Teaching and Learning Science at St. Mary's Catholic Primary School

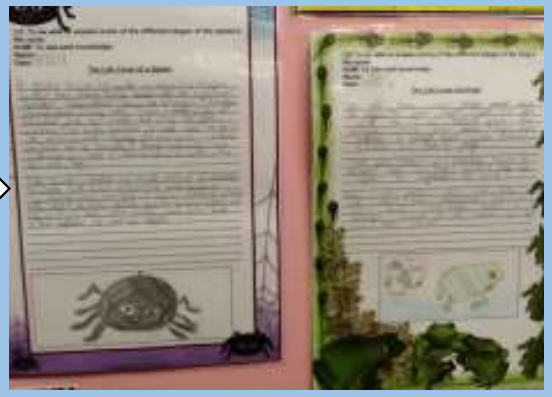
A whole school science display with comments and work from all year groups to show that we value science and we are putting the Science Principles into action.

An example of a successful Science Week workshop which all children in the school had experience of taking part in. These workshops help to maintain a high status for science and endorse our Science Principles.

A Reception child taking part in Gardening Club. However, there are members of the club from all year groups.

All year groups made corridor displays linked to their science work covered in class. This helped to show all visitors to the school that we regard science as an important area of the curriculum. Teachers ensured that the work on the display had cross- curricular links. This is an example of a Year 5 display.

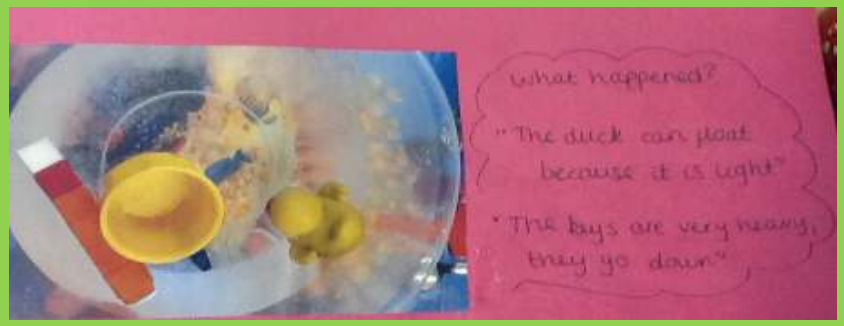
Examples of writing on the Year 5 display linked to Literacy.

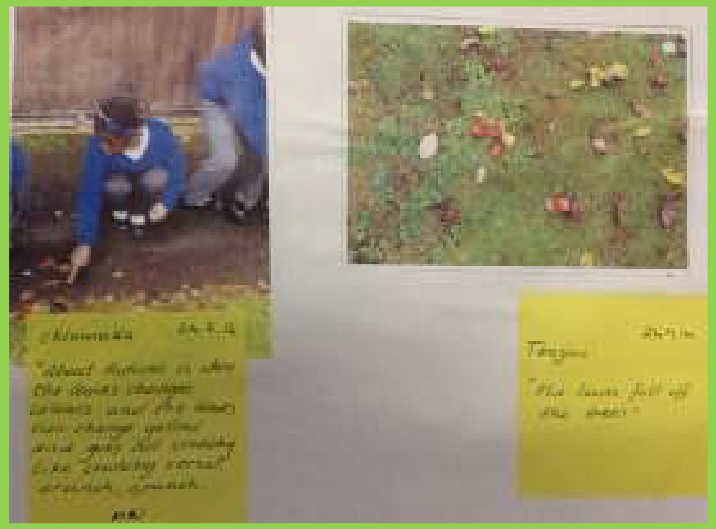


Reception children are making jelly and discussing the ideas of dissolving and changing state. The children are given hands on experiences and opportunity to discuss and use scientific terminology .

Subject Management A1 & A2

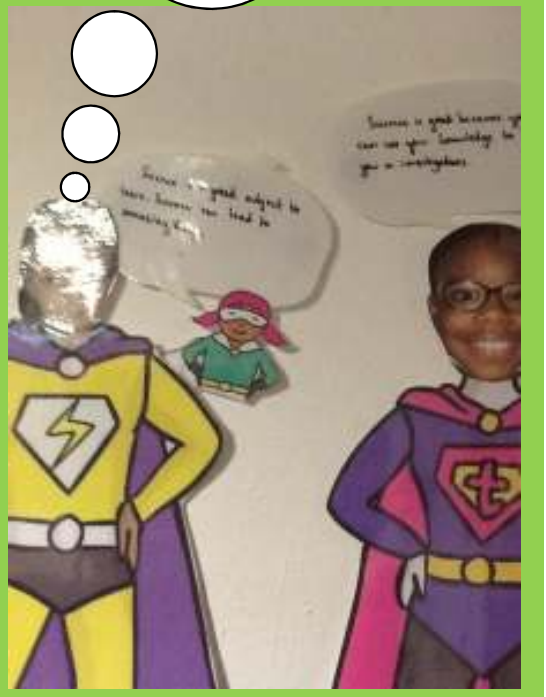
Children in Reception are given the opportunity to explore scientifically and use effective skills.





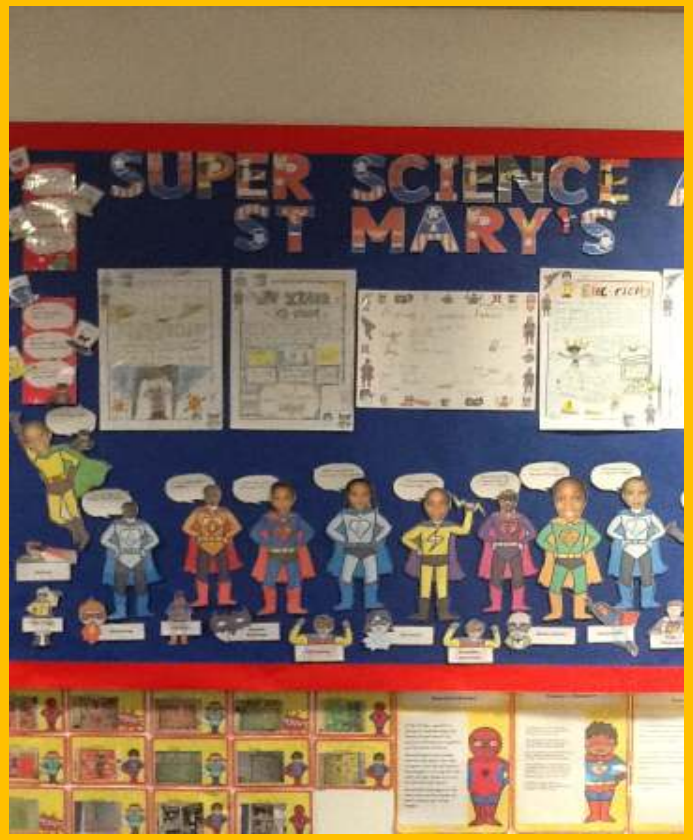
Staff considered what made good science teaching at St. Mary's and the Principles for Teaching Science was established and shared with Governors.

Science is great because you get to prove your ideas through investigations and it doesn't ,matter if your prediction isn't correct.



The Principles for Teaching Science

Children are able to ask their own scientific questions.
Children are able to explore scientifically using effective skills.
Children are actively engaged in science teaching.
Children are able to explain their ideas using scientific vocabulary.
Children are confident at linking their scientific knowledge to their enquiry.



The Super Science at St. Mary's display highlighting what children enjoy about science and how it links to different areas of the curriculum.

