

CHERRY ORCHARD PRIMARY SCHOOL
STEM POLICY
(science, technology, engineering and maths)

Date of Policy: July 2016
Member of Staff Responsible: Sarah Mitchell
Review Date: July 2017
Consultation: This policy was developed with staff following local and national curriculum guidance.

To be read in conjunction with the Teaching and Learning Policy, Assessment Policy, SEND Policy, Equality Policy and SMSC Policy.

Ethos Statement

It is the aim of the Governing Body of Cherry Orchard Primary School to support the implementation of policies and procedures that support the vision of:

“We care, we learn, we succeed.”

Values

Our school’s core values are generosity, gratitude, kindness, respect, trust, empathy and courage.

These core values are promoted, demonstrated and applied consistently throughout school. Within the teaching of STEM subjects (science, technology, engineering and maths), opportunities to address these values include but are not limited to the following:

- The activities of the school’s eco council
 - School assemblies about respect for the environment
 - Group work during technology and engineering sessions
 - Supporting charities through generous donations and fundraising
 - Promoting a respectful approach to our local and wider environment
 - Caring for other living things
 - Links with other schools
- Whole class activities that involve caring for other living things
- Teamwork during inter-house games science competitions
- Events to mark national and international events (World Space Week, British Science Week)
- Engaging with the local community during STEM weeks
- Trips to places of significance to STEM in the local and wider community
- Lessons that involve debate, team work and collaborative learning

Aims

The aim of teaching STEM is to inspire and engage children. Children are provided with the foundations required to understand the world around them and the impact advances in science has upon technology. Through building up a body of foundational knowledge, pupils are encouraged to develop a sense of excitement and curiosity about natural phenomena. We teach children to partake in different types of scientific enquiries and to pose and answer scientific questions about the world around them. We then demonstrate how that knowledge can be applied in real life engineering situations to pose a solution to a problem. Children are then able to use their knowledge, gained through scientific research, to their own design and technology projects in a practical environment.

The aims of STEM teaching:

- To prepare children for a STEM focussed future;
- To inspire and engage children in STEM subjects;
- To inspire the future scientist and engineers

Science

- To teach children to ask question and planning lines of investigative enquiry;
- To extend children’s natural curiosity and wonder about the world;
- To help children make decisions concerning environmental, moral and social issues;
- To develop scientific strategies and skills;
- To work co-operatively and communicate scientific ideas to others;

Technology and engineering

- To develop an understanding of technological processes, products, and their manufacture, and their contribution to our society;
- To develop imaginative thinking in children and to enable them to talk about what they like and dislike when designing and making;
- To enable children to talk about how things work, and to draw and model their ideas;
- To encourage children to select appropriate tools and techniques for making a product, whilst following safe procedures;
- To explore attitudes towards the made world and how we live and work within it;
- Children should learn to understand and apply the principles of nutrition and learn how to cook.

Research suggests that Years 3 to 8 is the time frame within which children form their opinions towards subjects like STEM. Encouraging children in to engage with STEM in years 10 and 11 is often ineffective. Providing opportunities early on and encouraging children to explore real world STEM is the most effective way of building children’s engagement.

Curriculum

	Autumn	Spring STEM focus week	Summer
EYFS	Science is primarily taught through the Early Learning Goal: Knowledge and Understanding of the World Additional opportunities for children to engage in scientific principals are created throughout the year within planned continuous provision.		
1	Everyday materials Technology: Building houses	Animals, including humans Technology: food and nutrition	Consolidation of seasonal changes and plants Technology: Weather stations
	Seasonal Changes Plants		
2	Uses of everyday materials Technology: Waterproof bags	Animals, including humans Technology: food and nutrition	Living things and their habitats Technology: pop up book
	Plants		
3	Magnets and forces Rocks Technology: marble run	Animals, including humans Technology: food and nutrition	Light Technology: shadow puppets
	Plants		
4	Electricity Technology: board game	Animals, including humans Living things and their habitats Technology: food and nutrition	States of matter Sound Technology: Create a musical instrument
5	Properties and changes of materials Technology: Rocket cards	Animals, including humans Living things and their habitats Technology: food and nutrition	Forces Earth and Space Technology: Orrery
6	Light Technology: Technology in theatre	Animals, including humans Living things and their habitats Technology: food and nutrition	Electricity Evolution and inheritance Technology: Lights

The Working Scientifically strand of the national curriculum is not taught separately; it is integrated throughout the whole science curriculum.

Every science lesson should be planned to develop one or more of these skills.

