St. Mary's CE Academy

'Excellence through faith & learning'

Science Policy

"I have come that they may have life,
and have it to the full."
John 10:10

Reviewed: **
Approved by Governors:
****
Date of next review: ***

Science Policy

St. Mary's CE Academy
'Excellence through faith & learning'

1. INTENT

Our School Vision & Vision for Science

At St Mary's Church of England Academy, we aim to provide a caring environment where every child can thrive and is supported to achieve their unique and amazing potential as a child of God. Our high standards of teaching and personalised learning are set within a broad, balanced and creative curriculum – a curriculum which is intended to prepare our learners to make a positive contribution towards society and enjoy future success.

Our School Vision for Science

Our vision is for every child to actively engage in the Science curriculum through a creative approach that is supported by the Cornerstones curriculum and is further enhanced by STEM projects and projects linked to the Global Goals for Sustainable Development (see appendix A). By engaging in a process of observing, questioning, doing and understanding we aim to foster the view that science is relevant, fun and something which all pupils can participate in.

The 2014 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 skills** required to understand the **uses and implications of** science, today and for the future. We understand that it is important for lessons to have a skills-based focus, and that the knowledge can be taught through this.

At St Mary's Church of England Academy, we encourage pupils to be inquisitive throughout their time at the school and beyond. The Science curriculum fosters a healthy curiosity in pupils about our universe and promotes respect for the living and non-living. We believe science encompasses the acquisition of knowledge, concepts, skills and positive attitudes. Throughout the programmes of study, the pupils will acquire and develop the key knowledge that has been identified within each unit and across each year group, as well as the application of scientific skills. We ensure that the Working Scientifically skills are built-on and developed throughout pupil's time at the school so that they can apply their knowledge of science when using equipment, conducting experiments, building arguments and explaining concepts confidently and continue to ask questions and be curious about their surroundings.

2. IMPLEMENTATION

Our Aims for Science - taken from the National Curriculum 2014.

Teachers create a positive ethos to science learning within their classrooms and reinforce an expectation that **all** pupils are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following;

● Science will be taught in planned and arranged units, making appropriate links to Cornerstones units, The 17 Global Goals for Sustainable Development and STEM challenges. This is a strategy designed to enable the achievement of a greater depth of knowledge and reinforce cross-curricular skills and knowledge. It also centres science in a meaningful context which allows pupils to appreciate their role as a global citizen. Pupils that are working at greater depth will experience a greater breadth of learning, as specified in the non statutory learning of the national curriculum and by providing challenges which allows them to apply their knowledge and Working Scientifically skills to different contexts and to solve problems.

● Through our planning, we involve problem solving opportunities that allows pupils to apply their knowledge, and find out answers for themselves. Pupils are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning and discussion opportunities to assess conceptual knowledge and skills, and assess pupils regularly to identify those children with gaps in learning, so that all pupils can be supported.

● Teachers build upon the knowledge and skill development of the previous years. As the pupil's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence.

● Teachers incorporate the study of a leading scientist, for example when studying forces pupils will learn about the work of Isaac Newton. This enables pupils to appreciate the work of pioneering scientist and understand how science has helped to shape the world we live in today. Where possible this should also include the work of female scientists, in order to promote STEM carers to female pupils.

● Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the pupil's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with each unit.

● Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding. Teachers find opportunities to develop pupil's understanding of their surroundings by accessing outdoor learning and workshops with experts.

● Pupils are offered a range of extra-curricular activities, visits, trips and visitors to complement and broaden the curriculum. These are purposeful and link with the knowledge being taught in class.

● Regular events, such as Science Week, Aspire Day and project days, such as Big Schools Bird Watch, allow all pupils to come off-timetable, to provide broader provision and the acquisition and application of knowledge and skills. These events often involve families and the wider community.

3. IMPACT

The successful approach at St Mary's C of E Academy results in a fun, engaging, high-quality science education, that provides pupils with the foundations and knowledge for understanding the world. Our engagement with the local environment ensures that pupils learn through varied and first hand experiences of the world around them. In contrast learning is also set in the context of Global Goals for Sustainability so that the pupils also understand world issues and appreciate the role they can play in helping to resolve these.

Frequent, continuous and progressive learning outside the classroom is embedded throughout the science curriculum. Through various workshops, trips and interactions with experts, local charities and secondary

school science departments, pupils have the understanding that science has changed our lives and that it is vital to the world's future prosperity.

Pupils learn the possibilities for careers in science, as a result of our community links and connection with national agencies such as the STEM association and the Advanced Manufacturing Park and learn from and work with professionals, ensuring that children have access to positive role models within the field of science from the immediate and wider local community. From this exposure to a range of different scientists from various backgrounds, all pupils feel they are scientists and capable of achieving. Pupils at St Mary's overwhelmingly enjoy science and thus results in motivated learners with sound scientific understanding and skills.

4.TEACHING AND LEARNING

Staff and Pupils were involved in the creation of the St Mary's Church of England Academy Science Principles.

Key Principle for Science Teaching	Qualities it will foster in the pupils
All adults have a clear understanding of scientific concepts and present that unit in the most engaging way.	• Motivated • Engaged • Positive view of science, see as being fun • View science as being relevant to them and society as a whole. • Development of practical skills linked to working scientifically- which will be relevant in their secondary education onwards • Use of equipment, including equipment specific to science e.g. pooters • Develop, use and understand scientific vocabulary • Independent thinker • Critical thinker • Evaluate • Decision making • Co-operate • Be curious • Question • Persevere • Be open minded • Responsible – environmental etc. • Sensitive- ethics of science etc • Adaptable/ tolerate uncertainty - evidence changes • Consider a career in science
Pupils are given the opportunity to learn through discovery by being provided with a variety of hands on, practical activities, including all types of scientific enquiry.	
Activities are based on thorough assessment of existing knowledge and practical skills in order to ensure that pupils progress their thinking and learning.	
Adults model activities, scientific vocabulary and thinking, including posing questions and interpreting evidence.	
Pupils are given the opportunity to pose questions, discuss their ideas, using scientific vocabulary, theories, and interpret results and evidence.	
Pupils are given the opportunity to test their own thinking and theories.	
Adults plan activities that are connected to recent scientific discoveries, unital issues and pupils interest so that they make connections to their lives and view science as being relevant.	
Scientific vocabulary is modelled by the adults. Scientific vocabulary is displayed and pupils' are actively encouraged to refer to it and use it during discussions and written work.	
Pupils are presented with resources that are in good	

working order and in sufficient supply in order for pupils to pursue their individual ideas.	
Junior leadership Team (representing pupil views) wanted science to be…..	
• Fun and exciting • Hands on- 'not writing' • To sometimes work in groups and sometimes on their own • Give them the skills for a career in science. The above principles were written with the pupil's voice in mind.	

