Christ Church School, Hampstead
A village school in London inspiring ***life in all its fullness***

Curriculum report to Governors
Science
October 2022
Subject leader: David Polidano

Intent

At Christ Church School we aim to instil a love of science within our pupils. Science at our school supports our vision of *inspiring life in all its fullness* through its contribution to a wide breadth of curriculum and we believe that high-quality science education is essential for understanding and respecting the world around us. Science in our school aims to encourage curiosity and develop a sense of excitement, in order to make sense of the world in which we live and give children a strong understanding of the uses and implications of science, today and for the future.

Our science curriculum is designed with high expectations in mind and provides opportunities for children to acquire the knowledge and skills they need to make progress throughout their time here at Christ Church and prepare them for when they move on to secondary science. At Christ Church, we aim to build and expand every child's science capital, in the hope that more children will continue to enjoy science and progress into STEM careers in the future. Science learning begins in Early Years in 'Understanding the World' and our curriculum covers the specific disciplines of Biology, Chemistry and Physics and these are made explicit to children in upper Key Stage 2.

The key skills needed to work scientifically are embedded in all our science teaching and build sequentially through the school, ensuring that all children have the opportunity to question, observe, discover, conclude and evaluate (essentially an understanding of the nature, processes and methods of science). Children are taught how to use scientific equipment by working practically throughout both Key Stages and we aim to encourage the children to be enquiry-based learners who can pose their own questions and seek answers to these. Science is taught across the curriculum wherever possible, including within additional enrichment activities, providing essential exposure and understanding for the children of how science impacts our daily lives.

Implementation

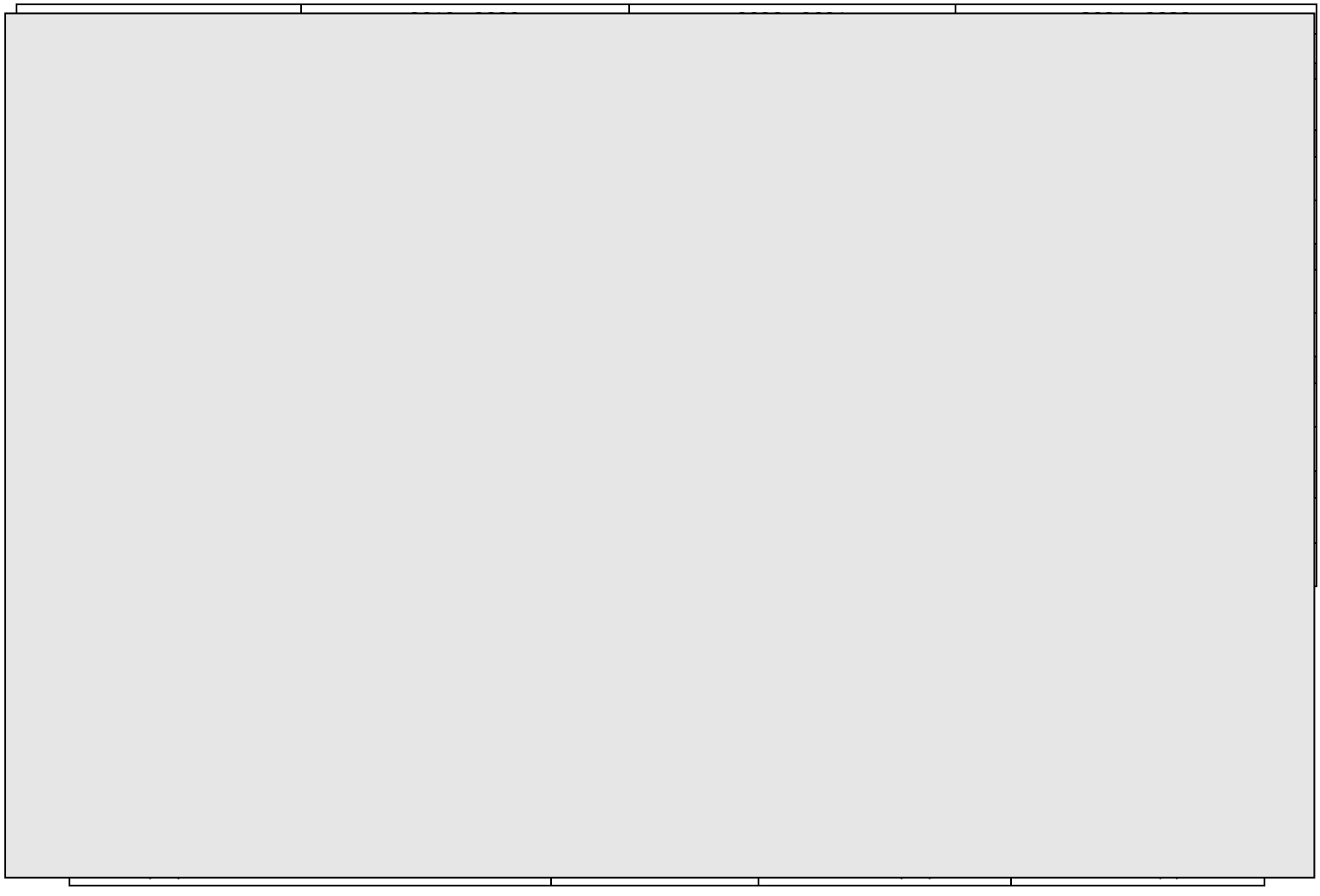
- Y1-6 class teachers follow the National Curriculum and ensure the working scientifically skills are taught, revisited and embedded. This builds on the foundations for Science learning within the EYFS curriculum in Reception, such as through working towards the Natural World Early Learning Goal.
- In KS1 and KS2, the science skills are taught alongside and through learning the science content. Lessons are carefully planned to ensure skills and knowledge progression within each year group, as well as throughout the school. The curriculum is designed so that by end of Year 6, pupils have built solid working scientifically skills (disciplinary knowledge) and have secure knowledge of the science content (substantive knowledge).
- A range of enquiry types are planned, taught and built upon across the Science curriculum (grouping and classifying; noticing patterns, observations over time, fair and comparative testing, research and modelling).
- Class teachers deliver science lessons and help to draw out links between previous learning and other curriculum areas.
- Class teachers are supported by the science subject leader and receive CPD through staff meetings and tailored support. Teachers demonstrate strong subject knowledge.
- Both formative and summative assessment is used in science. Teachers will use formative assessment (including questioning, observing, feedback and marking) to help shape a lesson, direct learning, address misconceptions, provide feedback and adapt future lessons. Summative assessment is carried out at the end of each science topic and assessment results shared with future class teachers and end of year assessments in both science content and working scientifically skills are reported to parents in end of year reports.
- Children use a wide range of relevant resources to help them with their learning and the curriculum is enriched through various trips and visits: e.g. Thames Explorer, Francis Crick Institute, Science Museum, Hampstead Heath Education Centre. These all help to enhance our children's science capital.

