



CASTLEWARD
SPENCER ACADEMY

Castleward Spencer Academy

Science Policy

Intent

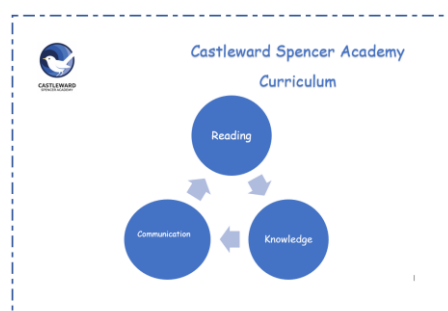
At Castleward Spencer Academy, we understand that a high-quality science education provides the children with the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity. Here at Castleward, we understand that all children should be taught the essential aspects of knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, children should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave and analyse causes.

Aims

The 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 knowledge required to understand the **uses and implications** of science, today and for the future.

Curriculum Drivers



Castleward Spencer Academy Curriculum



- **Reading-** We firmly believe that if children can read well and read widely, they will be best placed to achieve in all areas of the curriculum. By the time pupils leave Castleward, they will be able to read with accuracy and fluency, to analyse what they have read and developed an enjoyment of reading for pleasure.
- **Knowledge-** Knowledge is like glue that sticks information as well as learning together. When we have prior knowledge about a topic, we understand it better. Topics are personalised to meet the needs of the pupils who attend the school, ensuring that they have opportunities to apply prior knowledge to new learning experiences and developing reasoning and problem-solving skills.
- **Communication-** Pupils learn to articulate their ideas, feelings and understanding of new vocabulary in order to engage with others through spoken language. They become effective speakers and listeners empowering them to better understand themselves, each other and the world around them. Being able to effectively communicate allows pupils to develop and deepen their subject knowledge and understanding through talk in the classroom, which has been planned, designed, modelled, scaffolded and structured to enable them to learn the skills needed to communicate effectively.

Our vision for the science curriculum

- To provide children with the knowledge and skills to be curious and explore the world
- To develop excellent skills in maths to enable data handling and analysis
- To emerge as effective exponents of STEM through the disciplines of biology, chemistry and physics
- To ensure all children challenge themselves to address every question with investigation, prediction, observation, data collection, synthesis, analysis and a thorough evaluation of their findings
- To ensure children communicate their understanding and ideas with a wide technical vocabulary.

Inspired by Research

Knowledge



Knowledge is like glue that sticks information as well as learning together. When we have prior knowledge about a topic, we understand it better. The more children know, the more they learn.

The knowledge taught at CWSA has been carefully considered, so that it is personal to the children who attend the school. Science learning is sequenced so that there is a progressive, coherent flow, allowing ideas to build on secure foundations. This is referred back to at regular intervals during their time at Castleward Spencer through retrieval practice, so that links with previous learning are applied when learning new content, where appropriate. This can be achieved through:

- Explaining learning and knowledge to peers, teachers, other classes
- Showcasing knowledge in assemblies
- Encouraging pupils to ask and answer 'Why?' and 'How?' questions e.g. 'Tell me how this is the correct answer?' 'Show me', 'true or false'

When planning each unit, staff consider;

Facts- What are the keys facts that all children should know?

Skills- What are the things that all children should be able to do?

Experiences- What first-hand experiences do the children need to have to be able to access this knowledge?

Spaced Practice



At CWSA the curriculum has been skilfully designed to allow pupils to complete Spaced Practice, which is a technique that provides children to review material over a long period of time. This gives their minds time to form connections between the ideas and concepts being taught, so knowledge can be built upon and easily recalled later.

During a lesson, all the new learning is stored in the child's short-term memory (and quickly forgotten). When spaced learning is used, the material is able to make its way into his or her long-term memory instead. Creating a schedule for spaced repetition, helps the child better remember what he or she has learned. This will prepare them to build upon the information being learned, thus creating a solid foundation for future learning.

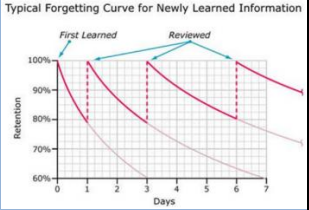
Low stakes quizzes are used in lessons games such as bingo, in order to aid long-term retention of knowledge and aids the cycle of not forgetting. This is completed using the following process at the beginning of each lesson;

Last lesson...

