
Construct and interpret food chains.
Explain how environmental changes may have an impact on living things.
Use the basic ideas of inheritance, variation and adaptation to describe how living things have changed over time and evolved; and describe how fossils are formed and provide evidence for evolution.
Group and identify materials, including rocks, in different ways according to their properties, based on first-hand observation; and justify the use of different everyday materials for different uses, based on their properties.
Describe the characteristics of different states of matter and group materials on this basis; and can describe how materials change state at different temperatures, using this to explain everyday phenomena, including the water cycle.
Identify, and describe what happens when dissolving occurs in everyday situations; and describe how to separate mixtures and solutions into their components
Identify, with reasons, whether changes in materials are reversible or not. use the idea that light from light sources, or reflected light, travels in straight lines and enters our eyes to explain how we see objects, and the formation, shape and size of shadows.
Use the idea that sounds are associated with vibrations, and that they require a medium to travel through, to explain how sounds are made and heard. Describe the relationship between the pitch of a sound and the features of its source; and between the volume of a sound, the strength of the vibrations and the distance from its source.
Describe the effects of simple forces that involve contact (air and water resistance, friction), and others that act at a distance (magnetic forces, including those between like and unlike magnetic poles; and gravity). Identify simple mechanisms, including levers, gears and pulleys that increase the effect of a force.
Use simple apparatus to construct and control a series circuit, and describe how the circuit may be affected when changes are made to it; and use recognised symbols to represent simple series circuit diagrams.
Describe the shapes and relative movements of the sun, moon, earth and other planets in the solar system; and explain the apparent movement of the sun across the sky in terms of the earth's rotation and that this results in day and night.

"Play is the highest form of research." Albert Einstein.

We know that good science leading to mastery occurs in our school when:

- ❖ Children are excitedthere are "Wow" moments.
- ❖ They want to do more.
- ❖ Children are active and engaged in their learning.
- ❖ Children ask good questions.
- ❖ Children can talk about what they have learnt and identify the next stages and steps.
- ❖ Children are involved in practical hands on activities.
- ❖ They are able to make links between the experiences and other subjects.
- ❖ They develop and extend their own learning, applying their knowledge to other situations. This will be through exploring and discovering new things.
- ❖ The children apply FAIL (First Attempt In Learning.) This is supported by the motto, "Believing and Achieving together."
- ❖ Science has the wow factor of the school ethos of Windows (notice and think), Mirrors (reflect upon it) and Doors (consider what it means to you and what you are going to do next.)
- ❖ The four E's are evident in every lesson: Explore, Engage, Enquire, Explain

In the classroom:

- ❖ Children are involved in the planning and their questions become part of the plan.
- ❖ They have access to a range of stimulating and interesting resources.
- ❖ Children can explore at their own level.
- ❖ You can hear, "Ooh! Ah! Wow!" Questions start with how, what, where, and why.
- ❖ Children talk to each other with statements such as, "Come and look," or, "I didn't know that."

The atmosphere is emotionally charged. There are obvious emotions of awe and wonder, excitement, anticipation and motivation.

Teaching and Learning:

Approaches include opportunity in the classroom, outside and from visits and visitors.

- ❖ There are opportunities to master exploration and investigation.

- ❖ There are opportunities to use digital resources, data loggers and easi-scopes.
- ❖ Book scrutiny will show evidence of observations, the children's own comments as well as those of the teacher, i.e. a dialogue. Through talking the children will have shown they can predict, hypothesise, use variables within fair testing, measure accurately and evaluate with clear explanations.

This document has been produced as a result of a staff meeting, discussions with senior management and with the pupils.

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