- Strong curriculum links with maths (handling data, light and reflection), geography (weather, seasons), DT (electrical circuits to build torches, forces to build cars), English (explanation texts, persuasive writing), history (fossils and evolution), art (pencil drawings of invertebrates and seeds) computing (fact pages, research), PSHE (healthy living) are utilised to consolidate prior science learning.
- All children are able to acquire the intended knowledge and skills in science, through adaptive teaching in the classroom. Learning is adapted for children with SEND and scaffolded support is given where needed.
- Children's work shows that lessons are sequenced effectively, showing progress throughout each topic within one year group and also across one topic over multiple year groups, where the topic is studied again and built on.

Impact

- Children enjoy science lessons in school and as homework activities. Children are interested in what they learn about and often continue to learn outside the classroom by doing their own research. Pupil voice shows that children find science exciting, interesting and relevant.
- All children develop their working scientifically skills to become better problem-solvers and work with increasing independence as they move through the school. Children learn to communicate effectively by presenting their findings in various different ways, with different audiences in mind.
- Children have a good knowledge of the key science curriculum content and can make connections across the curriculum. Children are able to identify topics that have been introduced in earlier year groups and understand how new learning builds on previous learning.
- Children have the opportunity to use a range of resources to carry out their work including scientific equipment and technology. Children's independence progresses throughout the school and they are given more opportunities to design their own investigations, select relevant equipment and consider how to record and present their findings.
- Children ask relevant scientific questions using subject-specific language. This Tier 3, subject-specific vocabulary is built on each year across the school, with opportunities to use this vocabulary orally, in their writing and through reading non-fiction texts.
- Science learning gives a chance for children to express views and opinions on topics which are important to them, e.g. climate change, plastics, sustainability, endangered animals.

Whole School Standards (three year trend):



Last year's key developments and successes in 2021/22:

1. Ensure connection with the Francis Crick Institute is maintained. Arrange trips to relevant institutions that link to learning to ensure enrichment opportunities are in line with or above pre-COVID levels. *All children to have experience of appreciating or engaging with science in a wider setting through enrichment opportunities.*

   (21/22 target achieved) Connection with the Francis Crick Institute was maintained – The Crick came into the school to run workshops with all year groups on one of their science topics, and the Year 5 class visited the Crick, with a catch up session for Year 6 provided by the Science subject leader using loaned equipment. Other classes visited the Heath Education Centre and Royal Observatory to enrich their science learning.
2. Continue to provide opportunities to revisit/use science learning in other curriculum areas during the summer term. Ensure regular spaced retrieval opportunities in autumn term for learning from previous academic year. *Children are given ample opportunities to revisit and use previous learning and use their working scientifically skills across the curriculum, throughout the school year.*

   (21/22 target achieved) Class teachers continued to provide opportunities to revisit/use science learning in other curriculum areas during the summer term but also in autumn term when science was not being taught. There were regular spaced retrieval opportunities in autumn term for learning from previous academic year and low-stakes quizzes to consolidate and revisit learning using key knowledge sheets.
3. Consider how end of topic assessments are run. Implement more consistency across the school in this. *Consistent summative assessment is carried out at the end of each topic to assess what children have learned and remembered.*

   (21/22 target partially achieved) Some classes used end of topic assessments or low-stakes quizzes to assess learning of a topic. This is something that should continue to be refined across the school with best practice shared and built upon.
4. Continue to ensure all children are able to talk about the skills and enquiry types being used. In upper KS2 children should be able to describe which enquiry type would fit their investigation. *All children can talk about the working scientifically skills and enquiry types they are using in their learning.*

   (21/22 target achieved) Children are able to confidently talk about the skills and enquiry types being used. This is something that will continue to be reinforced and monitored across the school.