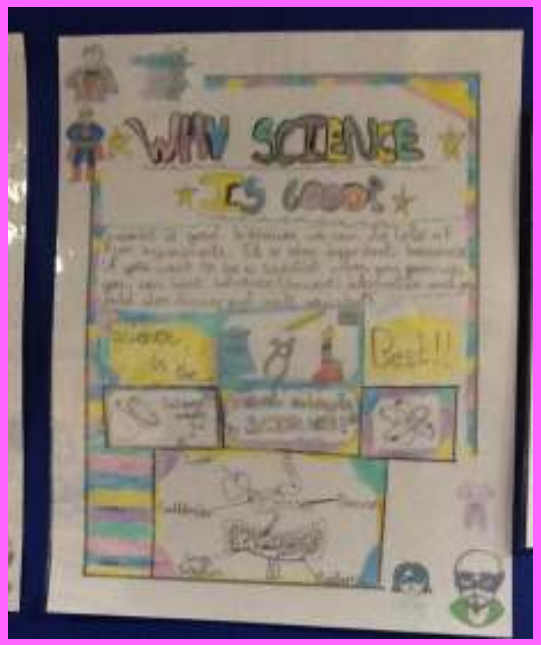
We are learning about air resistance and have been investigating which parachute will fall quickest. (Year 6)

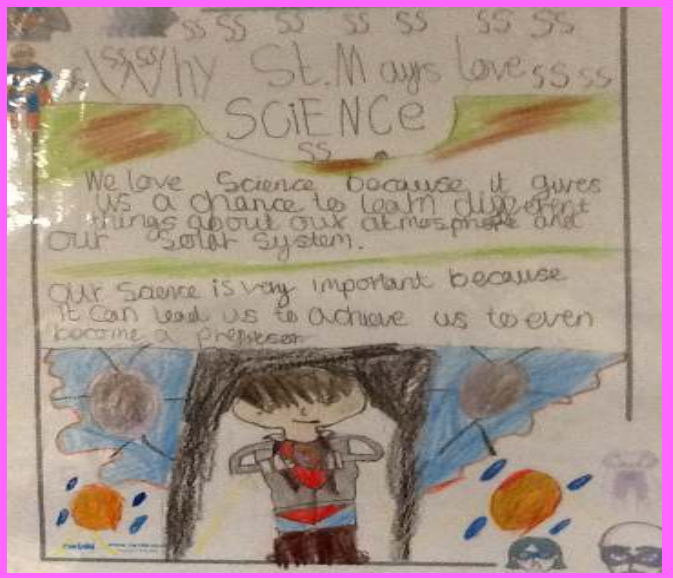
We are learning about the properties of magnets. We are sorting materials into magnetic and non-magnetic materials. (Year 5)

These pictures show how, as a school, practical science is very important and this again, links to the Principles of Science.

We are finding out about what objects can float and sink. (Reception)

Children throughout the school have explained why they enjoy science and the teaching of science at St. Mary's. Here are some comments from the children about their science experience in school which show that the Principles of Science are being upheld.





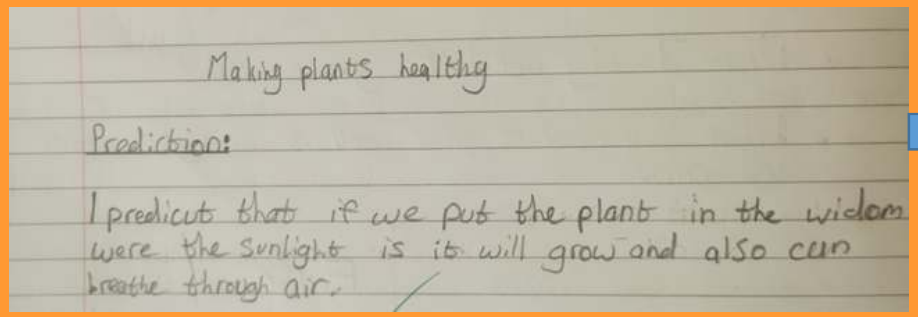
Reception children are able to begin a scientific dialogue which was one of the Principles of Science teaching that we wanted to achieve.

I love my science lessons because we always get a chance to ask our own questions and test our ideas.
Year 5

I liked to find out about how the seasons change. We can tell when the seasons change by what happens around us.
Reception

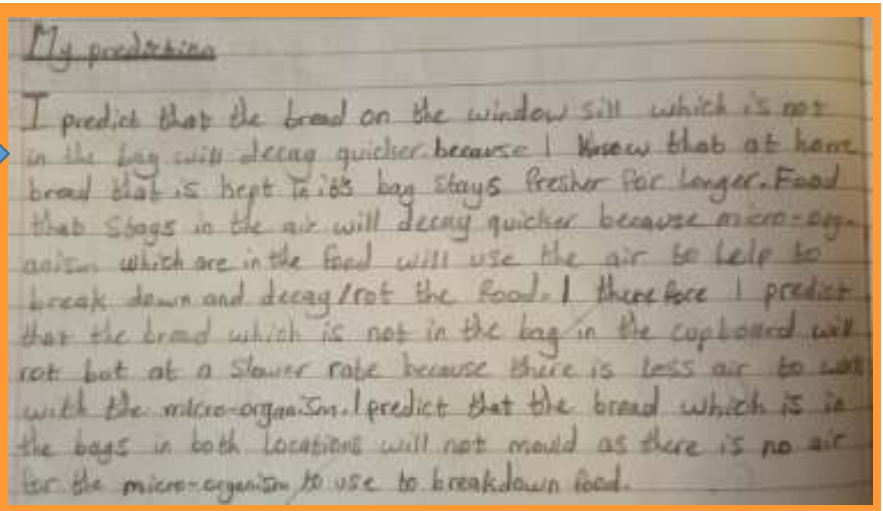
We are able to act like real scientists so when we have learnt about something, we can use those ideas in our enquiries.
Year 6

Year 6


Making plants healthy

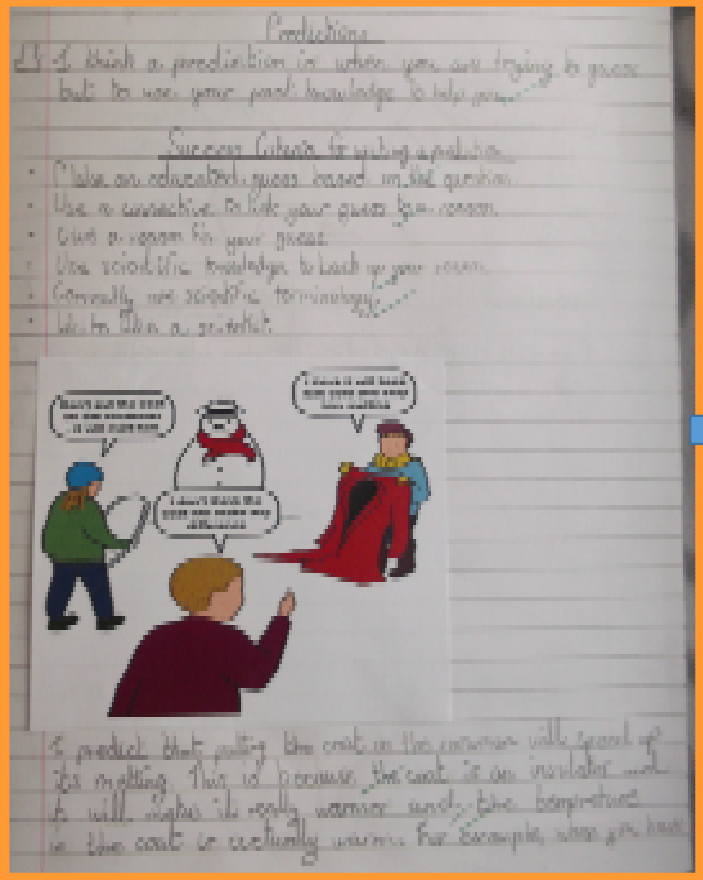
Prediction:

I predicut that if we put the plant in the widow were the sunlight is it will grow and also can breathe through air.