Last week...

Last topic...

Last year...

<p>Retrieval practice</p>  <p>The graph shows a typical forgetting curve for newly learned information. The y-axis represents 'Retention' from 60% to 100%, and the x-axis represents 'Days' from 0 to 7. A solid red line shows the initial decline from 100% at day 0 to approximately 80% at day 1. A dashed red line shows a 'Review' point at day 1, where retention is restored to 100%. The solid red line then declines again to about 70% by day 2. Another dashed red line shows a second 'Review' point at day 2, restoring retention to 100%. This pattern repeats, with a third review at day 3 and a fourth at day 5, each time showing a steeper decline followed by a reset to 100% retention. The final retention level at day 7 is approximately 65%.</p>	<p>Research suggests that used effectively, retrieval practice improves pupils' memory and recall and also improves children's application skills and their ability to transfer their knowledge to new concepts and situations.</p> <p>At CWSA the science curriculum has been skilfully designed to allow pupils to complete Spaced Practice. Teachers skilfully refer back to previous knowledge taught and revisit this at regular 'spaced' opportunities where knowledge and learning will be revisited in order to methodically interrupt the pupils' 'forgetting.'</p> <p>Retrieval Practise Examples;</p> <ul style="list-style-type: none"> • Low stakes quizzes • Pair Share: Review and Check, Multiple Choice Quizzes, Solve Familiar Problems, • Knowledge organisers- Completed for every unit of work, which are stored in the child's science book at the beginning of each unit, so that it is accessible guidance about the unit they are studying that can be continually referred back to.
<p>Vocabulary</p>	<p>The introduction of new vocabulary is of high importance at CWSA, as this is the children's opportunity to show what they are beginning to understand about the topic being taught. Vocabulary is sequentially taught using a wide range of Tier 2 (High frequency and multiple meaning vocabulary, often found in adult conversation and literature) and Tier 3 words (Low frequency, context specific vocabulary that is taught as part of a subject or domain), which are explicitly taught and connected to the sequence of learning not only in the subject being taught but also across the curriculum where appropriate.</p>
<p>Experiences</p>	<p>A primary focus of our curriculum is to raise aspirations, engender a sense of personal pride in achievement, and provide a purpose and relevance for learning. Using actual experiences to learn concepts and skills is much more effective than simply being told about them, as in the proverb: "Tell me, I'll forget; show me, I'll remember; involve me, I'll understand." With this in mind, staff plan a variety of experiences both inside and outside of the classroom to bring learning to life.</p>
<p>Scaffolding</p>	<p>EEF- 'Scaffolding' is a metaphor for temporary support that is removed when it is no longer required. Initially, a teacher would provide enough support through a range of resources so that pupils can successfully complete tasks that they could not do independently.</p> <p>Initially, the teacher will provide enough support so that pupils can successfully complete tasks that they could not do independently. This requires effective assessment to gain a precise understanding of the pupil's current capabilities. Support could be visual, verbal, or written. The teacher will gradually remove the support (the scaffold) as the pupil becomes able to complete the task independently.</p> <p>Teachers at CWSA provide a range of scaffolds within a lesson where appropriate, so that all children reach the same ambitious goals. This is achieved using</p> <ul style="list-style-type: none"> • The use of I do it, We do it, You do it when modelling examples to the class.

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| | <ul style="list-style-type: none">• Detailed support such as, key words, sentence stems, true or false examples, quality first teaching questioning• Key vocabulary relevant to the unit of work• Post it notes with key prompts or questions to guide through the task. |
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Implementation

Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children 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 topics blocks by the class teacher, to have a project-based approach. This is a strategy to enable the achievement of a deeper understanding of knowledge.
- Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, using high quality resources to aid understand of conceptual knowledge. Teacher use precise questioning in class to test conceptual knowledge and skills and assess children regularly to identify those children with misconceptions.
- Learning and skill development will be built upon over the year. As the children'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.
- Working scientifically, skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in keeping with the topics.
- Teachers demonstrate how to use scientific equipment, and the various working scientifically skills in order to embed scientific understanding. Teachers find opportunities to develop children's understanding of their surroundings.
- All resources taken from Developing Experts will be adapted to ensure the correct scaffolding is provided for the children.