Working Scientifically
KS1
Asking simple questions Observing closely, using simple equipment Performing tests Identifying and classifying Using their observations and ideas to suggest answers to questions Gathering and recording data to help in answering questions.
Lower KS2
Asking relevant questions and using different types of scientific enquiries Setting up simple practical enquiries, comparative and fair tests Making systematic and careful observations Gathering, recording, classifying and presenting data Recording findings Reporting on findings from enquiries Using results to draw simple conclusions, make predictions and raise further questions Identifying differences, similarities or changes Using straightforward scientific evidence to answer questions
Upper KS2
Planning different types of scientific enquiries to answer questions Taking measurements, using a range of scientific equipment Recording data and results Using test results to make predictions, to set up further comparative and fair tests Reporting and presenting findings from enquiries Identifying scientific evidence that has been used to support or refute ideas or arguments

Organisation of STEM

The STEM curriculum is organised within science schemes of work and separate design and technology schemes of work, both compliment and support the other.

The science curriculum is arranged in a fixed yearly cycle, as specified within the national curriculum. In both Key Stage two and Key Stage one Science is taught for one afternoon a week by the class teacher, within class groups. Embedded within the science topics in the Autumn and Summer terms, is a technology project. During each project pupils will apply the scientific knowledge they have acquired, with practical, technology focussed projects.

Teaching and Learning style in science lessons

Dual learning objectives are used in science lessons. This enables the children to fully appreciate and identify the knowledge they are acquiring and the methods for investigation they are using. Science lessons should be focussed around investigation and enquiry.

Dual learning objectives should include a investigative skill and a key question, around which the lesson evolves.

For example,

LO: To spot patterns

LO: Are the oldest children in our class the tallest?

Science teaching focuses on enabling children to think as scientists. We place emphasis on examining primary sources and in each stage children have the opportunity to learn through a variety of scientific enquiry methods and investigations. We encourage children to answer scientific questions and offer them the opportunity to use a variety of data. In addition we enable children to use ICT in science lessons where this serves to enhance the learning. We focus on helping children to understand that scientific events can be interpreted in different ways and that they should always ask searching questions about the information they have been given.

Fair testing is an important aspect of scientific investigation; however it is not the only means of investigation. Children are taught to appreciate this through access to a variety of methods of investigation.

Methods of investigation used at our school include:

- Observing over time
- Pattern seeking
- Identifying, classifying, grouping and comparing
- Fair testing
- Researching using secondary sources.

Teaching and Learning style in design and technology lessons:

The school uses a variety of teaching and learning styles in design and technology lessons. The principal aim is to develop children's knowledge, skills and understanding in design and technology. Teachers ensure that the children apply their knowledge and understanding when developing ideas, planning and making products and then evaluating them. We do this through a mixture of whole-class teaching and individual/group activities. Within lessons, we give children the opportunity both to work on their own and to collaborate with others, listening to other children's ideas and treating these with respect. Children critically evaluate existing products, their own work and that of others. They have the opportunity to use a wide range of materials and resources, including ICT.

During the Early Years, young children will be given the opportunity to explore a wide variety of materials e.g. play dough, clay, wire, wood and plastic. They will investigate uses of different materials and will be introduced to the correct language and use of a range of tools and equipment. They will be given the opportunity to use their imagination to create in 2d and 3d as well as opportunity to cook, bake and learn about healthy eating. Resources will be made available on a daily basis through the indoor and outdoor learning environment as well as teacher led and teacher input opportunities to develop these designing skills.

Our long-term and medium-term plans map out the themes covered each term for each year group. These plans define what we will teach and ensure an appropriate balance and distribution of work across each term.

Cross-curricular links

Maths

STEM in our school contributes to the teaching of mathematics in a variety of ways. Opportunities for STEM to support mathematical understanding are regularly exploited. These include, but are not limited to:

- The study space, scale and distance;
- The use of graphs to explore, analyse and illustrate a variety of data;
- The use of surveys and write conclusions based on their results;
- Choosing and using appropriate ways of calculating measurements and distances;
- Checking results of calculations for reasonableness;
- Learn how to use an appropriate degree of accuracy for different contexts;
- Use of equipment to measure;
- They apply their knowledge of fractions and percentages to describe qualities and calculate proportions.

English

STEM subjects make a significant contribution to the teaching of literacy in our school because it actively promotes the skills of reading, writing, speaking and listening. Some of the texts we use during literacy are scientific in nature, for example writing explanations about the water cycle or creating information pages about the digestive system. Children develop oracy through scientific questioning, presenting their findings to the rest of the class and through speaking and drama activities relating to specific topics. They develop their writing ability by writing up investigations, composing reports and through presenting collected data within posters and information pages.