My prediction

I predict that the bread on the window sill which is not in the bag will decay quicker because I know that at home bread that is kept in its bag stays fresher for longer. Food that stays in the air will decay quicker because micro-organisms which are in the food will use the air to help to break down and decay/rot the food. I therefore I predict that the bread which is not in the bag in the cupboard will rot but at a slower rate because there is less air to react with the micro-organism. I predict that the bread which is in the bags in both locations will not mould as there is no air for the micro-organism to use to breakdown food.

Year 5


Predictions

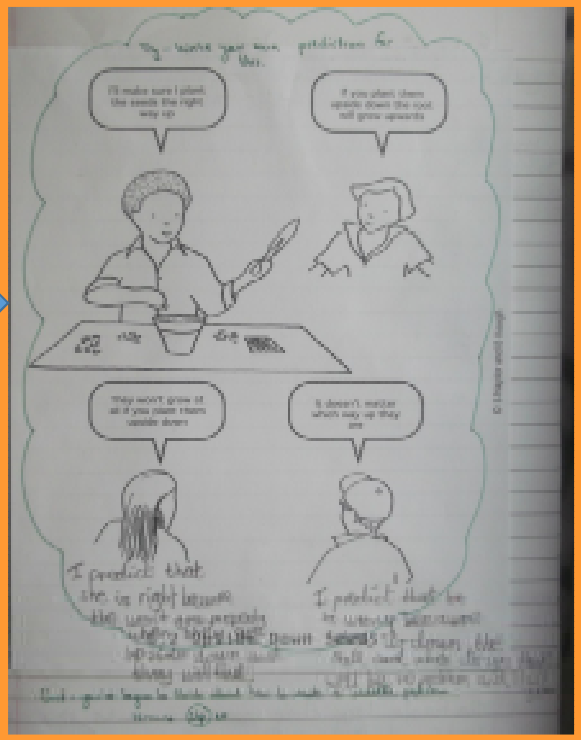
I think a prediction is when you are trying to guess but to use your past knowledge to help you.

Success Criteria for writing a prediction

- Make an educated guess based on the question
- Use a connective to link your guess to a reason
- Give a reason for your guess
- Use scientific knowledge to back up your reason
- Correctly use scientific terminology
- Write like a scientist

I predict that putting the coat on the warmer will speed up its melting. This is because the coat is an insulator and it will trap the really warmer and the temperature in the coat is actually warm. For example, when you have

Children in Reception and KS1 have worked on orally discussing prediction skills and children are encouraged to predict using correct scientific terminology.



Pre the staff meeting where areas of scientific enquiry were highlighted, teachers were spending lessons planning and carrying out entire investigations. There is now a focus on a particular skill which is taught and expanded on in the lesson allowing children a greater understanding of each investigative skill.

Children are now provided with a success criteria for each skill. This enables them to know what makes each stage of the investigation scientifically correct. There is a greater emphasis on children applying their scientific knowledge and reasoning to different areas of science which they may not have covered.

Subject Management, Teacher and teaching, Pupils and learning
A3, B1, B2 & C3

Learning Objectives	Key Vocabulary and Resources	Introduction and Key Questions. Activities including differentiation.		Plenary
To understand that green plants need light in order to grow well. To describe the characteristics of healthy and unhealthy plants. To make predictions, to plan how and what results to collect.	Healthy Unhealthy Factors Light Heat Air Growth Straggly Limp Yellow Germinate Measuring cylinders	Discuss in pairs what plants need to stay healthy. Compose a list together. *Green Hat: What factors do you think affect how healthy a plant is?* *White Hat: What do they need to grow well?* Complete Task 1 Show children an unhealthy plant. Discuss what they think would happen if we put the plant on a window ledge and gave it adequate water. *How could we record the plants growth?* *What could you measure?* *How could you record your measurements?* *What would a graph of your results look like?* Pupil Book pg. 4 Complete Task 2	Task 1 Children draw a healthy plant and create a circle map to describe what plants need to grow well. Task 2 Children write up the planning for their investigation and prepare their table using planning frame provided. HA: Monitor more than one factor e.g. size of leaves/plant growth and also expect more accuracy in exactly how they will measure.	Children share their investigation ideas and we discuss if they will work/results will be accurate enough. Over the week, children will collect data on their plant.

4	To know how to increase resistance in a circuit or reduce it. To understand how to write a detailed conclusion. WOSL: Thinking and communicating with clarity and precision.	Discuss with the children the meaning of dimmer and brighter. *Yellow Hat: What are the benefits of changing the brightness of a bulb?* *Green Hat: What different ways can you make a bulb dimmer or brighter?* 1. Discuss the meaning and use of the multi-flow map and model the frame on the board.	1. Create a multi-flow map together to show the ways in which a bulb could be made dimmer or brighter. Record in books. Use a given investigation plan of how the number of batteries affects the brightness of the bulb and create circuits to find out the answer. Write a conclusion together on the board using a comparative sentence. 2. Using the multi-flow map, choose a variable to investigate and create a question in your book. Write a prediction for your investigation. Carry out the investigation and write a conclusion from your findings. Bring the class back together to discuss again how to write a conclusion. WHITE HAT: What did we learn before about writing a conclusion? Explain to the chn that writing a conclusion is very similar to the structure which we followed when we were writing predictions. They are broken up into 4 parts which help us to structure them correctly. Display the 4 steps for the chn to see and talk them through the steps. Conclusion: 1. Describe the pattern 2. Highlight the variables 3. State the trend 4. Provide a reason that supports your prediction. Talk through each step with the chn and explain what they need to include in each step. YELLOW HAT: Why is this a beneficial way of writing a conclusion? BLACK HAT: What might you find challenging?	LA: Work in a small group to complete the investigation together. HA: Write an explanation in your conclusion to describe why the outcome was so. Write a few conclusions on the board and ask the children to identify and correct any mistakes. Encourage the children to give reasons why they are wrong.	Complete investigation plan, circuit equipment including different types/lengths/thicknesses of wire

The science co-ordinator provided staff with success criteria which could be shared with the class to help them teach the scientific skills effectively. As a result, teachers have adapted planning accordingly with more emphasis on the scientific skills.

Success Criteria for writing a prediction can be shared with the class

- Make an educated guess based on the question.
- Use a connective to link your guess to a reason.
- Give a reason for your guess.
- Use scientific knowledge to back up your reason.
- Correctly use scientific terminology.
- Write like a scientist.

Common problems when pupils draw conclusions

- Not appreciating that they are drawing conclusions about their evidence not trying to state a fact.
- Mistaking drawing a conclusion for getting the right answer.
- Ignoring evidence that does not fit.
- Not recognising evidence is weak or insufficient.
- A lack of scientific language.

The principles of writing a conclusion

- Describe the pattern.
- Highlight the variables.
- Construct the sentences linking the variables.
- State the trend.
- Provide a reason that supports (or refutes) your prediction.
- Use scientific knowledge and terminology correctly.
- Write like a scientist.

Language requirements for describing the pattern

- Time connectives (when appropriate): first, then, after a while, finally.
- Comparative language.
  - Comparatives (cold, cool, warm) to describe the independent variable.
  - Adjectives (slowest, quicker, quickest) to help describe changes to the dependent variable.
  - Use of adverbs (quickly) and intensifiers (very quickly) when appropriate.

Stating the trend

- "The warmer the temperature, the quicker the seeds germinated."

Success Criteria

- State the independent variable (often an amount or measure) with an appropriate comparative.
- State the dependent variable (nearly always a verb or noun) with an appropriate comparative.