Figure 1 Science principles informed by staff and pupil voice, to represent St Mary's aims for science learning.

Pupils say that science to be good when;

● We apply our 'working scientifically skills' to solve problems, explore, observe and investigate.

● We ask questions and work together to discover the answers

● Science has a wow factor and promotes a sense of awe and wonder

● Our learning is enhanced by outdoor learning, specialist visitors and we have access to quality resources

● We are involved in creating and carrying out investigations and can share and explain our ideas and conclusions.

● Pupils are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom.

● Teachers ask a range of questions which enable all pupils to take part, listening carefully to answers and taking learning forward, using open and closed questions and allowing pupils time to think and discuss.

● Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge.

● Teachers use precise questioning in class to test conceptual knowledge and skills, and assess pupils regularly to identify those pupils with gaps in learning, so that learning can be differentiated and where possible so that all pupils keep up.

● New vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the units. Vocabulary mats, science dictionaries and communication in print are used to support pupils with the acquisition on new vocabulary.

● Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the pupil's school career. The key knowledge for each unit and across each year group is mapped across the school and checked at the end of each science unit.

● Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding.

● Teachers find opportunities to develop pupil's understanding by accessing outdoor learning.

Scientific knowledge and conceptual understanding

Foundation Stage pupils investigate science as part of Understanding of the World strand of EYFSP. Pupils are encouraged to investigate through practical experience; teachers guide the pupils and plan opportunities that allows the pupils to experience and learn whilst experimenting for themselves.

For Key Stage 1 and 2 The National Curriculum programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Thus pupil's starting points are identified at the beginning of each science unit and the pupils are able to convey and record what they know already. This is recorded in a number of ways, as deemed appropriate for that pupil or year group. This may include:

- KWL grids
- Written thought shower/ physical thought shower
- Annotated diagrams, pictures and Concept Cartoons.

At the end of the unit pupil's return to write or add what they have learned and this along with other forms of assessment allow the teacher to check that pupils have the required knowledge/ made progress. Indeed part of this process is being able to verbalise their learning/ progress. Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary and teachers ensure that this is developed within each lesson and throughout each science unit.

Through use of the KWL strategy, pupils are also able to suggest what they would like to learn at the start of each teaching sequence and this ensures that teachers are able to adapt the programme of study to ensure that this is informed by pupil's interests and to maximise their engagement with and motivation to study science.

The nature, processes and methods of science 'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group and this is embedded within lessons and focuses on the key aspects of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils are given opportunity to seek answers to questions through collecting, analysing and presenting data.

The science curriculum ensures that pupils are provided with regular opportunities to apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data.

Spoken language

The national curriculum for science reflects the importance of spoken language in pupils' development across the whole curriculum – cognitively, socially and linguistically. At St Mary's C of E Academy science lessons provide a quality and variety of subject specific language to enable the development of pupils' confident and accurate use of scientific vocabulary and their ability to articulate scientific concepts clearly and precisely. They are encouraged and assisted in making their thinking clear, both to themselves and others, and teachers ensure that pupils build secure foundations by using discussion to probe and remedying their misconceptions.

More details of how lessons and units of science are taught can be found in Appendix B.

Organisation

Planning is a process in which all teachers are involved, but is guided by the long term plan for science and the wider curriculum. We use the DFE Science scheme of work and Cornerstones to inform teacher's planning. The key knowledge and skills of each science unit is also informed by the Associate of Science Education's 'Planning Matrices' and the Ogden Trust. Teachers also have access to the Hamilton and Explorify resources to further support and resource lessons, in line with national pedagogy, from the National Stem Centre.

Science will be taught in planned units, which where possible will complement the whole class topic. STEM challenges are used to help pupils apply their knowledge and skills and to challenge more able pupils. Links are also made to real life issues and scientist who have significantly contributed in that particular area of science.

The table below shows the units of science to be taught and the type of investigations that should be completed a long side that unit of work. The investigations that are stipulated must be completed to ensure coverage of all types of investigation. However it is recommended that other forms of investigation are included where time permits and should be planned by the teacher in order to support the needs of the class. Pupils should be taught science for a minimum of two hours per week. However we also recognise that science may take place in other lessons, for example a scientific biography in Literacy or working scientifically skills being taught in Mathematics.