Recovery curriculum:

No major adaptations to our Science curriculum needed to be made for 21/22 school year, as the full curriculum was delivered in the previous year, including many opportunities to work scientifically using a range of enquiry types. The DfE recovery curriculum document made suggestions which identified the most important content across the three scientific disciplines:

At key stage 1:

- an example of content which will support future study is knowledge about herbivores because it allows pupils to learn about food chains in key stage 2. This, in turn, enables them to understand ecosystems in key stages 3 and 4.

At key stage 2:

- concepts that are beneficial to future study include, but are not limited to, forces, electricity, magnetism, materials and substance, reactions, nutrition, evolution and inheritance, ecosystems, properties and changes of materials.

Teachers used this information to inform their planning for science, but also when planning spaced retrieval opportunities throughout the first half of the year. We also identified specific working scientifically skills to focus on in each phase.

Key targets and actions moving forward (development priorities for 2022/23):

Target and *intended outcome*	**Planned actions (including dates where applicable)**
Continue to build on good practice from across the school with spaced retrieval and assessment activities to ensure consistent use of key knowledge sheets to support this *All teachers to use key knowledge sheets consistently as part of regular spaced retrieval activities and as assessment activities, providing important information regarding next steps and any gaps to address. All children have a good grasp of identified key knowledge.*	Ensure all key knowledge sheets are up to date – staff meeting to share best practice in how to use these for a range of purposes. Monitor their use and impact – lesson visits and pupil voice.
Continue to investigate and refine wider enrichment activities to complement the planned Science curriculum to ensure these remain at 21/22 levels *All children are able to build on and enrich their Science learning outside the classroom or with visiting specialists.*	Crick workshops to take place across the school in summer term. Arrange for Year 5 to visit Crick Institute for enrichment with support provides for planning other Science trips, where appropriate. Use local science leader network as good resource for ideas. Continue to use the Royal Institution enrichment opportunities and investigate additional opportunities such as Young Engineer scheme, with DT leader. Continue to promote equipment loans across the school.
Ensure all teaching staff, including ECT and new staff members, are confident to appropriately sequence and interleave substantive and disciplinary science knowledge. *Both substantive and disciplinary knowledge are built progressively and sequenced so as to support each other. Pupil progress in both areas is assessed to be at least good across the school, with children knowing and remembering more of the planned science curriculum.*	Staff CPD on sequencing and interleaving both areas of science learning. Specific support from Science leader for newer staff, if needed. Monitoring through lesson visits, review of planning, pupil voice and assessment data.

Ofsted curriculum research review – summary and response/reflection

The Ofsted curriculum research review for Science (June 2021) reviews a wide range of relevant educational research into both primary and secondary science teaching and identifies factors which may contribute to high-quality science education.

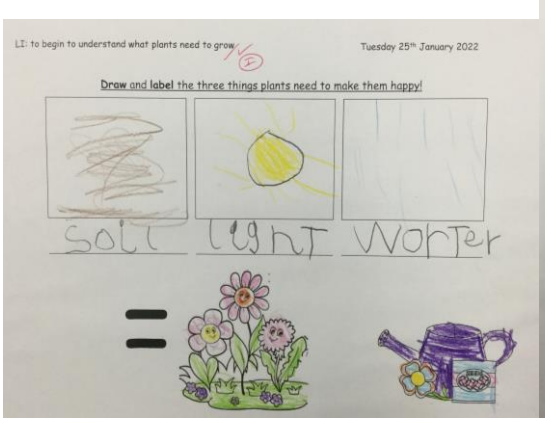
Summarised information about features of high quality science education identified in the review	Our response – how does this align with our teaching and learning at Christ Church
The curriculum is organised into substantive (products of science) and disciplinary (how scientific knowledge is generated – 'working scientifically) knowledge	At Christ Church, we have designed a curriculum that builds on prior knowledge and expands on this in alignment with the national curriculum. Substantive and disciplinary knowledge are both taught in conjunction with each other rather than separately.
The curriculum is sequenced so that pupils have the necessary disciplinary and substantive knowledge to carry out practical work successfully and learn from it.	Practical work has a clear goal to teach particular substantive or disciplinary knowledge, or a specific curriculum objective. Practical work will come after students have the necessary prior knowledge to learn from the activity.
Systematic approaches, alongside carefully selected texts, are used to teach the most important vocabulary in science.	Key vocabulary is explicitly taught, and displayed in lessons and classrooms. This may be done using high quality texts as well and then reinforced through non-fiction reading opportunities.
Pupils regularly retrieve knowledge from memory to help them remember and organise their knowledge. This is coupled with feedback. Teachers think carefully about what pupils are being asked to retrieve and whether this prioritises the most important content.	Through spaced retrieval low-stakes quizzes and regular recapping on prior learning, students need to retrieve knowledge from memory and are formatively assessed and given feedback. This may be done at the beginning of lessons or even through morning work. Key knowledge has been identified and is the focus of these retrieval activities.
Science teachers engage with subject associations, and take responsibility, with support from the school, for developing their own subject knowledge throughout their career.	Through in-school CPD sessions, and our link with The Francis Crick Institute, teachers are able to access high quality resource and information to develop their subject knowledge. A range of planning resources are also available to help with the planning and resourcing of science lessons.