Teaching Sequence

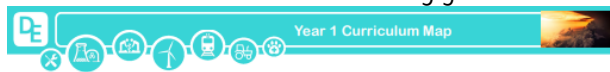
Long term planning

At Castleward Spencer Academy, long term planning is prepared based on the Developing Experts Programme. This is a programme which takes into consideration the national curriculum programmes of study for all year groups over the year.

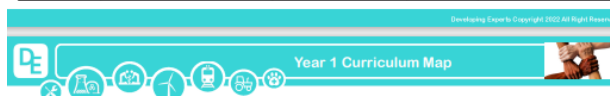
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Autumn 1	Animals, including humans – All about animals	Animals, including humans 1 – Growth	Animals, including humans	Animals, including humans	Animals, including humans	Animals, including humans
Autumn 2	Seasonal Changes	Animals, including humans 2 – Life cycles	Forces and Magnets	Electricity	Changes of materials	Electricity
Spring 1	Exploring Everyday Materials 1	Living things and their habitats	Light	Living things and their habitats	Earth and Space	Evolution and inheritance
Spring 2	Exploring Everyday Materials 2	Living things and their habitats around the world	Plants	Living things and their habitats – conservation	Forces	Light
Summer 1	Plants	Plants	Rocks	Sound	Living things and their habitats	Living things and their habitats
Summer 2	Animals, including humans – All about me	Uses of everyday materials	Scientific Enquiry	States of matter	Properties of materials	Looking after our environment

Medium term planning

The medium-term plan identifies the area of learning for the six half terms of the school year. This plan allows staff members to identify the National Curriculum links along with the scientific enquiry and key words for that unit. Staff can access this and annotate accordingly.



Year 1 - Seasonal changes				
Lesson Intention	National Curriculum Reference	Scientific Enquiry Covered	Rocket Words Covered	Resources Needed
Understand there are four seasons	Observe changes across the four seasons	Using their observations and ideas to suggest answers to questions	season spring summer autumn winter	A large measuring bowl for collecting rainwater. Colouring and drawing resources.
Understand the changes that take place in autumn	Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies	Using their observations and ideas to suggest answers to questions	autumn hibernate weather product harvest	Rain gauges, drawing and colouring resources if designing the den, or junk modelling resources if creating a model.
Understand the changes that take place in winter	Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies	Using their observations and ideas to suggest answers to questions	winter weather frost sheet temperature	Rain gauges.
Understand the changes that take place in spring	Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies	Identifying and classifying	spring compare changes grow chick	Rain gauge, scissors and glue.
Understand the changes that take place in summer	Observe changes across the four seasons Observe and describe weather associated with the seasons and how day length varies	Using their observations and ideas to suggest answers to questions	summer warm sun protection temperature headweas	Rain gauges, drawing and colouring resources.
Investigate how you can measure rainfall	Observe and describe weather associated with the seasons and how day length varies	Performing simple tests Gathering and recording data to help in answering questions	rainfall measuring record results graph	The rainwater collected over five weeks. Writing and colouring resources.



Year 1 - Animals, including humans 1 - All about me				
Lesson Intention	National Curriculum Reference	Scientific Enquiry Covered	Rocket Words Covered	Resources Needed
Discover the basic parts of the human body	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Identify and classify	head body skeleton limb joint	Class presentation, pen, pencil, wallpaper, marker pens.
Learn about eyes and sight	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Perform simple tests Gather and record data to help in answering questions	brain eyelash eye sight blind	Class presentation, drawing materials.
Learn about ears and hearing	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Perform simple tests Gather and record data to help in answering questions	sound ear sign language vibration deafness	Class presentation, pen, pencil, a range of instruments or different objects to create sounds
Explore the tongue and taste	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Use observations and ideas to suggest answers to questions	tongue mouth taste flavour sweet	Class presentation, bread dipped or spread with a variety of different flavours for children to taste. You could use marmite, honey, jam, lemon juice, cream cheese, olive oil. You could also include a variety of fruits and vegetables.
Explore the senses of touch	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Gather and record data to help in answering questions	touch fingertips skin organ brain	Class presentation, range of classroom objects.
Discover how your nose smells	Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	Identify and classify	smell odour nose nostril nose hair	Class presentation, a selection of containers suitable for pulling food in. A range of food to smell, for instance, vinegar, garlic, cinnamon sticks, fruits, washing up liquid, liquid hand soap, cheese, crisps, chocolate and onion.