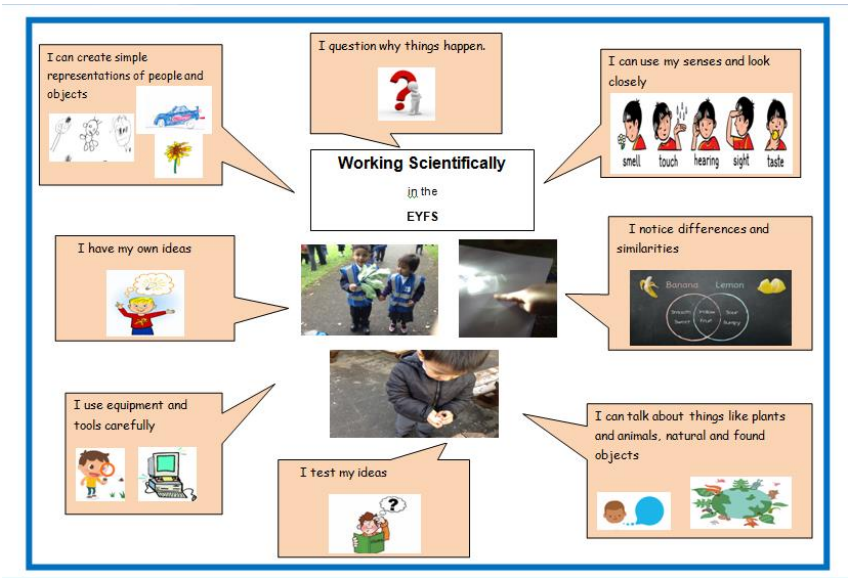
	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 1	Moon Zoom **Everyday Materials** **Investigation:** Which material makes the best umbrella/ curtains/ gymnast's leotard etc?		Dinosaur Planet **Animals Including Humans** **Investigation:** Research into the structure of different animals (fish, amphibians, reptiles, birds & mammals).		Enchanted Woodland **Seasons/ Seasonal Changes** **Investigation:** Observe how weather/day length change over the seasons	**Plants** **Investigation:** Grouping plants based on features
Year 2	Street Detectives **Using Everyday Materials** **Investigation:** Identifying and classifying uses of different materials		Towers, Tunnels and Turrets **Animals Including Humans** **Investigation** Observing animals grow over time	**Plants** **Investigation:** Do plants with bigger seeds grow taller? What do plants need to grow well?	Beach Comers **Living Things and their Habitats** **Investigation:** Research into animals' diets to create simple food chains.	
Year3	Urban Pioneers **Light** **Investigation:** Looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.		Flow **Rocks and Fossils** **Investigation:** Research how fossils are formed	**Forces and Magnets** **Investigation** Cars down a ramp/ Comparing strengths of magnets	Tribal Tales **Animals Including Humans** **Investigation** Identifying and grouping animals with and without skeletons	**Plants** **Investigation:** Observe coloured water travelling up plants stem
Year 4	Road Trip USA **Animals Including Humans** **Investigation:** Research into teeth of different animals	**Sound** **Investigation:** Finding patterns in the sounds that are made by different objects.	Potions **Electricity** **Investigation:** Investigate which materials are conductors and which are insulators	**States of Matter** **Investigation:** Observe the evaporation of water from different places linked with temperature	Raiders and Traders **Living Things and Their Habitats** **Investigation:** Using and making simple guides or keys to explore and identify local plants and animals	
Year 5	Pharaohs **Properties and changes of materials** **Investigation:** Investigate dissolving of salt/sugar. Patterns in time taken to dissolve with different temperatures/ different sizes of sugar/ stirring or not stirring.		Stargazers **Earth and Space** **Investigation:** Group planets based on their size/ atmosphere/ orbit time/ rotational period etc.	**Forces** **Investigation:** Designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective	Peasants, Princes and Pestilence **Animals Including Humans** **Investigation:** Researching gestation periods of different mammals Research naturalists e.g. Jane Goodal	**Living Things and Their Habitats** **Investigation:** Grow plants from cuttings Observe butterflies hatching from chrysalis.
Year 6	Revolution **Light** **Investigation:** Investigating shadows of objects being the same shape as the objects	**Electricity** **Investigation:** Does the number of cells affect the brightness of a bulb in the circuit?	Hola Mexico! **Animals Including Humans** **Investigation:** How does your pulse rate change after exercise?		Darwin's Delights **Living Things and Their Habitats** **Investigation:** Use classification systems and keys to identify some animals and plants in the immediate environment	**Evolution and Inheritance** **Investigation:** Research into palaeontologists such as Mary Anning/ Research into proof of evolution Charles Darwin / Alfred Wallace

Types of Investigation: **Observing over time** / **Comparative & Fair Test**/ **Grouping & Classifying**/ **Researching**/ **Pattern Seeking**

Further details about the content of the science curriculum can be found by in ‘Our St Mary’s Curriculum for Science document.

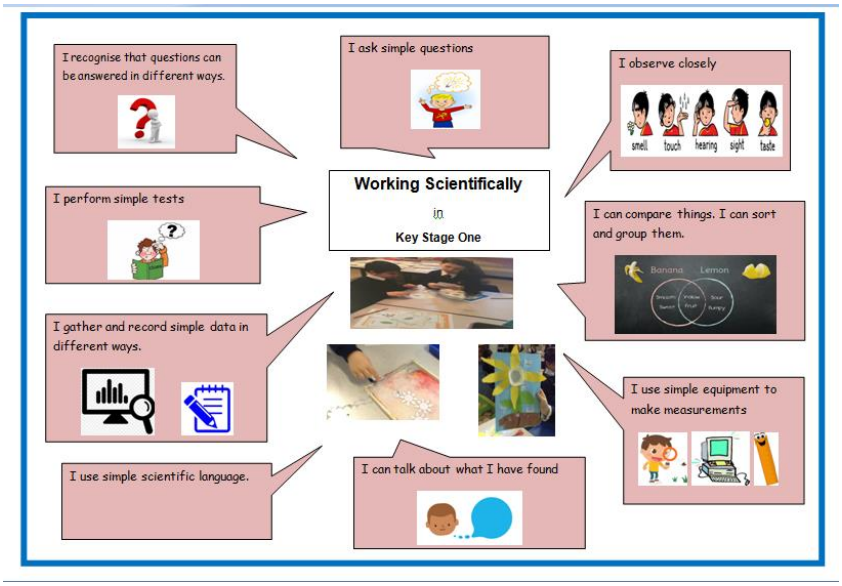
Working Scientifically

Foundation Stage



Foundation Stage deliver science content through the ‘Understanding of the World’ strand of the EYFS curriculum. This involves guiding pupils to make sense of their physical world and their community through opportunities to explore, observe and find out about people, places, technology and the environment. They are assessed according to the Development Matters attainment targets and in the final year of the Key Stage against the Early Learning Goals.