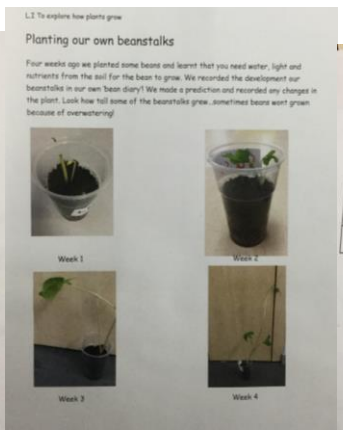
Work sampling

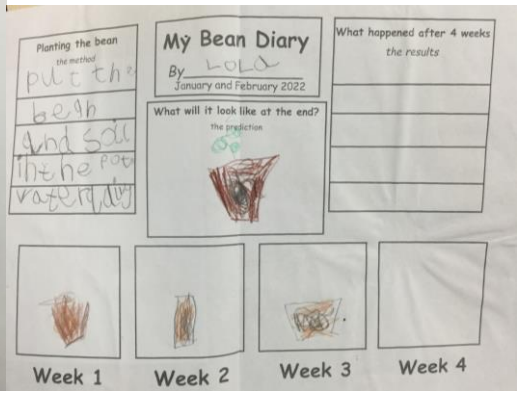
Plants – example of planned progression in substantive Science learning through the school

Reception

Reception thought about what plants might need to grow, then planted and observed their own bean plants as part of their topic on Jack and the beanstalk.

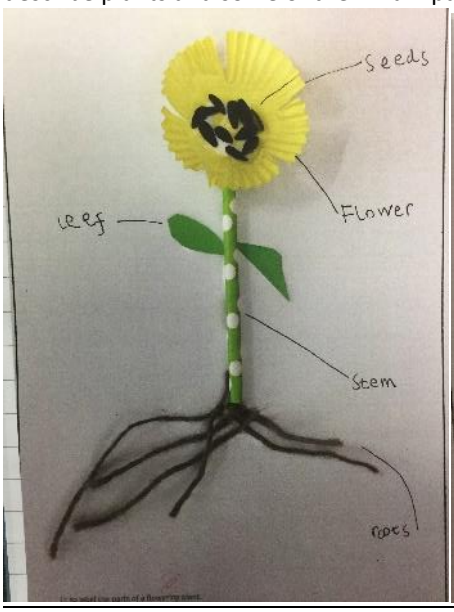


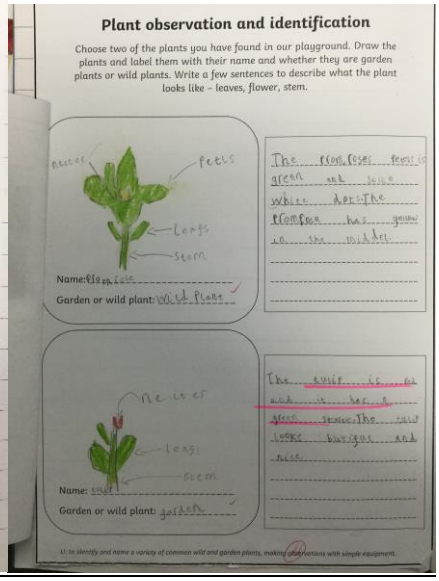




Year 1

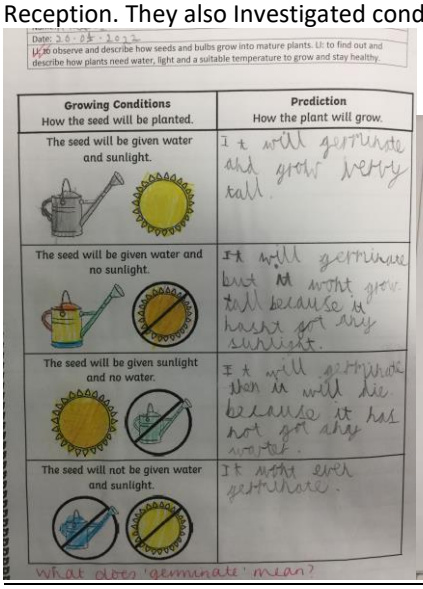
Identify and label main parts of a flowering plant. Use an identification key to identify plants in their local environment, then describe plants and some of their main parts.