The Science Knowledge- Success Criteria

- Link the trend stated (the comparison between the variables) to an everyday context.

The Year 6 teacher has made clear improvements to planning using the materials given to her during INSETs and Staff Meeting time. It has helped to impact of the quality of the children's science work.

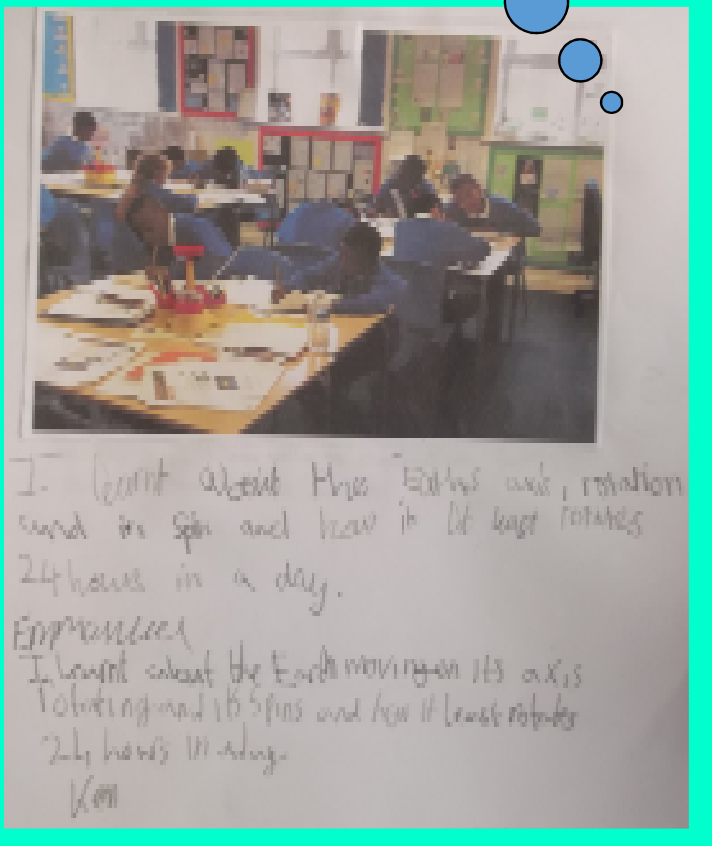
Reception making cross-curricular links.

Year 5 are classifying different materials into magnetic and non-magnetic groups.

Each class has a scientific scrap book where they have the opportunity to discuss the scientific knowledge that they have acquired and make notes for other children to learn from.

From reception through to Year 6 the children develop their scientific enquiry skills which gradually allows them to move away from adult support to becoming confident enough with their scientific knowledge to independently carry out enquiries.

Links to A3. Teachers are feeling confident with allowing children to experiment and have hands on experiences of science after Staff meetings and CPD sessions.



Year 6 are working independently on investigating solutions.

It was so much fun to actually investigate which materials are magnetic and which are non-magnetic. We were then able to sort the materials into Venn-diagrams. Year 6.

In gardening club we are learning that seeds turn into plants. Reception

I really enjoyed getting the opportunity to see and touch the animals – I learnt a lot about their habitats and how they are adapted. Year 5

Links to A4.
There is so much science and scientific activities taking place in school that it shows a shared and understanding of the importance and value of science to children's learning.

We loved learning about the different parts of a plant and about how plants can reproduce. Year 5

Teachers aim to have a variety of hands-on equipment and resources to use in lessons and to help children conduct their own enquiries effectively. They also provide opportunities for children to conduct open- ended enquiries and ask scientific questions.

Subject Management A4

Staff took part in a Working Scientifically Inset. Staff worked with a Science expert to work on how to teach scientific enquiries effectively linked to the New Curriculum. It was a “hands on” Inset which proved to be very successful.

“I learnt how to conduct relatively simple investigations but focus on one area of scientific enquiry.”

“The Inset has given me the confidence to conduct scientific enquiries and gave me tips to help improve my own practise.”

Nursery

Reception

Year 1

Science Displays from all the year groups in St. Mary's


Year 4

Year 3


Year 2

Year 5

Year 6

Science is valued in school. All classes have science display boards which correspond with the unit being taught. In addition, the school has a science theme running through the corridor showing the scientific enquiry skills in each year group. It also displays the progression of Science throughout the school.

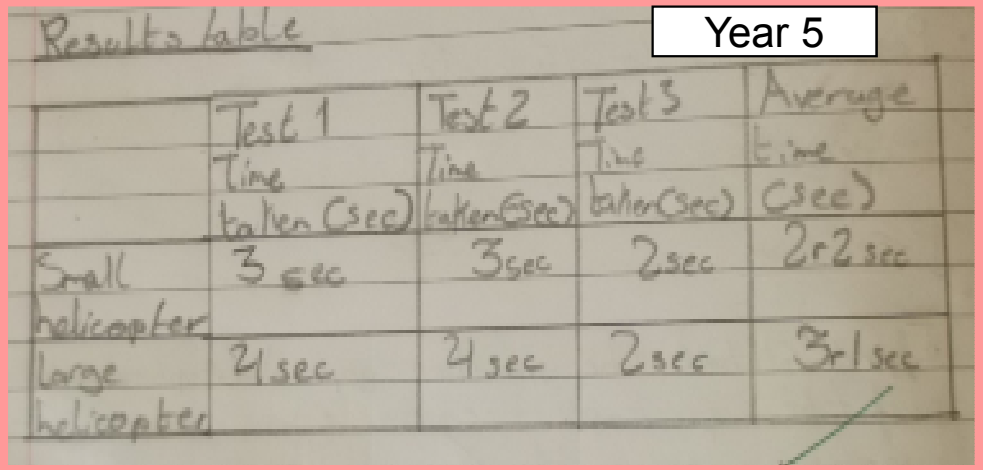
Parents are able to support their children in their science learning based on the information given to them via parent consolations and the regularly updated website. Parents and pupils are aware that science has a high status in school and parents are encouraged to offer any support within science lessons.

As part of the D&T week, children took part in workshops linked to science topics such as electricity and forces.

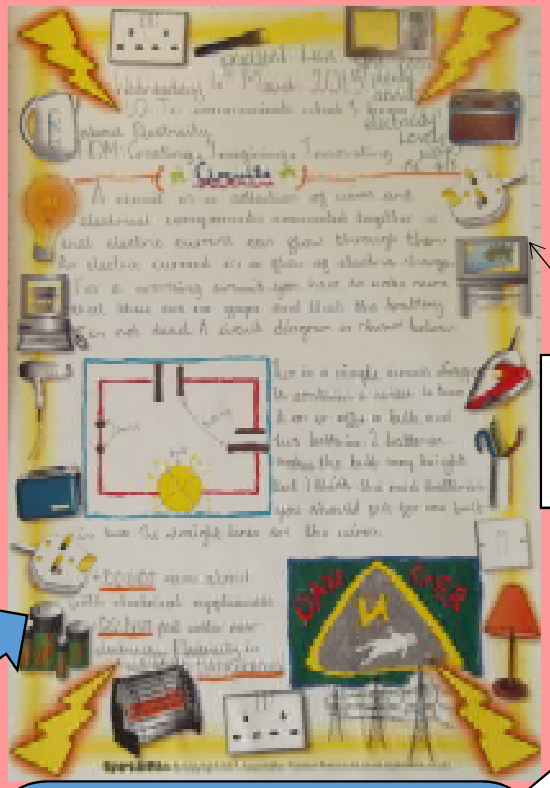
On a “Bring your Mum to School” day, children made birdhouses linked to the topic of habitats.

Cross Curricular links in science show that the subject is being valued and that key skills are being taught through different subject areas.