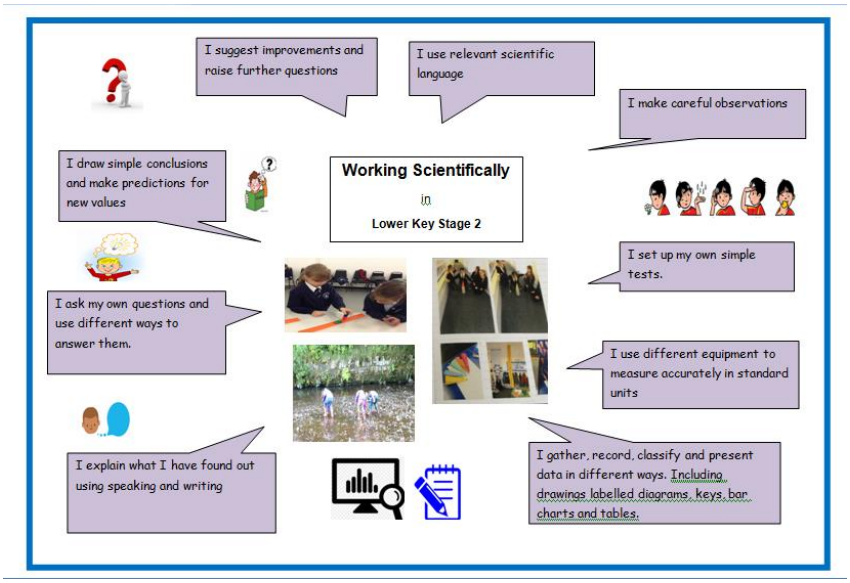
Key Stage 1



The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop

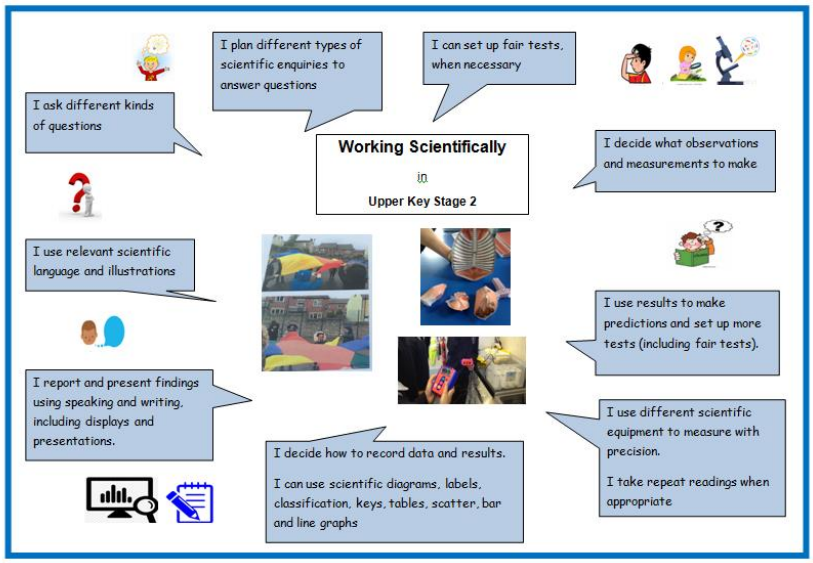
their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos. 'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

Lower Key Stage 2



The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out. 'Working scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

Upper Key Stage 2



The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings. 'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content. Pupils should read, spell and pronounce scientific vocabulary correctly.

5. RECORDING

Pupils should be given opportunities to record in a variety of ways that are in line with expectations, stated within the Working Scientifically skills, and should be evident within their science books. Some of these ways may include:

- Photographs, pictures, labelled diagrams, models, keys,
- Written work; such as recounts, balanced arguments etc,
- Tables,
- Graphs,
- Use of technology: PicCollage, presentations on power point, word.

Indeed written work in science should reflect the standards and levels shown within a pupils literacy book.

Where scientific work has taken place as part of another lesson, for example Mathematics, a note should be included in the science book with the date and a brief description of the work, for example 18.1.20- Science- bar graph to show heart rates- see maths book.

When pupil's work as part of a group on a STEM challenge evidence should be recorded for each group and placed in the class STEM challenge floor book. This then moves with the class as they progress through school.

6. ASSESSMENT and FEEDBACK

Marking for Improvement

Much of the work done in science lessons is of a practical or oral nature and, as such, recording will take many varied forms thus making marking different. It is, however, important that written work is marked regularly and clearly, as an aid to progression and to celebrate achievement. When appropriate, pupils may be asked to self-assess or peer assess their own or other's work. Marking for improvement comments in a pupil's book must be relevant to the learning objective to help pupils to better focus on future targets.

Assessment

In line with the KWL strategy, pupils identify what they know already about each unit, as well as what they would like to know. The programme of study responds to the pupils' starting points, as well as their specific interests. It also ensures a focus on the key identified knowledge of each unit, which is mapped within and across year groups to ensure progression. In EYFS, we assess the children's Understanding of the World according to the Development Matters statements and some aspects of Communication and language and Expressive Arts Design are also science based.

Pupil's progress is continually monitored throughout their time at St Mary's C of E Academy and is used to inform future teaching and learning. By the end of each key stage, pupils are expected to know, apply and understand the matters, skills and processes specified in the relevant programme of study as set out in the National Curriculum. These are set out as statutory requirements. We also draw on the non-statutory requirements to extend our pupils and provide an appropriate level of challenge.

Pupils receive effective feedback through teacher assessment, both orally and through written feedback in line with the success criteria. Pupils are guided towards achievement of the main objective(s) through the use of process based 'success criteria', provided by and explained by the teacher. Pupils will have these to refer to in the lesson, where they will be evident in their books and used to identify areas of difficulty by pupils' and teachers when reviewing and assessing work. Assessment for learning is continuous throughout the planning, teaching and learning cycle and uses a variety of methods:-

● Observing pupils at work, individually, in pairs, in a group, and in classes.

● Questioning, talking and listening to pupils

● Consideration of work/ materials / investigations produced by pupils, together with discussion about this with them.

● Pupils use of self assessment systems, for example Lego Taxonomy, unit success criteria, etc

● End of unit quizzes/ tests (this is at the discretion of the class teacher).

Throughout each unit a variety of assessment methods should be used in order to fully capture a pupil's scientific ability and knowledge and ensure that they are not prevented from demonstrating their learning and understanding.

Summative assessments:

Summative assessments are made at the end of each blocked science unit, where key knowledge is checked. Throughout the school teachers will assess whether children are working at/above or below the expected level for their age based on their understanding and application of the content of the National Curriculum 2014. Teachers then moderate their assessments before making overall judgements. In addition to end of unit assessments, at the end of the year teachers also make final assessments of a pupil's working scientifically skills. All summative assessments are then recorded and shared with the subject coordinator and Head of School. Appropriate summative data is also shared with future class teachers as part of the schools transition process. Progress and attainment is also reported to parents through parents' evenings and end of year reports.

