



Rationale for Science

Curriculum Intent

We aim to develop and sustain pupils' curiosity about the world, enjoyment of scientific activity and understanding of how natural phenomena can be explained.

Our main purpose of science education should be to enable every individual to make informed decisions, and to take appropriate actions, that affect their own wellbeing and the wellbeing of society and the environment.

We have a knowledge-rich science curriculum, with scientific knowledge and skills based on the 2014 National Curriculum for Science. We aspire for pupils to leave school with knowledge to be successful at secondary school and a desire to participate in science with a genuine interest in the discovery of new scientific knowledge and appreciation of how science impacts the lives of everyone.

During Key Stages One and Two pupils cumulatively build knowledge and skills needed to succeed at secondary school. The curriculum model centres around being able to re-visit topics, offering opportunity to further increase and secure knowledge, skills and understanding, with carefully selected practical opportunities to develop enquiry and problem-solving skills. We aim to equip pupils with the substantive knowledge required for a well-rounded general knowledge and understand how the world works, but also the disciplinary knowledge to understand how science as subject develops and grows with time and increasing research.

Using the requirements of the Science National Curriculum as our guide, our Science lessons offer opportunities for children to:

- Develop scientific knowledge and conceptual understanding of the disciplines of Physics, Chemistry and Biology.
- Formulate their own questions about the natural world.
- Foster the confidence to 'be wrong' when it comes to making predictions and postulating their own theories.
- Promote an awareness of the importance of teamwork in scientific experimentation.
- Practically investigate their questions using various methods of enquiry.
- Gain competence in the science skills of planning scientific investigations, gathering and analysing data and critical evaluation of investigations across the disciplines.
- Use a range of methods to gather data from investigations and secondary sources including I.C.T., drawings, diagrams, videos and photographs.
- Present data in a variety of methods including tables, bar charts, line graphs, pictograms and pie charts.
- Produce comprehensive science reports that demonstrate their proficiency in the scientific method.
- Have care for the safety of all individuals in lessons by developing knowledge of the hazards of the materials and equipment they handle, along with mitigating these hazards.
- Develop an enthusiasm and enjoyment of scientific learning and discovery.

In Science we aim to build pupils' science capital, not only in science lessons but beyond the classroom, enabling pupils to see how science affects our lives. Scientific advances mean that future generations will need to be STEM-literate if they are to be active citizens who can participate in societal changes. The eight dimensions of science capital will be embedded in the curriculum, extra-curricular activities, family days and trips. The eight dimensions of science capital include:



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1. Scientific literacy
2. Science related attitude, values and disposition
3. Knowledge about transferability of skills
4. Science media consumption
5. Participation in science in and out of school
6. Family science skills, knowledge and qualification
7. Knowing people in science related jobs
8. Talking to other about science in everyday life

Implementation and Pedagogy

The science curriculum is comprehensive broad and balanced and follows the National Curriculum 2014.

The curriculum works on a spiral principle where pupils revisit concepts with increasing levels of complexity and demand, building on prior knowledge, not moving on until this knowledge is secure. Whole school approaches such as retrieval practice on a daily, weekly and monthly basis are integrated into the delivery approach. Curriculum implementation is based on the work from the learning scientists, opportunities for dual coding, spacing and interleaving are prominent in the schemes of learning and topic planning.

Science lessons are timetabled to allow for spacing between lessons. Pupils should study an hour to an hour and half of Science each week, using in house Schemes of Learning supported by resources from PZAZ. In Early years, science is taught through the children learning by play with some adult –led activities. Additional opportunities are provided in Science, such as STEAM day and British Science Week.

The science curriculum is based on a knowledge-rich curriculum covering the National Curriculum. Outline schemes of learning have been written by a science specialist teacher and explicitly maps out in detail the knowledge required in each of the topics, and map out the progression of knowledge from one year or key stage to the next. The basis of the curriculum design is influenced by the work of psychologists Daniel Willingham and the learning scientists.

The curriculum map allows for topics to be revisited over the course of study, each time a topic is revisited more depth is added. Thus further connections are made between prior learning and new knowledge. This long term curriculum map allows for the mixed age classes and ensure coverages without year groups repeating topics.

Based on Rosenshine’s principles of instruction, new learning in each topic is broken down into small steps across a series of planned lessons linked to the big question associated with each topic in KS2 or the theme in KS1. The size of the step increases as pupils gain more knowledge. All activities are planned to deepen understanding of scientific ideas.

Demonstrations are used in class for pupils to develop both their observational skills and use their scientific knowledge to explain their observation. A “predict-observe-explain’ model is used for demonstrations ensuring pupils gain the most from them. Practical tasks are designed to allow pupils a hands on experience of science and start to develop their investigate skills and critical thinking. Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding.



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Learning activities and teaching styles are not prescribed but a variety of approaches will be used in lessons and suggested in the outline schemes of learning and are referred to in the school's teaching and learning strategy.

Opportunities for cross curriculum links

The class teacher is able to see links between science and maths when they deliver lessons and make these link explicit to pupils. This enables pupils to build connections between different subjects and connect schema in their long-term memory, adding new knowledge to existing knowledge and experiences.

Vocabulary

Key vocabulary is identified for each unit. New vocabulary is introduced to pupils through direct teaching to pupils with the word meaning and origin, pupils are shown how to use the word the in a sentence and which part of speech the word belongs to. For example, photosynthesis derives from "light" and "to make", it is a **noun**; the name of the process, photosynthesise is the **verb** used when plants carry out this process, photosynthetic is the **adjective** used to describe an organism that can carry out this process.