Year 5



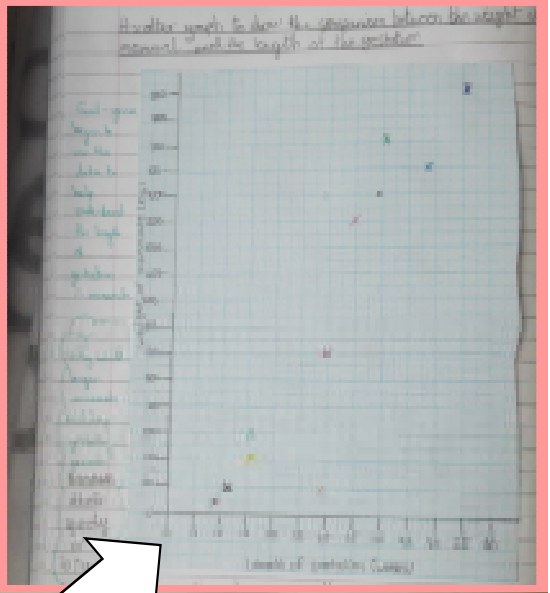
There are many opportunities for children to experience different skills in Science lessons which they can apply to various areas of the curriculum. At the end of each Science unit children are encouraged to demonstrate their understanding of Science through a piece of extended writing.

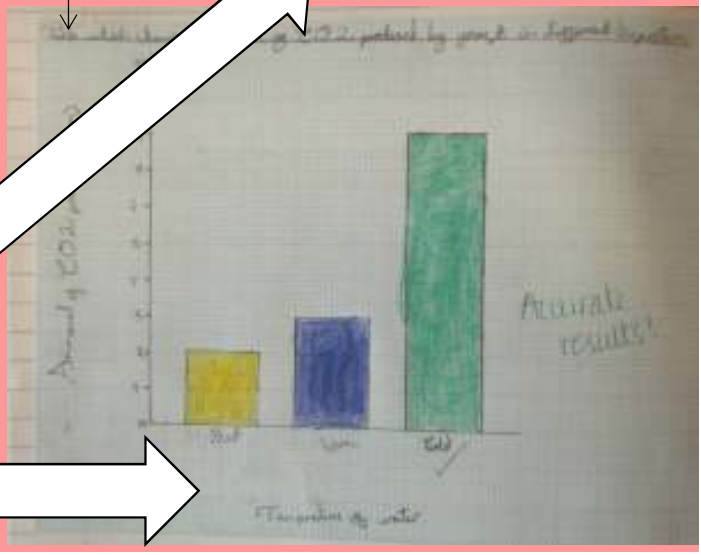


Year 6

As a result of the changes to the new numeracy curriculum children are now provided with more opportunities in Science to use data such as; results tables, Venn-diagrams, bar charts and scatter diagrams.

Year 5

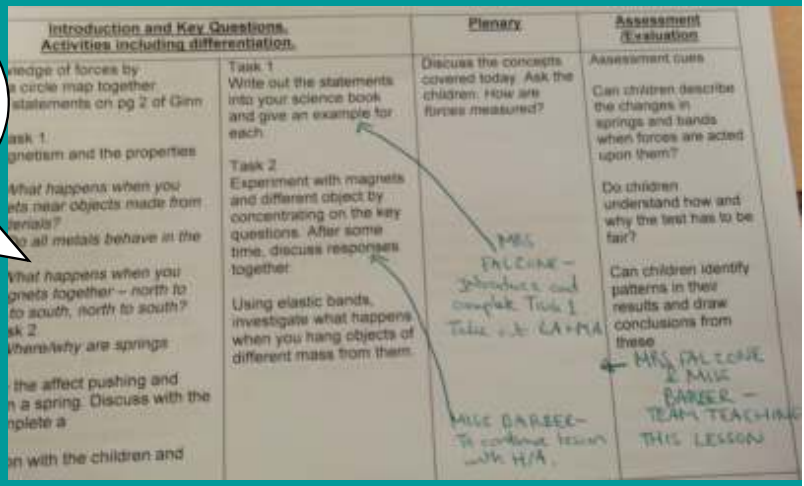




Subject Management A5

Reception planning shows that the teachers have ensured that the children have made sure that the children are given the opportunity to have different experiences of science. The school trip to the farm will help to reinforce what is being taught in class. This is something which has been mentioned in staff meetings which the teachers have made an effort to show.

"Having the opportunity to team-teach Science lessons with another member of staff has really allowed me to become more confident with both teaching the enquiry skills and applying them to investigative work."



Communication and Language & Literacy

Monday – Reading focus / special book focus

Tuesday – FARM VISIT

Wednesday - Children to write about the farm visit. What did they see? Hear? Smell? What did they enjoy? Look at time connectives, first, the, last

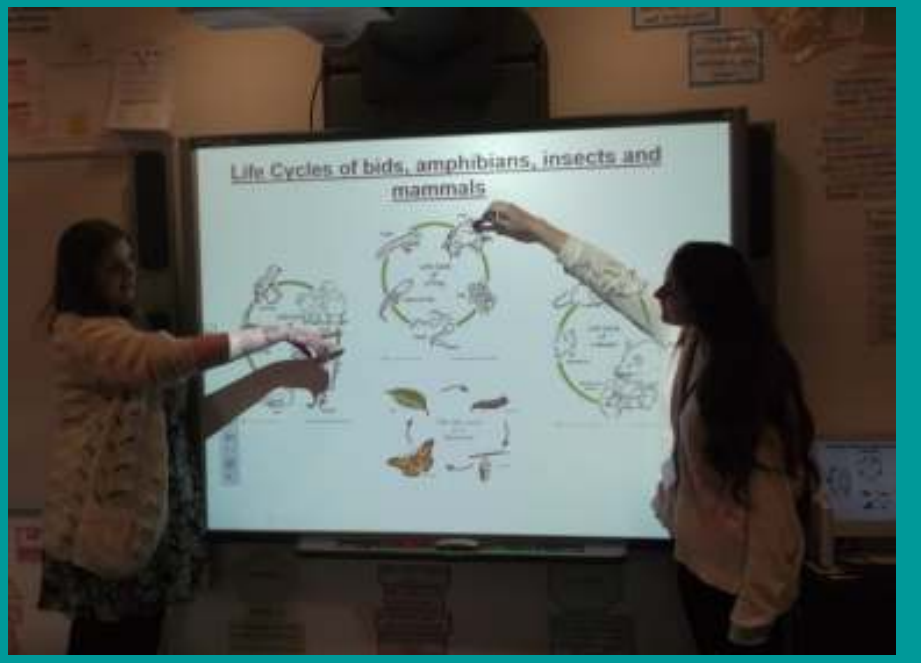
Thursday – Children to write a thank you letter to the farm to say what they enjoyed doing.

Friday – Children to draw/paint a picture of their favourite animal. To describe the animal and say why they like it.

Understanding the World

The farm visit – looking at animals, their young. How farms operate. Children being to classify adult and young and how to care for animals and children animals will need to survive.

ICT – Children to use "2Paint" package and draw a picture of the farm. Can the add simple text boxes and print their work (work to be placed into special books)



Staff meet throughout the year to have Science updates as well as looking at progression of work and assessment in Science. This is the opportunity for staff to highlight any strengths or concerns in their own teaching of Science.

Teacher and teaching

B1

Staff have the opportunity to improve their own understanding and teaching of Science through CPD from outside agencies e.g. the borough Science consultant and a King College University lecturer observing and feeding back Science lessons with their expertise.