(Examples of assessment materials are included in the Appendix C)

7. STEM

STEM challenges are designed and planned for by the teacher in order to allow pupils to draw on their scientific knowledge to solve a problem or answer a question. It also allows them to apply and use skills from Design Technology, Art, Mathematics and Computing as well as develop other so called 'soft skills' such as collaboration, communication, persistence etc.

Further details about STEM, including a definition of STEM at St Mary's C of E Academy and how this pedagogy is used can be found in St Mary's C of E Academy STEM Handbook.

8. EQUAL OPPORTUNITIES

At St Mary's Church of England Academy School we are committed to providing all pupils with an equal entitlement to scientific activities and opportunities regardless of race, gender, culture, class or ability. Further details can be found in the whole school Equality Policy.

9. INCLUSION (eg EAL/SEN/ etc)

In school we aim to meet the needs of all our pupils by differentiation in our science planning and in providing a variety of approaches and tasks appropriate to ability levels. This involves providing opportunities for SEND children to complete their own projects, with support, to develop speech and language skills, as well as scientific skills and knowledge. This will enable pupils with learning and/or physical difficulties to take an active part in scientific learning and practical activities and investigations and to achieve the goals they have been set. Some pupils will require closer supervision and more adult support to allow them to progress whilst more able pupils will be extended through differentiated activities. By being given enhancing and enriching activities, that are based on the non statutory elements of the National Curriculum more able pupils will be able to progress to a higher level of knowledge and understanding appropriate to their abilities. (Please see Appendix D for more detail and support on differentiation). .

10. RESOURCES

All resources are kept in labelled boxes and draws. The subject Co-ordinator with the support of all staff will ensure that resources are well maintained and in sufficient number to meet the needs of whole class investigations. A variety of equipment will be available for use so that pupils of all abilities can access learning or be used to extend learning.

11. LEARNING ENVIRONMENT

Activities are organised at the teacher's discretion, taking into account the space needed for effectively conducting investigation and the appropriate use of other spaces, such as the school grounds, Ruskin Park and the STEM room. (Please see appendix E for use of the STEM room).

Science and STEM activities may be carried out individually, as a small or large group, or as a whole class activity. Decisions about sizing of groups are made in the context of supporting and extending pupils learning.

12. DISPLAYS

The school promotes the displaying of science work in classrooms and corridors. These can be divided into two categories, those which support a pupil's learning and those which celebrate a pupils learning. Displays which support pupils learning should include communicate ideas and stimulate interest and vocabulary, in relation to the block of science that is being taught. These displays may include vocabulary, pictures, diagrams and exemplar work. It should also include a child friendly version of St Mary's vision for teaching and learning in science and working scientifically skills poster(s) that are relevant to your key stage and or class. Displays which celebrate pupils learning should reflect a pupil's efforts, progress or achievements. This type of display can play an important part in building a positive ethos towards science.

13. HEALTHY AND SAFETY

Pupils will be taught to use scientific equipment safely when using it during practical activities. The Subject Co-ordinator will check and maintain equipment on a regular basis. However Class Teachers and Teaching Assistants will check equipment before use with their class and report any damage, taking defective equipment out of action. Teachers and Teaching Assistants are asked to complete an equipment form (see Appendix F) to record any defective equipment or request new or additional resources. A simple risk assessment will be carried out for all practical activities any perceived hazards will be reported to the Head who will determine the appropriateness of said activity. Advice, risk assessments and COSHH forms can be found at CLEAPPS https://www.cleapss.org.uk/ .

14. ROLE OF A SUBJECT LEADER

It is the responsibility of the subject leader to monitor the standards of pupil's work. 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 science in the school. The subject leader monitors the resources for science units and suggests trips and workshops to support learning. The subject leader has specially-allocated time for fulfilling the task of reviewing samples of pupil's work, training, liaising with other subject leaders from other schools and organising science week. They also speak with pupils and collect their thoughts and feelings about the subject, using these as a stimulus for further development of the subject, where appropriate.

15. PARENTS (Including Homework)

Parental input is highly valued and parents are regularly invited and welcomed into school to share their own expertise with the pupils. There is an annual family challenge event that engages many families in scientific activity during British Science Week, as well as parents who share their experiences within a field of science during Aspire Day. Children may receive science homework based on their current unit.

Appendix.

APPENDIX A

Appendix B- Teaching and Learning

Guidance for the Teaching of a Science Unit

Before teaching

Each unit should begin by ascertaining what they know- range of AFL strategies

- KWL Grid (written on with pictures and models)
- Concept cartoons- used as a basis for discussion
- Thought shower/ practical thought showers } Lollipop sticks, Dog biscuit bones
- Lego self assessment (non negotiable).

Initial writing/ recording of existing knowledge is to be completed in pencil by the pupils or scribing adult.

Teaching a unit

Teaching should include a balance of:

- Knowledge gathering, internet, books, firsthand experience, outdoor learning and excursions (where appropriate).
- Emphasis on use of real objects (where possible), with the hierarchy of selection of objects being as follows: real objects, detailed models, detailed diagrams, photographs and pictures; with latter often being least supportive to extending pupils learning.
- Working scientifically
- Use of activities and resources to specifically teach subject and unit specific vocabulary, for example the use of Explorify. This may be as a 5-10 minute mental and orals starter. (Pupils are also given access to vocabulary mats, including those made in communication in print and are given time to personalise their scientific dictionary).
- STEM challenges- to check for those pupils exceeding (are they able to apply their knowledge and skills they have gained). They are also used to allow pupils to pursue a particular interest that they indicated when filling in the KWL grid at the start of the lesson
- Wherever possible be linked to one of the 17 Global Goals for Sustainability.
- Working as individuals and in groups of different sizes.

Throughout the unit pupils are supported by unit and lesson specific success criteria, which are referred to by the pupil and teacher as part of the marking, feedback and assessment process.

Analysis time (or another appropriate time) is used to support pupils who have an emerging knowledge of a subject to enable them to achieve expected. This time may also be used to teach subject –specific vocabulary to pupils, in particular EAL pupils.

