



Eratosthenes, light and the absence of light!

PHYSICS



SCIENCE LEARNING STATEMENTS

Area of Learning	Skills and Knowledge
Scientific Enquiry and applying knowledge in context	I can raise my own relevant questions about the world around me.
	I can be given a range of scientific experiences including different types of scientific enquiry.
	I can start to make my own decisions about the most appropriate type of scientific enquiry I might use to answer questions.
	I can set up simple practical enquiries, comparative and fair tests. I can recognise when a simple fair test is necessary and help decide how to set it up.
	I can talk about criteria for grouping, sorting and classifying; use simple keys, with some help.
	I can recognise when and how secondary sources might help me to answer questions that cannot be answered through practical investigations.
	I can make systematic and careful observations. I can help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.
	I can begin to look for naturally occurring patterns and relationships; begin to decide what data to collect to identify them.
	With help, I can take accurate measurements using standard units, learn how to use a range of equipment, such as data loggers and thermometers, appropriately.
	I can collect and record data from my own observations and measurements in a variety of ways: notes, bar charts, tables. I can use standard units, drawings, labelled diagrams, keys and help to make decisions about how to analyse the data.
With help, I can look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions.	
I can use relevant scientific language to discuss my ideas and communicate my findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions.	
With support, I can identify new questions arising from their data, making predictions for new values within or beyond the data they have already collected and finding ways of improving what I have already done.	

Overview and rationale:

How light and dark work is a fascinating concept which Eratosthenes' experiments came to discover in the Egyptian city of Alexandria, way back in 250BC! Year 3 use the story of how shadows were 'discovered' and build upon the children's knowledge acquired in KS1. This will be their first venture into where light actually comes from and the power of the sun. The children will already have some knowledge of the strength of our solar system's star from learning about the weather and seasons in Year 1 and 2 and now their curiosity will be piqued by investigating dark being the absence of light. The topic further enables the children to raise questions about the world around them and think critically about why light works as it does and how it interacts with Earth's materials and the moon! Scientific enquiry and investigation into shadow draws upon mathematical knowledge and data collection and analysis, with the pupils planning and conducting experiments into light sources and reflection, making predictions and using their observational skills to summarise and conclude. Little scientists they are truly becoming!

MATHS AND SCIENCE ACROSS THE CURRICULUM – Data Handling and Statistics

Science NC: recording findings using simple scientific language; interpret and present data using tables

KEY VOCABULARY

light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous, Eratosthenes

NATIONAL CURRICULUM OBJECTIVES

1. recognise that they need light in order to see things and that dark is the absence of light
2. notice that light is reflected from surfaces
3. recognise that light from the sun can be dangerous and that there are ways to protect their eyes
4. recognise that shadows are formed when the light from a light source is blocked by an opaque object
5. find patterns in the way that the size of shadows change

Possible 'higher order' questioning

	School Value	Topic relevance: How/when/where/why is it needed?
Remember	Can you state some differences between opaque and transparent surfaces?	Respect
Understand	Can you summarise the process of how shadows move throughout the day?	
Apply	Can you explain how reflection works and why, on some surfaces, it doesn't?	Responsibility
Analyse	Shadows shorten in the mornings and lengthen later in the afternoon. What might you infer from this?	
Evaluate	What would happen if you looked at the light too long? What do you think would happen to your shadow if you could turn invisible?	
Create	Plan an investigation to test how well surfaces reflect light.	

'CORE' KNOWLEDGE	'ADDITIONAL' KNOWLEDGE
1) I know that Eratosthenes discovered how light and shadow works.	a) I know he did his experiments in Alexandria, Egypt. b) I know he discovered how shadow worked in 250BC. c) I know that he found this out by doing an experiment where he put sticks in the ground and measured the angle and length of the shadows.
2) I know that there are different types of light source – natural and man-made.	a) I know that there are <u>are</u> natural (sun, lightning, fire flies) and man-made light sources (torch, lamp) b) I know that light reflects off objects e.g., mirrors and that is how we see them. c) I know that the moon is not a light source as it reflects the sun's light.
3) I know that shadows are formed by objects blocking light.	a) I know that a shadow changes depending on the position of the light source. E.g., a footballer may have more than one shadow when playing at night. b) I know that a shadow changes throughout the day according to the position of the sun. c) I know that the sun travels in straight lines and when an object blocks this light a shadow is formed.
DO: RECORD: MAKING SHADOWS	
4) I know that materials can be translucent, transparent, and opaque and that this can affect shadow.	a) I know that translucent objects allow some light particles to pass through (stained glass window, tissue paper). b) I know an opaque object blocks all light from travelling through (person, table, book). c) I know that a transparent object allows all light particles to pass through (window, reading glasses, clear bottle).
5) I know that there is a relationship between the Earth, Sun and the Moon.	a) I know the Moon orbits the Earth and that this takes approx. 29 days (a month). b) I know the Earth orbits the Sun with the Moon and this takes approx. 365 days. c) I know the Earth rotates (24hrs) as it orbits the sun, and this gives us night and day.
6) I know that reflective materials only work when a source of light reflects off them.	a) I know that some reflective materials have retroreflective properties. b) I know retroreflective materials reflect the light back towards the source regardless of direction (e.g., high visibility jackets). c) I know how to investigate if a material is reflective or not.

ART AND DESIGN

Exploring and Developing

Exploring and developing ideas	Explore ideas for different purposes. Question and make thoughtful observations. Explore the roles and purposes of artists, craftspeople and designers working in different times and cultures.
Evaluating and developing work	Adapt their work according to their views and describe how they might develop it further. Annotate work in sketchbook.

Painting

National Curriculum	Additional Skills	Knowledge	Key Vocabulary
<i>Experiment with different effects and textures, inc. blocking in colour, washes, thickened paint etc.</i>	-To apply knowledge of colour mixing the primary and secondary colours to produce shades appropriate to the task. -Explore with poster paint and water colours and select which to use appropriate to the desired artistic effect. -Describe colours by objects e.g. sunshine yellow, raspberry pink -Carry out resist printing techniques including marbling	-Know that when you add grey to a colour you make a tone. -Know how to use the primary colours and secondary colours to make all secondary and tertiary colours. -Know the different types of paint and their properties – poster paint, powder paint and water colours. -Know that poster / powder paint gives a more vibrant bold effect and that watercolours are more muted, subdued and softer -Know some of the complimentary colours and how to apply them in their art (e.g. yellow and purple, green and red) -Know what complimentary colours are and what happens when they are mixed together.	Tone, effects, textures, complimentary colours, bold, vibrant, subdued, muted, softer.

Artist/Style/Activities

Monet and Renoir (Impressionism)

Compare the two artists, paint a water reflection in the impressionist style (light, shadow, water reflection, six key features of impressionism)