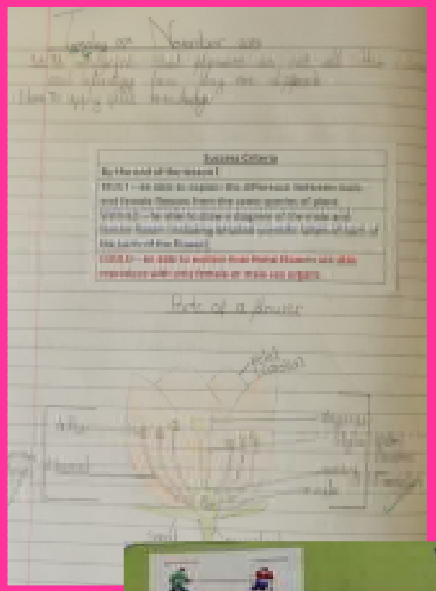
This shows the teacher focusing on one area of scientific enquiry and planning has been adapted after Staff Meeting sessions.

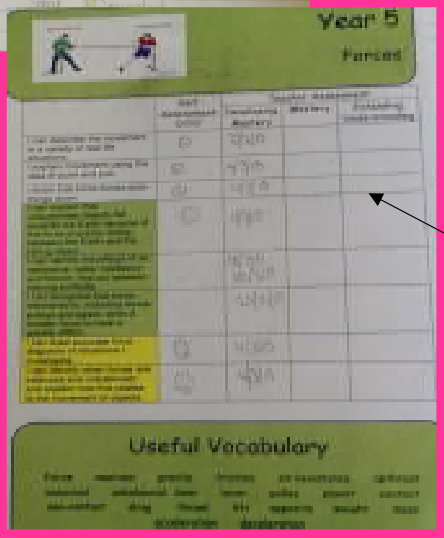
Learning Objectives	Key Vocabulary and Resources	Introduction and Key Questions. Activities including differentiation.	Plenary	Assessment /Evaluation
To plan and carry out an investigation with a specific focus on making predictions. HOM- Thinking interdependently Sc4 2c Understand friction, including air resistance, as a force that slows moving objects. 2b Understand that objects are pulled downwards because of gravitational attraction between the object and the Earth. Breadth of Study: 1d Use first hand data to carry out a range of scientific investigations.	Air Resistance Surface area Forces Gravity Mass Weight Predict 50cmx50cm tissue paper 20cmx20cm tissue paper 45cm pieces of string Paper-clips Stop-watches	Engage chn at the start of the lesson by asking them to discuss the equipment on their tables. Chn will need to use their talk partners to think about what they might be able to investigate using the resources and begin to generate a question. GREEN HAT: What might we be investigating using these resources? WHITE HAT: What question could we investigate? Lead chn to the question-"Does the surface area of the parachute affect the amount of time it would take to fall?" Ask chn what they need to do before they carry out an investigation- write a prediction. Remind chn of the structure we use to write a prediction; 1. Make an educated guess based on the question. 2. Include a connective. 3. Give a reason for your guess. 4. Use scientific knowledge to back up your reason. Chn to practise writing their prediction on their whiteboards and feeding back to the class. Model some good predictions- highlighting where the structure has been followed. Discuss fair testing with the chn and give them time to stick in their method. Provide chn with time to make their parachutes allowing them to choose how they want to make them- structure etc- ensure chn understand that they can make them hoe they want but each parachute must be the same in their pair. While chn are making parachutes- target Malachi, Monica, Freddine and Precious to determine understanding following absence last lesson. Chn to take their parachutes onto the climbing frame and work as a group to record their findings and find the average. Back in class chn are to discuss findings and record them into their books. Chn to conclude investigation next lesson.	WHITE HAT: How might your results change if you increased the number of paper clips you added to the larger parachute? WHITE HAT: What scientific knowledge are you using to help you make that prediction?	Assessment cues Can children begin to make a link between surface area and the time taken for the parachute to fall? Do children understand how and why the test has to be fair? Can chn predict how their results might change if the variable changed?

Through the use of outside agencies, staff have had input into using and applying Scientific skills and to ensure that the New Curriculum objectives are being covered appropriately. The new 'Science Bug' scheme linked to ICT has had a positive impact on teachers planning and allowed more opportunities for cross-curricular links.

This Year 6 planning has shown that the teacher has gained a lot from CPD and Staff meeting information about the importance of focusing on a particular scientific skill.

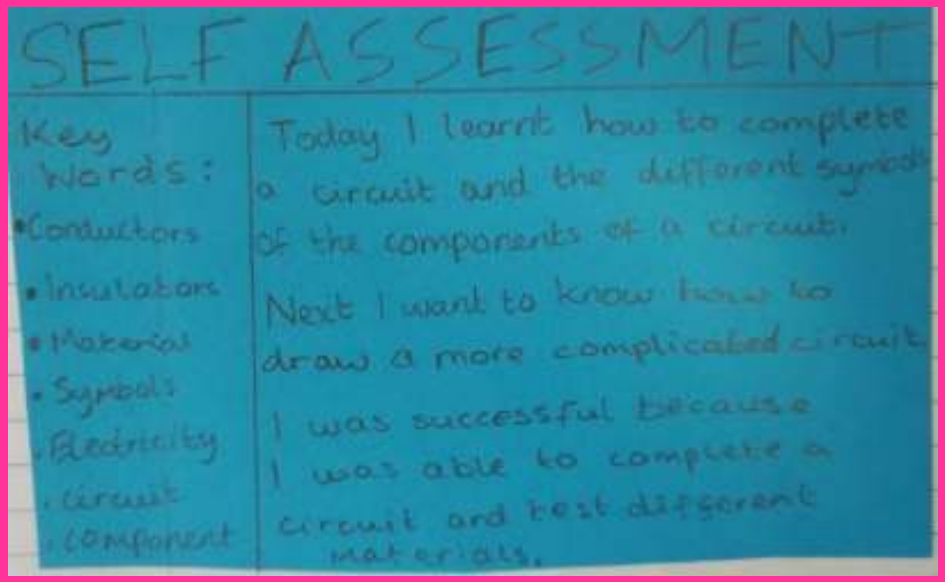
Teacher and Teaching & Pupils and Learning
B2, B3 & C2

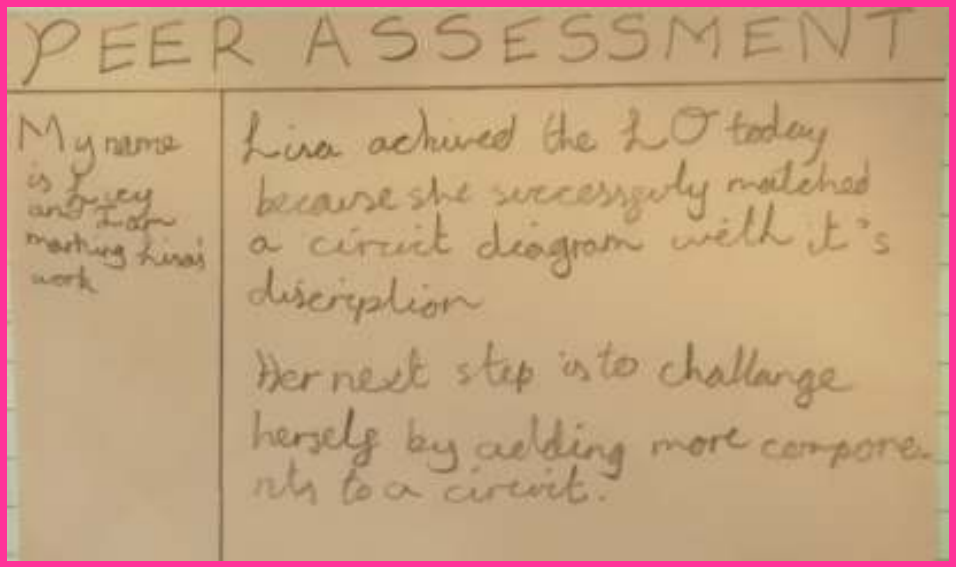




Teachers are using specific success criteria in lessons which the children are referring to in their work and their evaluation of their learning. This is helping the children to be able to self and peer assess their own learning which is allowing them to be more confident to verbalise their science knowledge.