At the end of a unit

Return to initial assessments

- KWL Grid or Thought shower/ practical thought showers- Pupils will add details about what they now know.
- Lego self assessment **(non negotiable).**

This can be written in blue pen or comparative photos taken to show what they have learnt and the progress a pupil has made over the course of a unit.

- Build in time to discuss their self assessments.

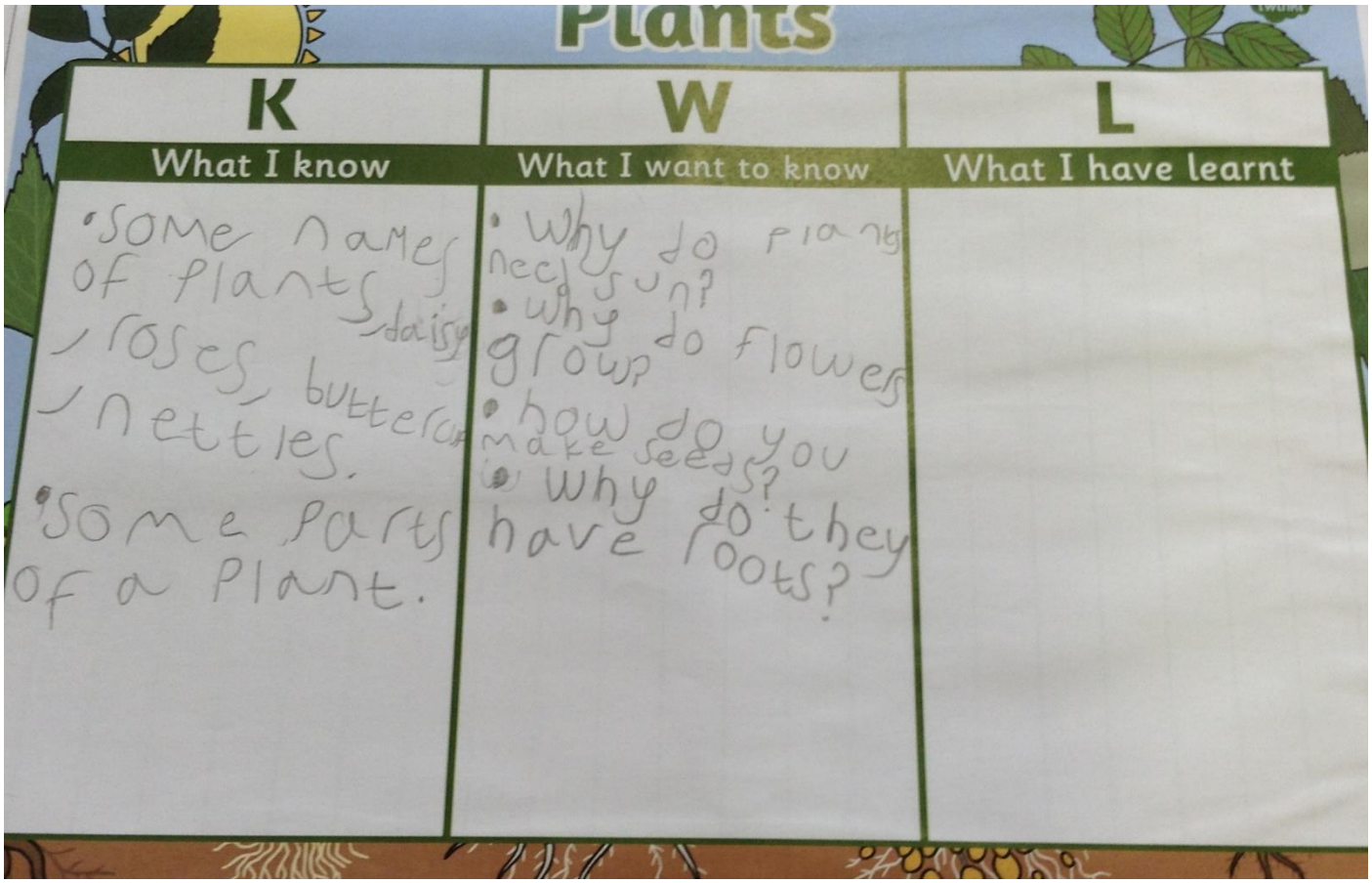
Teachers will then complete a science assessment sheet for that unit and send a copy to the subject coordinator.

Appendix C- Assessment documents

c.i.- Lego Solo Taxonoy

				
I don't know anything about this topic	I know one thing about this topic	I know a few things about this topic	I know a few things about this topic and can link them together	I can apply what I know to something new.

c.ii.- KWL Grid

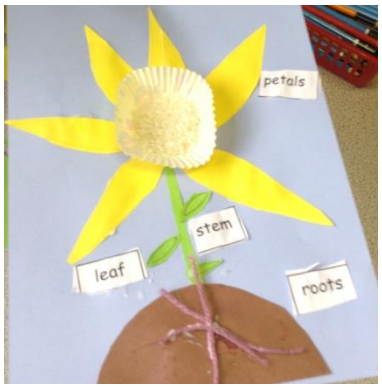


KWL Grids should be used for every unit- where appropriate a Teacher or Teaching Assistant can scribe for a pupil.

c.iii.- Concept Cartoons

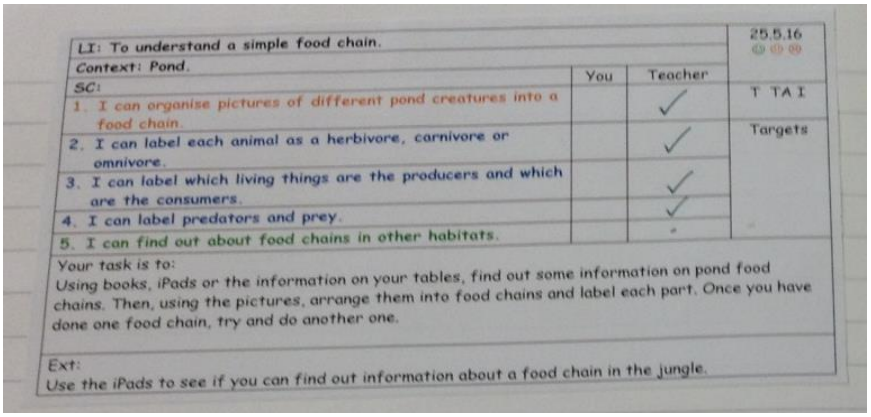
Concept cartoons: used to promote discussion –writing abilities should not be a barrier to showing learning and understanding.