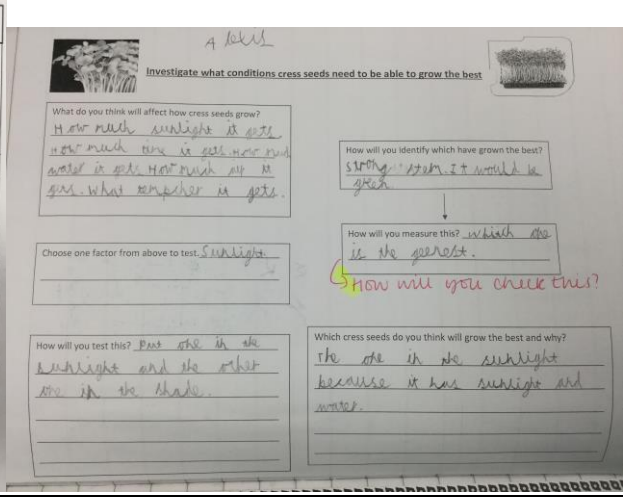




Year 2

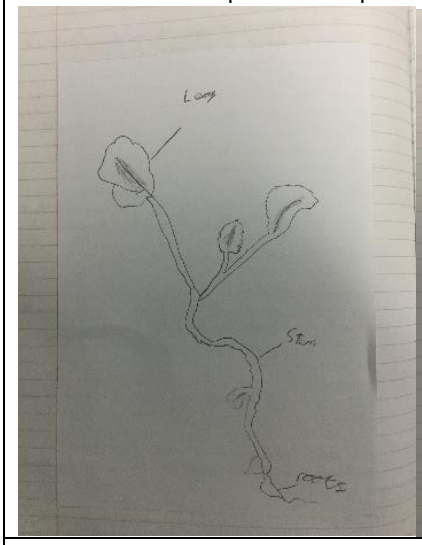
Considered what bean plants would need to grow well, and made predictions based on their prior knowledge from Year 1 and Reception. They also Investigated conditions for cress plants to grow.

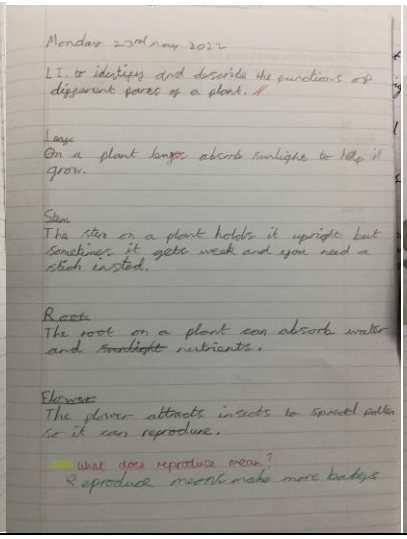


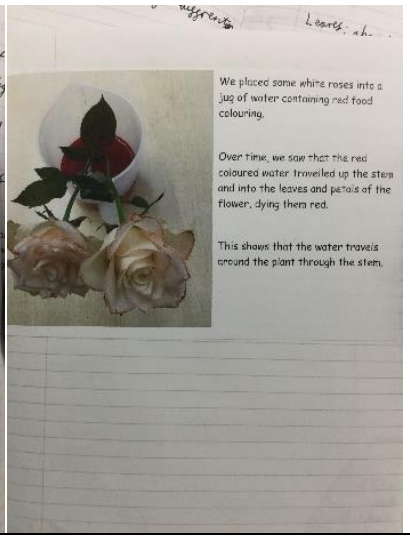


Year 3

Labelled the main parts of a flowering plant and learnt about the function of each of these. Children then observed how water travels to different parts of the plant using coloured water.

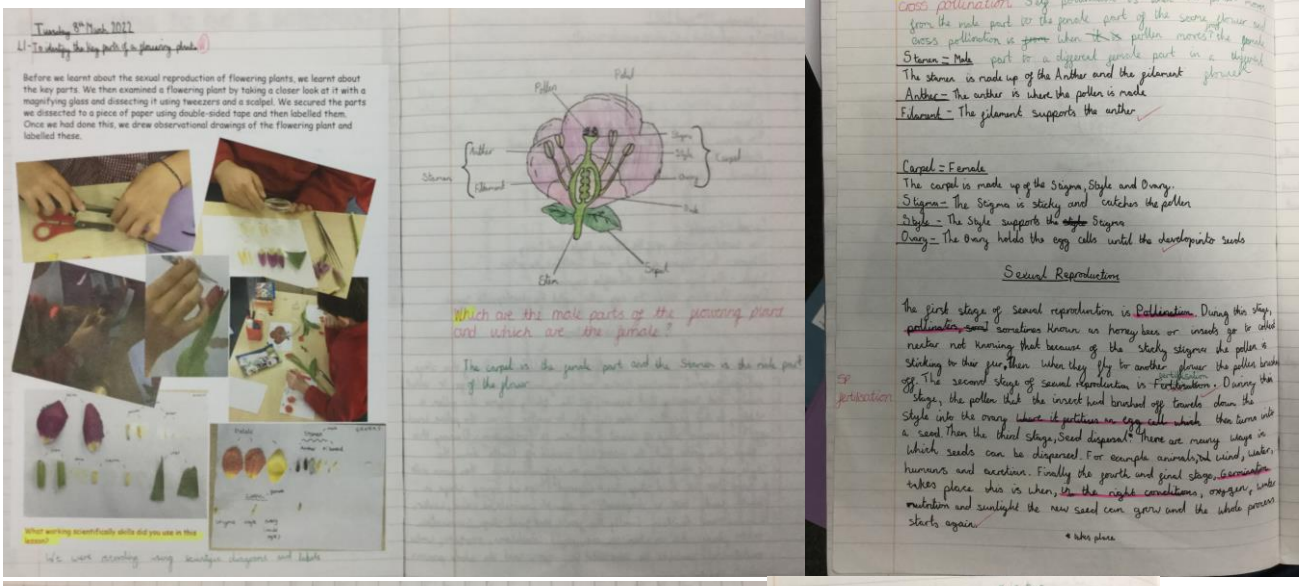






Year 5

As part of living things and habitats topic – dissected a flowering plant, and identifying main parts using their prior knowledge. Children then learnt about asexual and sexual reproduction of plants, considering advantages and disadvantages of each.