Teachers are encouraging children to reflect on their own learning and they complete a target sheet for each unit. This self assessment sheet helps children and teachers identify any areas of concern or areas of strength.



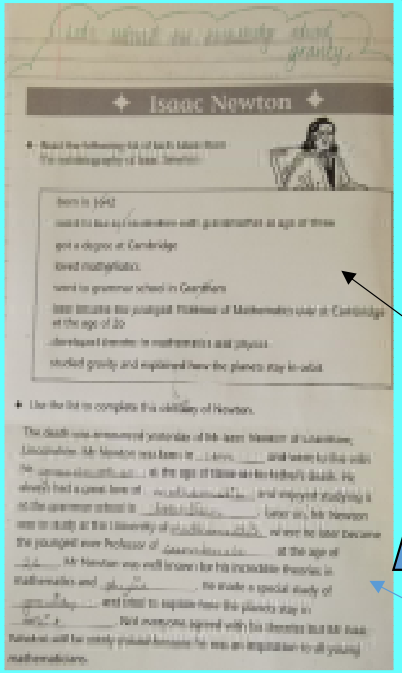


Teachers have peer mentor partners and are encouraged to teach science as part of the process. This is an opportunity to learn and gain new skills as well as to gain constructive feedback to aid future plans and lesson delivery.

Peer Mentoring Report
Autumn 2014
Miss Carberry to Mrs Gopaul St Catherine to Green Class
Science Lesson
Focus: The use of partner talk on the carpet to promote a deeper understanding in Science lessons.

Mrs Gopaul had expressed a want to try to develop the understanding of Science in her classroom with a greater number of pupils. We had discussed how allowing the children more controlled and monitored partner talk opportunities could help to extend the understanding of some of the children.
Mrs Gopaul started the lesson with a detailed re-cap of the scientific vocabulary which would be used in the lesson. They revised each word and what it meant and they practised using it in a sentence. Once the children had a good understanding of the vocabulary- it was made clear that there was an expectation that the children should use these words throughout the lesson.

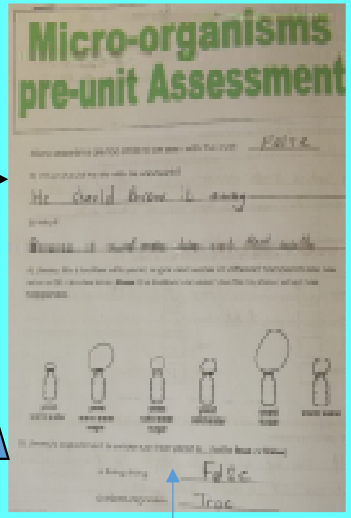
The teacher made it clear that she wanted the children to discuss and talk about the learning which was happening in the room with their partners and she wanted them to help each other learn. She used language such as; "you are all going to have to be teachers with me today" which help create an excited and engaging atmosphere with all children keen to play the role of the teacher. The children were then asked to teach their partner one thing which they remember from the learning in the topic. Emphasis was put on the word teach rather than tell which encouraged the children to extend their answers and give reasons for them. All children worked really well and were equally as excited to learn as they were to teach.
Less able children were supported by the adults in the room and where needed they were aided in compiling their sentences but were encouraged to verbally transfer the knowledge they had. This worked really well as a subtle differentiation tool and allowed all children to be equally engaged. The children did spend extended time on the carpet as was planned but this worked and it meant that children were able to later achieve the task set to a good standard.



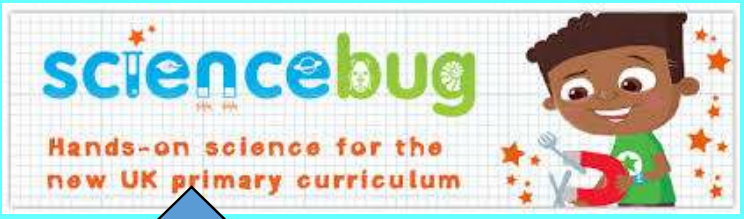
Year 5

Teachers use pre unit assessments as a way of assessing what the children know and this aids the planning process. Teachers also extend the children's knowledge by asking them to complete challenge activities.

Some of these ideas were obtained from courses NQTs and other members of staff attended to enhance their Science CPD.



Year 6



The new Science Bug resources have been purchased to aid staff with planning the new curriculum units of work. Staff have had Inset into how the resources can be used effectively to plan and deliver effective lessons and how scientific enquiry skills can be incorporated. There has been positive feedback from staff about this new resource.

There is a designated science resource area where resources are labelled and put into topic boxes. Teachers are able to access resources to aid them in their scientific enquiry lessons.

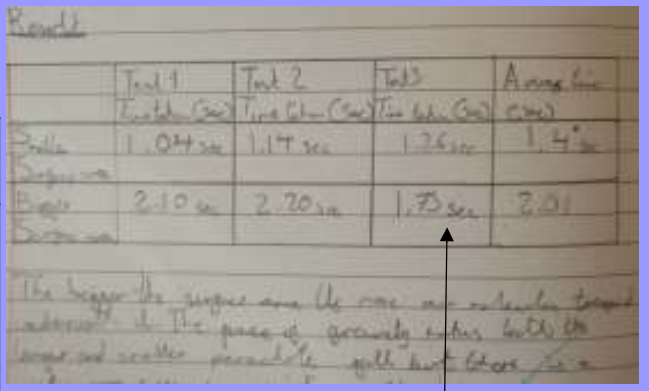
Pupils and Learning and Broader Opportunities
C1 & D1

Learning Objectives	Key Vocabulary and Resources	Introduction and Key Questions. Activities including differentiation.	Plenary	Assessment /Evaluation
To be able to compare and group together everyday materials. HOM: Applying Past Knowledge	properties, material, compare, contrast, group, organise, criteria, hardness, soluble, insoluble, transparent, opaque, electrical conductor/insulator, thermal conductor/ insulator, magnetic, non-magnetic, attract, repel	Organise children into groups and give each a selection of familiar classroom objects to discuss, for example, a marker pen, pencil, paper clip, plant pot, sweatshirt, sports shoe, stapler, ruler, water bottle, lunch box, eraser. Make sure that there is a good mix of objects made of different materials and with different properties. Check that children know what all the objects are. *White Hat: What materials are the objects made from? What properties could describe the materials?* Make sure that the distinction is established here between the materials the objects are made from, for example, metal, plastic, and the properties of those materials, for example, hard, shiny. Ask the children, in groups, to write the property words that they have come up with on separate sticky notes. Take feedback from the children about the properties they have identified. Provide mini-plenary to check children's understanding of technical vocabulary. Prompt them to use technical vocabulary to describe properties, for example, flexible, rigid, transparent, translucent, opaque, conductor, insulator, (electrical and thermal), magnetic. Identify two material or property words for an object. For example, for a ruler, the material and property words could be plastic, flexible. *LA: Challenge 1: Children sort a collection of materials: first into solids, liquids and gases and then using their own criteria* *Give the children a collection of real materials to handle and explore.* (Children use a Venn Diagram: links with Maths: PROVIDED WITH TEMPLATE on the IWB) Comparing materials (Resource sheet 1) includes a list of 15 possible materials and objects. Ask the children to use the grid to classify their collection. They should begin with solid, liquid and gas as sort criteria to establish their baseline understanding of this core knowledge (taught in Year 4). They should then move on to identifying their own criteria. *White Hat? Are all the materials that you have said are solids the same?* *Blue Hat? What property could describe the difference/s?* *White Hat: Are any of the materials transparent? Would any conduct electricity?* Choose three of the materials and ask the children to discuss what is similar about them. *White Hat: Are there any other materials in your selection that have the same properties? Are there any other materials that you can think of with these properties?* *MA and HA: Challenge 2: Children compare and group a selection of materials according to their own criteria.* . (Children use a Venn Diagram: links with Maths ON THE IWB) Give the children a selection of materials, for example, milk, shaving foam, ketchup, butter, yoghurt, jelly, hair gel, sand, flour, sugar. Be ready to offer prompts to get them started, and refer them to the Property definition list (Resource sheet 2) if necessary. As they think about the criteria they will choose to compare and sort materials, challenge the children to think about less obvious or visible properties, for example, whether the material/s would be waterproof, or soluble in water, or magnetic. *Blue Hat: How are the materials similar? How are they different? Which properties have you used to sort your materials? Is there a property that is only appropriate to one or two materials?*	*Green Hat: How are the two materials you have chosen the same?* *White Hat: Which properties do they have in common? How are they* different? Select and show children two objects on the IWB that are made of the same material in different forms, for example, a metal food tray and a rigid metal object, like the frame of a chair. Again, ask children about the similarities and differences between the materials. Ensure that children recognise that both are solids and both are made of metal, and that they share some properties but also have different properties, for example, the food tray is much less rigid than the chair frame.	