Appendix c.iv.- practical ways of pupils showing understanding



Practical thought showers/ activities: spoken language should not be a barrier to showing learning and understanding.

c.v. Success criteria for a lesson



LI: To understand a simple food chain. 25.5.16

Context: Pond.

SC:	You	Teacher
1. I can organise pictures of different pond creatures into a food chain.		✓
2. I can label each animal as a herbivore, carnivore or omnivore.		✓
3. I can label which living things are the producers and which are the consumers.		✓
4. I can label predators and prey.		✓
5. I can find out about food chains in other habitats.		

T TA I

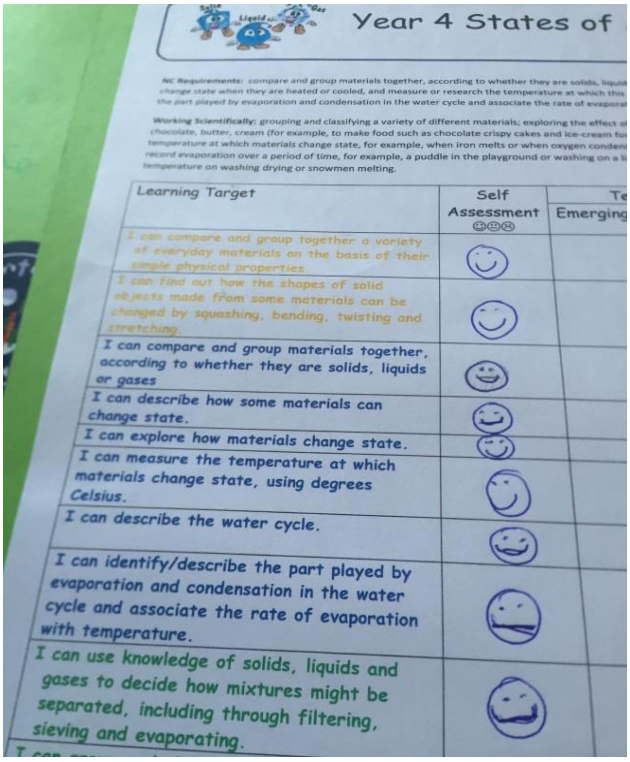
Targets

Your task is to:
Using books, iPads or the information on your tables, find out some information on pond food chains. Then, using the pictures, arrange them into food chains and label each part. Once you have done one food chain, try and do another one.

Ext:
Use the iPads to see if you can find out information about a food chain in the jungle.

Orange statements- working towards **Blue** working at expected **Green** working at greater depth. This is in line with the whole school policy.

C.vi.- Unit success criteria:

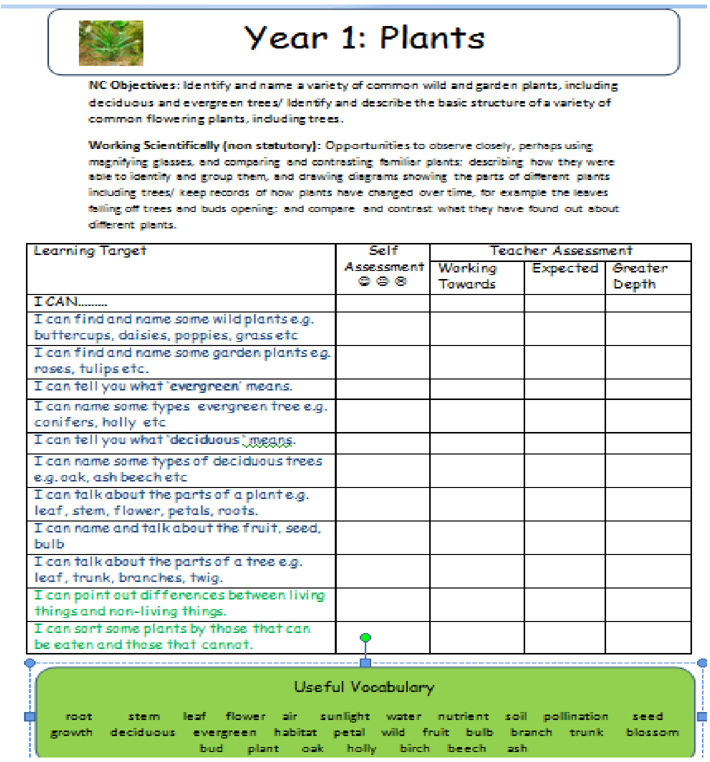


Year 4 States of

NC Requirements: compare and group materials together, according to whether they are solids, liquid
change state when they are heated or cooled, and measure or research the temperature at which this
the part played by evaporation and condensation in the water cycle and associate the rate of evapora

Working Scientifically: grouping and classifying a variety of different materials; exploring the effect o
chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream fo
temperature at which materials change state, for example, when iron melts or when oxygen conden
record evaporation over a period of time, for example, a puddle in the playground or washing on a li
temperature on washing drying or snowmen melting.

Learning Target	Self Assessment ☺😐☹	Emerging
I can compare and group together a variety of everyday materials on the basis of their simple physical properties		
I can find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.		
I can compare and group materials together, according to whether they are solids, liquids or gases		
I can describe how some materials can change state.		
I can explore how materials change state.		
I can measure the temperature at which materials change state, using degrees Celsius.		
I can describe the water cycle.		
I can identify/describe the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.		
I can use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.		



Year 1: Plants

NC Objectives: Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees/ Identify and describe the basic structure of a variety of common flowering plants, including trees.

Working Scientifically (non statutory): Opportunities to observe closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants; describing how they were able to identify and group them, and drawing diagrams showing the parts of different plants including trees/ keep records of how plants have changed over time, for example the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants.