Computing

We use ICT in STEM subjects where appropriate; through the use of the laptops, interactive whiteboards, camera recorders, data loggers, heart rate monitors, electronic microscopes, digital simulations and music equipment. Children use ICT in science to enhance their skills in data handling, presenting work and researching information using the internet and relevant software. Children have the opportunity to use the digital camera to record and use photographic images. Children use data loggers within lessons to enhance the accuracy of the data they record. They are able to measure temperature, sound and light using data loggers.

During technology projects children use computer aided design. Children also use computing to allow them to program, monitor and control their products.

SMSC

Spiritual education in STEM involves the search for meaning and purpose in natural and physical phenomena. It is the wonder about what is special about life, an awe at the scale of living things from the smallest micro-organism to the largest tree and the interdependence of all living things and materials of the Earth.

Moral education, in STEM subjects, encourages pupils to become increasingly curious, to develop open mindedness to the suggestions of others and to make judgements on evidence not prejudice. Students realise that moral dilemmas are often involved in scientific developments. When considering the environment the use of further natural resources and its effect on future generations is an important moral consideration.

Social education involves group practical work which provides opportunities for pupils to develop team working skills and to take responsibility. Pupils must take responsibility for their own and other people's safety when undertaking practical work. Global advances in STEM subjects has a major effect on the quality of our lives. Pupils are encouraged to consider the benefits and drawbacks of scientific and technological developments and the social responsibility involved.

Cultural education in STEM subjects involves understanding that scientific discoveries are as much of a part of our culture as great music and films. Credit is given to scientific discoveries of other cultures. Science is also seen as a contemporary activity and developments are made all over the world. It is therefore an activity undertaken by a wide range of men and women in many different cultures both now and in the past. The interdependence of the world in environmental issues is central to science.

Resources

STEM subject resources are audited by the subject leader. Resources should be kept in an orderly fashion so as to allow teachers to deliver practical based, well-resourced lessons.

Risk assessments

All aspects of STEM are taught in a stimulating environment. Children are taught to recognise that there are hazards in living things, materials and physical process, and assess risks and take action to reduce risks to themselves and others. When using various pieces of equipment children are given the necessary supervision and resources to ensure they are working in a safe environment. All activities are risk assessed if required.

Marking and assessment

We assess the children's work in STEM subjects – (Science and DT) by making informal judgements as we observe the children during lessons. Once the children complete a piece of work, we mark and comment as necessary. Once we complete a unit of work, we use objectives from the national curriculum statutory requirements to make a judgement of each individual child's understanding. We record their performance within excel documents. These assessment records are used to plan future work, to provide the basis for assessing the progress of the child, and to pass information on to the next teacher at the end of the year.

Samples of the children's work are kept each year showing evidence of good practice.

Science assessment records are maintained using SPTO tracker system. Quick quizzes are used to inform judgements of children knowledge, against curriculum objectives.

Design and technology assessment records are maintained using excel tracking sheets.

Equal opportunities

At Cherry Orchard School we teach science to all children, whatever their ability. STEM forms part of the school's curriculum policy to provide a broad and balanced education to all children, We provide learning opportunities matched to the needs of the children with learning difficulties and we take into account the targets set for individual children in their ITPs. We also challenge our higher achieving children by setting enquiry based problems and through targeted questions.

We recognise the fact that there are children of widely different abilities in all classes and we provide suitable learning opportunities for all children matching the challenge of the task to the ability of the child. We achieve this by:

- Setting common tasks which are open ended that can have a variety of responses;
- Setting tasks of increasing difficulty, some children not completing all tasks;
- Grouping children by ability in the room and setting different tasks for each ability group;
- Providing resources of different complexity according to the ability of the child;
- Using teaching assistants to support the work of individual children or groups of children.

Monitoring and evaluation

The STEM subject Leader is responsible for monitoring the standard of the children's work and the quality of teaching in science. Monitoring and evaluation takes place.

Role of subject leader

- provide a strategic lead and direction for the subject;
- support and advise colleagues on issues related to the subject;
- monitor pupils' progress in that subject area;
- provide efficient resource management for the subject;
- report on attainment and progress.

Policy adopted by Governors: October 2015 (updated July 2016)

To be reviewed: October 2017

Signed: _____ **Headteacher**

Signed: _____ **Chair of Govenors**

S Mitchell (AHT)