Short term planning

There are no expectations for staff to produce daily plans, but there are short term lesson plans provided through the programme Developing Experts. The delivery of lessons should be carefully considered to ensure maximum engagement and appropriate challenge. Each lesson will be supported by a PowerPoint/IWB presentation, which will incorporate key questions, models and videos. Teachers will address in the moment misconceptions through mini plenaries and plenaries, and/or complete pre/post teaching to ensure all pupils can access the lesson.

Teaching Methods

We aim to fully include all pupils in science lessons, the resources for SEND pupils will remain age appropriate, but will be adapted to their developmental stage of learning and personalised in order to meet their needs. Higher achieving pupils will be stretched and challenged through complex questioning.

Scaffold Support

We do not differentiate by task instead looking to support and challenge through every step of our lesson design. This ensures that pupils do not get held behind by not being exposed to *age appropriate learning. In addition, it stops pupils being held back by being labelled as “low ability”. Instead we provide support for any pupil who needs it.

Support means:

- Pre-teaching content in advance of the unit

- Symbolised support resources
- Using adult support (without removing independence)
- Same day or next day intervention to stop gaps appearing in the first place

*Some of our pupils will have recognised and specific SEND. These pupils will not be able to access the same learning as others at times (although assumptions should not be made that this is always true). Where they need to access a different curriculum, their learning should be guided by their ILPs.

Like we do not label pupils as low ability, we also do not label pupils as high ability. This means that all pupils follow our normal lesson sequence. This is because we provide deliberate challenge at every stage of the lesson. However, for some pupils in some lessons, careful attention will need to be paid to the speed at which they progress.

AFL

Feeding forward- we provide advice and guidance to children in order to move their learning on. This is the sole purpose for any response to their learning. At Castleward, we are going to shift from feeding back to children once the moment has passed, and feed forward as much as possible, during the lesson. Live marking and verbal feedback have proven to make the most difference to children's progress. Written feedback is not expected in books. Live verbal feedback and highlighting is the aim. Adults are highlighting evidence within the piece of work that shows that the objective from the lesson has been achieved. Green – where it is met and orange where work needed. Both can be done during the lesson.

AFL via retrieval practice- In order to effectively embed knowledge and assess how much knowledge the pupils have retained, knowledge retrieval activities are planned into the learning process. After each knowledge area is completed, children are assessed on what they can remember then at spaced intervals.

Interactive Quizzes – We use multiple choice questions as they make assessment more reliable and pupils understanding is more visible to the teachers. Multiple choice quizzes can be completed for each lesson or after a series of lessons to assess the children's understanding.

Mark Book – Within our programme, Developing Experts, the mark book section allows teachers to review a pupil's performance as it gives an average score for the assessment quizzes, keyword quizzes and word search time. This is all access through the teachers account as it is set for the pupils.

At each formal assessment point, Science assessment data is updated on the school's Google Drive form. This is recorded as either working at or working towards age related expectations.

Environment & Exercise Books

Topic/Science Wall

Topic/science walls should include the following:

- Showcase the topic and learning outcomes including key words, language and images
- Class work added as the topic progresses
- An area for children to ask scientific questions (on post it notes)
- Key vocabulary for the unit

Exercise Books

All pupils have an exercise book specifically for science. All Learning (every lesson) is evidenced. This could be photographs, questions or explanations of today's learning. The presentation of science books should be

consistent, age appropriate and show that pupils take pride in the appearance of their work. - The date to be written in full. E.G Monday 16th January - The Learning Objective to be at the top of the page on the left-hand side (handwritten or typed). When sticking in question sheets/resources, these to be trimmed to ensure they fit onto the page - Pencils and rubbers to be used – no pens (except Purple Pen comment)

Impact

At Castleward Spencer Academy, the successful approach from using Developing Experts results in a fun, engaging, high-quality science education, that provides children with the foundations and knowledge for understand the world. Our engagement with the local environment ensures that children learn through varied and first-hand experiences of the world around them. Through various workshops, trips and interactions with experts, children will 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 the expert films and curriculum links to industry, ensuring that children have access to positive role models within the field of science from a range of science disciplines and STEM related industries. From this exposure to a range to different scientists from various backgrounds, all children feel they are scientists and capable of achieving. We aim to ensure that every child enjoys science which results in motivated learners with a sound scientific understanding.