Teacher subject knowledge

Our teachers are encouraged to continually improve their knowledge and practical competence by:

- Having access to CPD and resources that cover every area of the National Curriculum such as PZAZ and White Rose Science.
- Observation by the science subject leader with feedback and professional discussion
- Subject knowledge support and practical demonstration from the Science subject leader
- Science themed staff meetings during the school year.
- Inspection of pupil work via scrutiny of book work and learning walks.
- Termly analysis of pupil progress in science.
- Science drop ins ad feedback

The school is signed up to the Focus 4 TAPS project to support teaching, learning and assessment in primary science.

Science Subject Leader Role

The school has appointed a science coordinator whose responsibility it is to oversee the science function of the school. They will:

- 1) Strive to continually improve all aspects of the school's science function.
- 2) Purchase sufficient resources that allows the school to adhere to the principles as set out in the 'Science Lessons' section above and activities describe in the outline scheme of learning.
- 3) Monitor the impact of science delivery by assessing and track pupil progress
- 4) Improve their own practical and technical knowledge of science.
- 5) Conduct annual reviews of the school's science provision.
- 6) Communicate with teaching staff when necessary.
- 7) Report to the Governors

Impact

The successful approach at Watlington CP School results in a fun, engaging, high-quality science education, that provides children with the foundations for understanding the natural world. Through various workshops, trips and speakers children have the understanding that science has changed our lives and that it is vital to the world's future prosperity. Children learn the possibilities for careers in science as a result of our community links.



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Pupils are well prepared to access new learning at secondary school because they have a sound foundation of knowledge secured at KS1 and 2. As cited by cognitive scientist Daniel Willingham “Those with a rich base of factual knowledge find it easier to learn more”.

We measure the impact of our curriculum through:

- Ongoing formative assessment through retrieval practice, marking books and feedback to pupils, teacher -pupil dialogue and assessment of practical skills
- Monitoring of pupils' responses in retrieval practice
- Performance in end of topic quizzes and completion of end of topic assessment tasks
- Data tracking in 4 data drops per year
- Student voice with school council

At the end of KS1 and KS2 teachers will assess whether a pupil has or has not met the expected standard. This performance measure will be tracked in school.

Work scrutiny and book looks by subject leaders will monitor the impact of the science curriculum. Writing in science will also be used to inform teacher assessment of pupils writing for end of key stage statutory assessments.

Sources:

- <http://www.danielwillingham.com/articles.html>
- <https://www.sec-ed.co.uk/best-practice/four-ideas-for-applying-rosenshines-principles/>
- <https://www.aft.org/sites/default/files/periodicals/Rosenshine.pdf>
- https://educationendowmentfoundation.org.uk/public/files/Publications/Science/EEF_science_summary_of_recommendations_poster.pdf
- <https://www.retrievalpractice.org>
- The learning scientists <https://www.learningscientists.org>
- <https://d2tic4wvo1iusb.cloudfront.net/documents/pages/Protocol-A-systematic-review-of-evidence-on-primary-science-teaching.-Addendum-1.pdf?v=1668002149>
- [Research review series: science - GOV.UK \(www.gov.uk\)](https://www.gov.uk/research-review-series/science)



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Main priorities

PRIORITY	ACTIONS	WHEN?	WHO?	IMPACT	RAG
SUBJECT Science					
Increase the amount of meaningful practical activity in lessons, whilst ensuring key knowledge in linked to the practical task.	<ul style="list-style-type: none"> - Check resources in science resources cupboard and ensure practical activities in SOL are resourced - Teacher CPD on science practical - Use of former secondary science teacher for demonstration in dissection for biology - Pupils to develop skills in writing up practical experiments - Monitoring of science lessons with practical activity 	July 2024	Subject Leader Teachers	Teachers are equipped to deliver science lessons and as a result teach more challenging, better prepared and engaging lessons. Practical activities are well matched to the learning intentions, evidenced by observations. Pupils develop their scientific enquiry skills and are prepared for secondary science. Evidence by observation, final teacher assessment, books, pupils voice.	
Develop teachers subject knowledge in Science	<ul style="list-style-type: none"> - Survey for teachers in confidence in subject knowledge - CPD in teachers meetings - Peer observation - Co-teaching 	July 2024	Subject Leader Teachers	Teachers are more confident to deliver science lessons and as a result teacher more challenging, better prepared and engaging lessons. Evidenced by observations, teacher survey.	
Ensure SoL are completed for the new curriculum LTP and meet the needs for mixed age classes, complete with rigorous methods for assessment	<ul style="list-style-type: none"> - Subject lead to complete writing - Share with teachers - Feedback from staff on SoL. - Participation in the Foucs4TAPS project 	July 2024	Subject Leader Y5 teacher	Teachers follow SoL to ensure all curriculum content is covered. Evidenced by book scrutiny and observations. Pupils develop greater science knowledge and are able to recall this due to the sequencing of lessons in SoL, evidenced by data, assessment tasks, pupil voice.	
Raise the profile of science in school through promotion and celebration of science	<ul style="list-style-type: none"> - House event- STEAM day - Celebrate British Science week with assemblies and competitions - Explore development of a science club 	July 2024	Subject Leader	Pupils engage with science and share enthusiasm for science – evidenced by pupils voice	