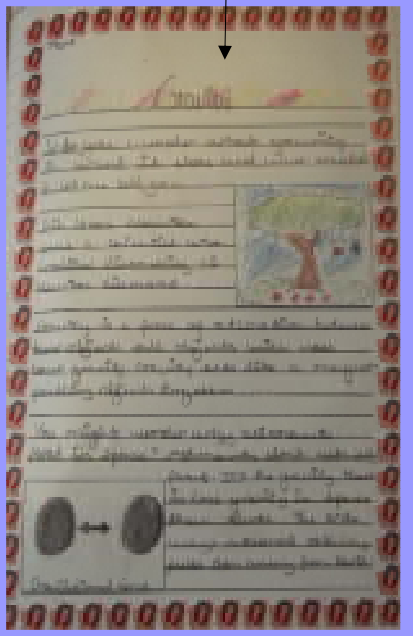
Year 5 planning

Mini-plenaries are identified on plans to help children assess their learning and it gives the teacher the opportunity to address any misconceptions.

Cross curricular links are made evident on planning.



Cross curricular links are evident throughout science plans and in science books. Here there are numeracy and Literacy links.
Year 6



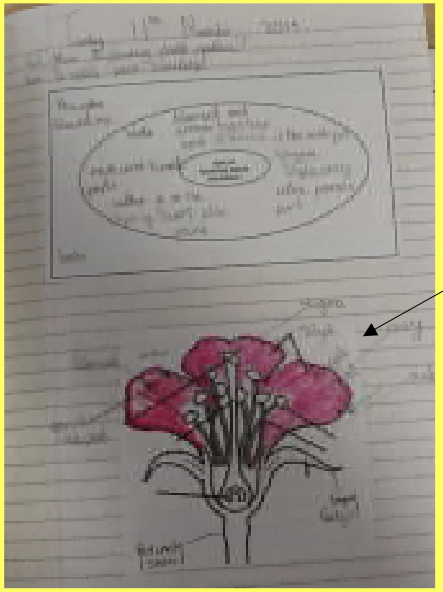
Reception

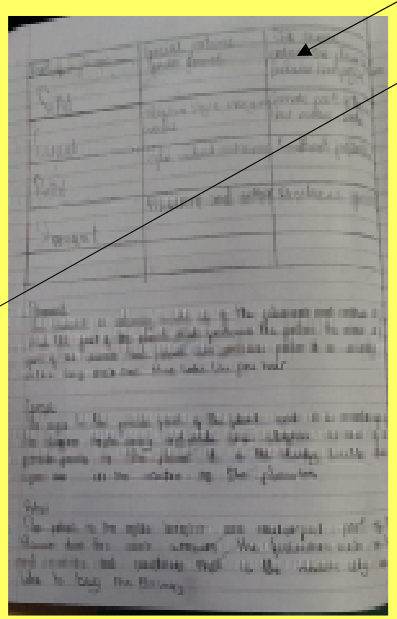
In Reception, there is evidence of the children discovering exploring scientific ideas through different areas of the curriculum. They were investigating sound, changing state through their cooking and looking at how different objects float and sink in their outdoor area.

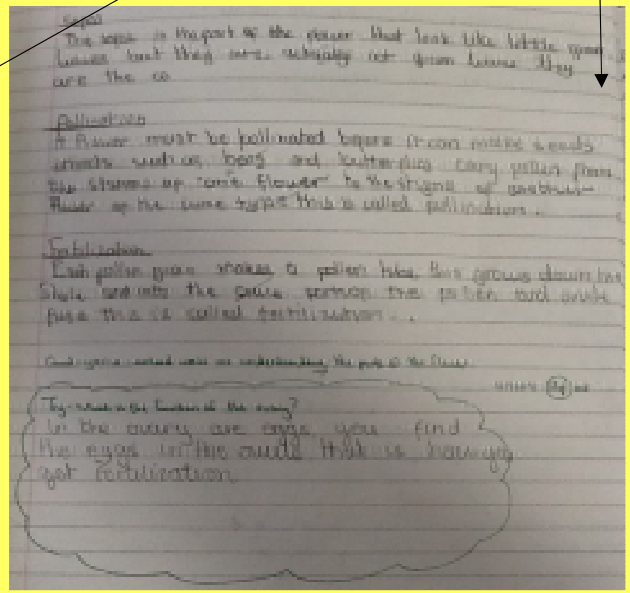
Year 5

Children are learning about growing plants and about the life cycle of plants in Gardening Club.

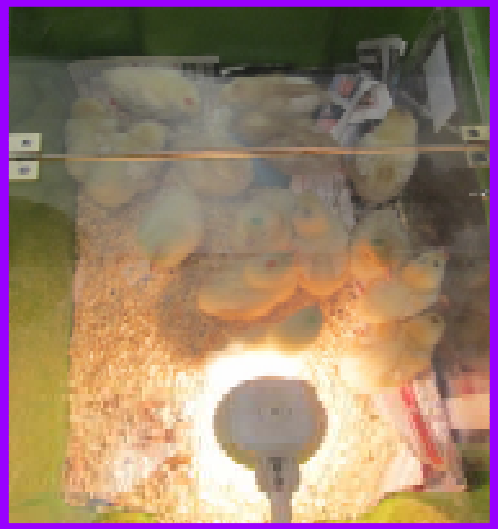
Children in Year 5 were writing about the dissection of a plant in a non-chronological report in Literacy.







Broader Opportunities D2



Reception

Outside agencies have visited the school and have worked in different classes to help enrich the science teaching and learning for the children.

Year 5

I loved when the chicks hatched out of their egg. I learnt how a chick can grow up to be a chicken.

Science week activities have taken place to help ignite children's curiosity and help them understand that science is a way of exploring the world around them.

Year 6

The children visited Paradise Wildlife Park Zoo. They took part in a workshop about animal habitats and life cycles.

Micro-biologist came to visit the school and worked with the Year 6 children in conjunction with their Micro-Organisms unit of work.

I really enjoyed the science workshop because it was a fun way for me to learn about forces. The scientist knew lots of amazing facts.

A range of activates were carried out when outside agencies visited the school over science week. These photos show some examples of Year 5 workshops.