Tuesday 8th March 2022

LI- To identify the key parts of a flowering plant.

Before we learnt about the sexual reproduction of flowering plants, we learnt about the key parts. We then examined a flowering plant by taking a closer look at it with a magnifying glass and dissecting it using tweezers and a scalpel. We secured the parts we dissected to a piece of paper using double-sided tape and then labelled them. Once we had done this, we drew observational drawings of the flowering plant and labelled these.

What working scientifically skills did you use in this lesson?

We were recording using scientific diagrams and labels

Petal, Pollen, Stigma, Style, Carpel, Ovary, Stamen, Anther, Filament, Sepal

Which are the male parts of the flowering plant and which are the female?

The carpel is the female part and the Stamen is the male part of the flower

Wednesday 20th April 2022

LI- To understand how plants produce sexually.

Explain the difference between self pollination and cross pollination. Self pollination is when the pollen moves from the male part to the female part of the same flower and cross pollination is from when the pollen moves to the female part in a different flower.

Stamen = Male part

The stamen is made up of the Anther and the filament

Anther – The anther is where the pollen is made

Filament – The filament supports the anther

Carpel = Female

The carpel is made up of the Stigma, Style and Ovary.

Stigma – The Stigma is sticky and catches the pollen

Style – The Style supports the ~~stigma~~ Stigma

Ovary – The Ovary holds the egg cells until the developing seeds

Sexual Reproduction

The first stage of sexual reproduction is Pollination. During this step, pollination ~~and~~ sometimes known as honey bees or insects go to collect nectar not knowing that because of the sticky stigmas the pollen is sticking to their fur, then when they fly to another flower the pollen brushes off. The second stage of sexual reproduction is Fertilisation. During this stage, the pollen that the insect had brushed off travels down the style into the ovary where it fertilises an egg cell which then turns into a seed. Then the third stage, Seed dispersal, there are many ways in which seeds can be dispersed. For example animals, wind, water, humans and accidents. Finally the fourth and final stage, Germination takes place this is when, in the right conditions, oxygen, water, nutrition and sunlight the new seed can grow and the whole process starts again.

Monday 25th April 2022

LI- To understand how plants reproduce asexually and consider advantages and disadvantages of sexual and asexual reproduction.

	Advantages	Disadvantages
Sexual Reproduction	• Diseases will not affect all the individuals in a habitat because the will all be different • The species can change over time to adapt to new environments and habitats	• Time and energy are needed to wait for another parent plant to reproduce with • Reproduction is not possible for an isolated plant
Asexual Reproduction	• Only one parent plant is needed so new plants can be made even if there are no other plants nearby • ~~There is no variation or difference in new plants so the species is less resilient to diseases or changes in climate~~ • The population can be increased • Good features of the parent plant will always be passed on	• There is no variation or difference in new plants so the species is less resilient to diseases or changes in climate

Some plants reproduce asexually because the ~~bulbs are underground~~ food storage and then they split in half. Then a new plant grows out of the side of the bulb. For example onions and daffodils.

Some plants reproduce asexually because they grow runners. Runners are horizontal stems which grow plantlets that then grow roots. The plant continually reproduces. For example strawberry plants and spider plants.

Some plants reproduce asexually because they have tubers. Tubers are ~~under ground~~ underground food stores and it uses the food to create new plants / tubers. For example potatoes and garlic.

What is vegetative propagation?

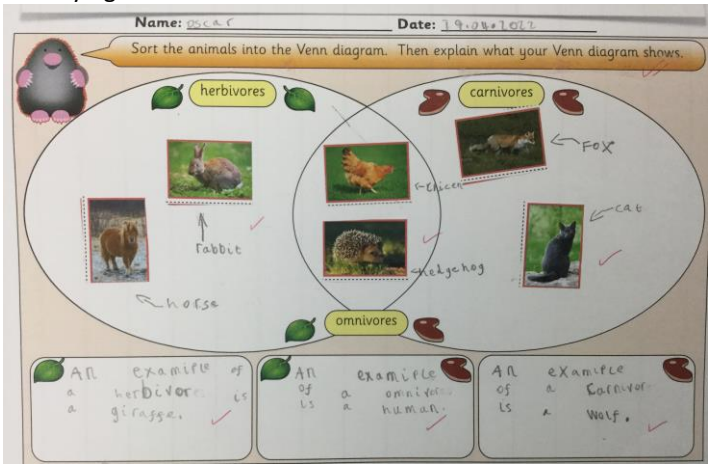
A form of asexual reproduction where humans take cuttings from plants and plant these.

Work sampling

Disciplinary knowledge: Working scientifically – Planned progression in one enquiry type: Grouping and Classifying. Taught within the context of a range of science content.