Learning Target	Self Assessment ☺😐☹	Teacher Assessment		
		Working Towards	Expected	Greater Depth
I CAN.........				
I can find and name some wild plants e.g. buttercups, daisies, poppies, grass etc				
I can find and name some garden plants e.g. roses, tulips etc.				
I can tell you what 'evergreen' means.				
I can name some types evergreen tree e.g. conifers, holly etc				
I can tell you what 'deciduous' means.				
I can name some types of deciduous trees e.g. oak, ash beech etc				
I can talk about the parts of a plant e.g. leaf, stem, flower, petals, roots.				
I can name and talk about the fruit, seed, bulb				
I can talk about the parts of a tree e.g. leaf, trunk, branches, twig.				
I can point out differences between living things and non-living things.				
I can sort some plants by those that can be eaten and those that cannot.				

Useful Vocabulary

root stem leaf flower air sunlight water nutrient soil pollination seed growth deciduous evergreen habitat petal wild fruit bulb branch trunk blossom bud plant oak holly birch beech ash

c.vii: Summative assessment

Statutory Requirements All children should be taught to:	Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), .	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 associated with burning and the action of acid on bicarbonate of soda.
NAME						
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC

Science Assessment Sheets

Key Stage 1 (Years 1 and 2) WORKING SCIENTIFICALLY

Statutory Requirements All children should be taught to: NAME	Asking simple questions and recognising that they can be answered in different ways.	Observing closely, using simple equipment.	Performing simple tests.	Identifying and classifying.	Using their observations and ideas to suggest answers to questions.	Gathering and recording data to help in answering questions.
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC
	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC	EM EXP EXC

This document is shared with the subject co-ordinator, head of school and future teacher, as part of transition.

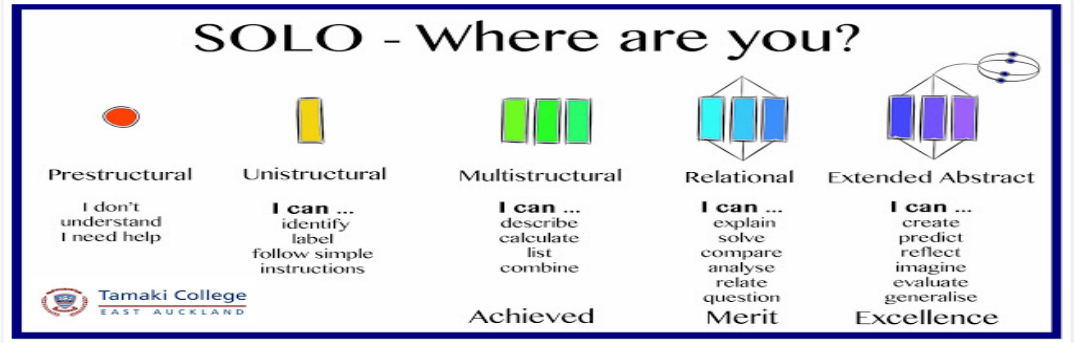
Appendix D: Inclusion/ Differentiation

Differentiation in Science

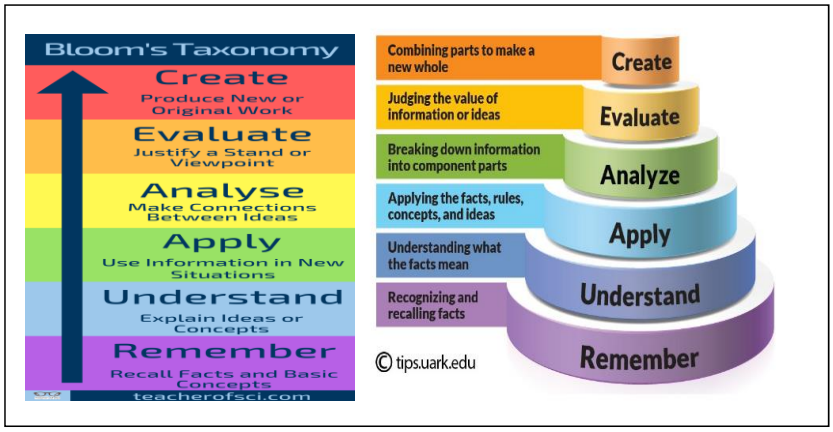
In order to differentiate effectively it is important to know our pupils' prior learning. Differentiation can be achieved by considering and adjusting one or more of the following:

- Providing different tasks NOT more
- Providing choice
- Moving from guided to independent tasks
- Moving from simple to complex ideas
- Moving from concrete to abstract ideas

Models and theories about thinking and learning can also be used to guide and plan activities of increasing complexity. Some of these are as follows:



Increasing complexity ↓	IDEAL	BLOOM's Taxonomy	SOLO Taxonomy
	• Identify	• Knowledge	• Pre-structural
	• Describe	• Understanding	• Uni-structural
	• Explain	• Application	• Multi-structural
	• Apply	• Interpretation	• Relational
	• Link	• Synthesis	• Extended Abstract
		• Evaluation	



Differentiation by Resource

- By type of resource and their level of challenge (e.g. website, data, presentation, video clip)
- By quantity of material (e.g. just one website, factsheet, text book or many)
- By practical resources (e.g. different trays of materials for different groups)

Differentiation by Support

- Using scaffolds and graphical organisers: scientific enquiry posters, writing templates, graph axes
- Using higher-order questioning (Blooms' taxonomy)
- From a teaching assistant
- From a peer or group

Differentiation by task

- A written activity: report, story, poem, mind map, leaflet, letter
- A presentation, powerpoint, TV commercial, news report, poster
- A role play, drama, mime, song or rap

Differentiation by Outcome

- Using an open-ended activity that allows pupils to demonstrate different levels of achievement
- Starts from a clear understanding of the success criteria for a task

Appendix E: Guidance on using STEM Room

STEM Room

The STEM room is space with resources that support large or small groups to work to solve a STEM challenges. Pupils of all abilities are able to independently access the resources they need due to photo graphed labelled draws.

It may also be used so that each of the class can perform comparative tests without influencing each other, only coming together to share results.

Appendix F

Equipment Repair or Request Form

Date: .....

Year Group:.....

Unit

Science:.....

Equipment needing repair: .....

.....

New equipment

required:.....

.....