Year 1

Classifying animals based on diet



Name: Oscar Date: 19.04.2022

Sort the animals into the Venn diagram. Then explain what your Venn diagram shows.

herbivores, carnivores, omnivores

Fox, Chicken, Cat, Rabbit, Hedgehog, Horse

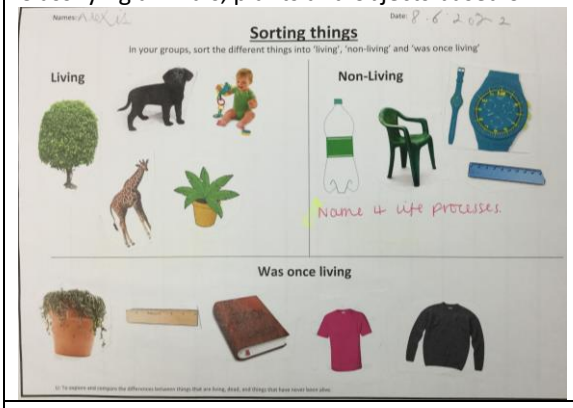
An example of a herbivore is a giraffe.

An example of an omnivore is a human.

An example of a carnivore is a wolf.

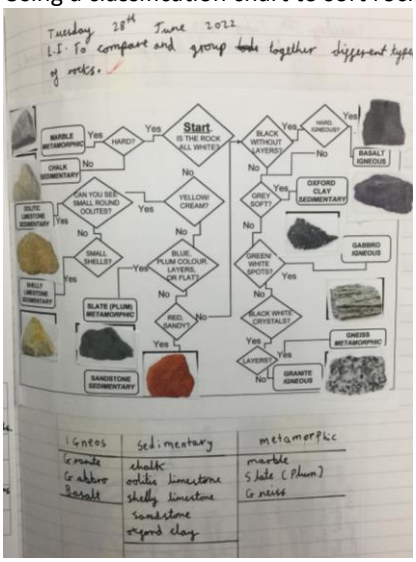
Year 2

Classifying animals, plants and objects based on whether they were alive, dead, or ever living.



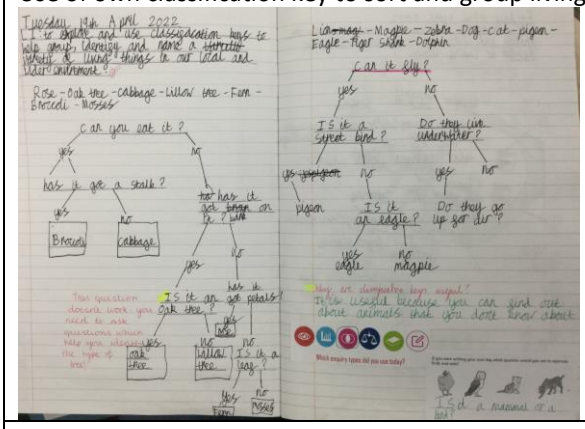
Year 3

Using a classification chart to sort rocks based on properties.



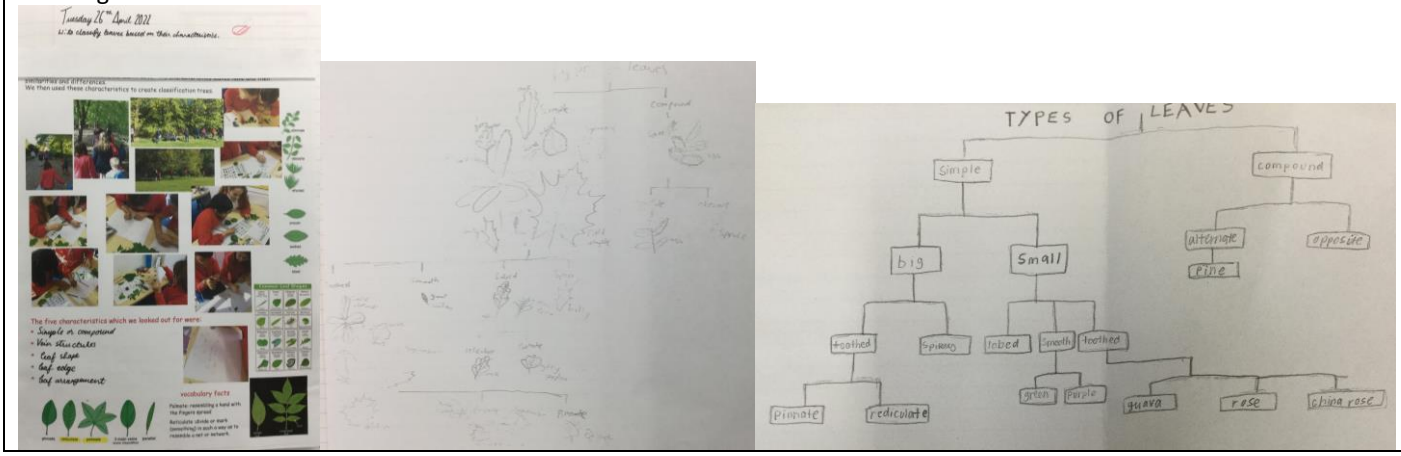
Year 4

Use of own classification key to sort and group living things.



Year 6

Creating classification charts to sort leaves based on their characteristics.



2021/22 Enrichment of our curriculum

Whole-school PSHE week, linking to heathy lifestyles

https://christchurchschool.co.uk/wp-content/uploads/2022/02/Year-6-PSHE-week.pdf
https://christchurchschool.co.uk/wp-content/uploads/2022/02/Year-3-PSHE-week.pdf
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https://christchurchschool.co.uk/wp-content/uploads/2022/02/Year-2-PSHE-week.pdf
https://christchurchschool.co.uk/wp-content/uploads/2022/02/Healthy-lifestyle-workshops-February-2022.pdf

Whole-school Eco Week, linking to sustrainability and environmental issues

https://christchurchschool.co.uk/wp-content/uploads/2022/06/Eco-week-Year-6-June-2022.pdf
https://christchurchschool.co.uk/wp-content/uploads/2022/06/Eco-Week-Year-5-June-2022.pdf
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https://christchurchschool.co.uk/wp-content/uploads/2022/06/Eco-Week-Year-1-June-2022.pdf
https://christchurchschool.co.uk/wp-content/uploads/2022/06/Eco-Week-Reception-June-2022.pdf

Year 3's DT project was to create obelisk structures to support plants as they grow.
https://christchurchschool.co.uk/wp-content/uploads/2022/07/Y3-DT-Plant-Obelisks.pdf



Year 4 visited **Hampstead Heath education centre** and took part in a classification workshop.



Year 1 visited **Hampstead Heath education centre** twice and took part in a plants workshop and a seasons workshop.



Year 5 visited the **Royal Observatory and Planetarium**.


A group of Year 5 and 6s visited the **Royal Institution for a 'Science on Stage' show**. They learnt about Benjamin Franklin and electricity, fire, and liquid nitrogen!



Children across the school took part in science workshops, delivered by scientists from **The Francis Crick Institute**. These covered topics including senses, sound, skeletons, and light.


Year 5 visited the **Francis Crick Institute** for a science discovery day.

<u>Pupil voice</u>

Pupil voice discussions in Summer 2022 demonstrated that:

Children could talk in detail about what they had recently been learning in science:

Y6: Light also but we've learnt about reflection. We had a workshop from the Francis Crick where we used lasers to bounce off of mirrors. We used our learning from Year 3 about not looking directly at the sun to help us not look directly at a laser.

Y3: Light. If you hit light on a hard surface it will bounce off. Why? Because it can't go through. What is the word for something that lets light pass through? See-through.

Y2: Plants. We planted cress and estimated which would grow the best. It's not necessarily the tallest that makes it the healthiest though. The cress with no water is tallest but not the greenest. Plants search for light.

Y4: We've learnt about teeth and the different types and functions. We've been testing liquids to see what damage they do to teeth. We learnt about teeth because they are important in the digestive system which we already know about.

Y1: Plants. We found flowers on the Heath. We used a sheet to check the type of tree and ticked it off. We found dandelions which have green leaves and purple flowers.

Y5: Plants. We've learnt about the parts of a plant but found out also about lifecycles.

Children could share information from their books to show/talk about how the learning builds from year to year. E.g. How does what you learnt in Year 3 help you with your learning in Year 5?

Y5: Our learning about the parts of a plant built on what we learnt in Year 1 when we found out the basic parts like leaves and stem. Now we know how plants reproduce using different parts.
Y6: Our learning on forces used our understanding of gravity from our space topic in year 5.
Y3: We learnt about what plants need in Year 2 and now we are finding out they also need nutrients and how the nutrients get to the plant.
Y4: We use the skills that we have learnt in different year groups, like questioning and taking recordings.
Y6: We used our classification knowledge from Year 4 to help us make classification keys in Year 6

Children could explain how they are helped to remember their science learning:
Y2: We can look back at our books this year or from other years.
Y4: Homework activities
Y4: Revise and test yourself
Y6: Morning work
Y6: Spaced retrieval
Y3: Because we do so much science close together we really focus on the topic and that helps us remember

The children were able to recognise the different enquiry types and discuss where they had used them so far:
Grouping and classifying
Y1- We made groups of different types of leaves and grouped carnivores, omnivores and herbivores.
Y3- Transparent, opaque and translucent materials.
Y4- types of electrical appliance and electrical conductors or insulators. Producers and consumers. Classification keys.
Y6- Classification keys

Observations over time
Y1- We have been watching how the tree in the playground changes all year
Y2- Our cress seeds growing in different environments.
Y3- We are growing radishes.
Y4- Teeth enamel enquiry.
Y5- Flower cutting enquiry

Comparative or fair testing
Y3- Growing radishes
Y4- Teeth enamel enquiry
Y5- Flower cutting enquiry

Research
Y4- Animal diets
Y5- Lifecycles- we researched correct terms for adult and juvenile animals, e.g. frogspawn, froglet and adult frog.
Y6- How our circulatory system works

Modelling
Y1- We made flowers out of straws and cupcake things
Y4- Digestive system, teeth models – made out of everyday materials
Y6- Circulatory system – with paper to make a stop motion animation

What makes our curriculum provision for Science exceptional and beyond the expected?
- Relationship with the Francis Crick Institute for resources, CPD and enrichment
- Use of Hampstead Heath education centre and Heath in general for enrichment, as well as use of world class Science Museum, Royal Observatory and Royal Institution
- Clear progression of skills taught in each year group, building on what children have previously learnt, for both substantive and disciplinary knowledge

Key points for discussion with governors about this report
- Sharing of work sampling with reference to where knowledge and skills have clearly been built on throughout the school
- Updating governors on links with Francis Crick provision
- Share key targets for development