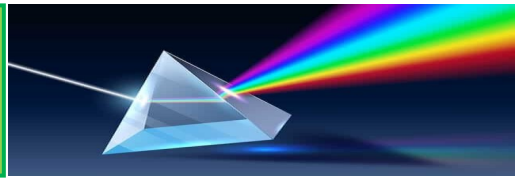
Ibn Al-Haytham: the father of optics

Light

PHYSICS



Overview and rationale:

Having had a proper introduction to light with Eratosthenes back in Year 3, our Year 6 scientists are ready to really explore how it all works and how the ingeniousness of our eyes (with the help of our brains, of course) recognise light. The children build on their prior knowledge of light and shadow and investigate how light travels either straight to our eyes, or via reflecting off other objects, something that Alhazen studied in Basra, Iraq way back in 900 and 1000 AD. The topic is full of observations, predictions, planning and experimenting and the group consolidate their understanding and the importance of how to be accurate and fair when conducting scientific investigations. They even explore the challenges that people with visual impairments face when playing blind football!

SCIENCE LEARNING STATEMENTS

Area of Learning	Knowledge and Skills
Scientific Enquiry and applying knowledge in context	I can use my science experience to explore ideas and raise relevant questions of different kinds.
	I talk about how different scientific ideas have developed over time giving specific examples.
	I select and plan the most appropriate type of scientific enquiry I might use to answer questions and give justifications.
	I recognise when and how to set up comparative and fair tests. I explain which variables need to be controlled and why.
	I use and develop more complex keys and other information records to identify, classify and describe living things and materials. Identify patterns that might be found in natural environments
	I can recognise which secondary sources will be most useful to research my ideas; separate opinion from fact and give justifications for their reasoning
	I make their own decisions about what observations to make, what measurements to use and how long to make them for.
	I can look for causal relationships in my data and identify evidence that refutes or supports my ideas.
	I choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. I can take repeat measurements where appropriate and give justifications for their choice.
	I can decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs, use multiple methods where appropriate.
	I can identify scientific evidence that has been used to support or refute ideas or arguments, begin to form opinions about validity of these.

NATIONAL CURRICULUM OBJECTIVES

1. recognise that light appears to travel in straight lines
2. use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
3. explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
4. use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

KEY VOCABULARY

As for Year 3, plus straight lines, light rays. Teachers to use discretion on vocabulary to revisit and new vocabulary to introduce - e.g. Ibn Al-Haytham, optics, man-made, natural, shadow, absorb, reflect, absence of light, periscope, Camera Obscura

‘CORE’ KNOWLEDGE	‘ADDITIONAL’ KNOWLEDGE
1) I know that light travels in straight lines from light sources. PLAN: ASK QUESTIONS AND PLAN ENQUIRY: Raising light questions	a) I know that the moon is not a light source but just reflects light.
	b) I know which are natural sources of light and which are man-made.
	c) I know that light travels in all directions from the surface of the light source.
2) I know that Ibn Al-Haytham discovered that objects are seen because they give out or reflect light, into the eye; we see things because light travels from light sources to objects and then to our eyes.	a) I Understand the difference between opaque, transparent, translucent.
	b) I can reason about materials and their properties of reflection and absorption of light (why they reflect or absorb).
	c) I know that Ibn Al-Haytham is known as the ‘father of optics’ and studied optics in the eye 1000 years ago in Iraq.
	d) I know that colours are seen because certain light colours are absorbed by objects and only certain colours are then reflected back.
3) I can explain why shadows have the same shape as the objects that cast them. DO: RECORD: Investigating shadows	a) I know that light travels in straight lines either past, through or is absorbed by objects.
	b) I know that black is the absence of light.
	c) I know that shadow lengths are affected by the position of a light source.
4) I know that I can explore the behaviours of light and light paths by using mirrors, shadows, reflection, and refraction.	a) I know that light can be reflected around objects.
	b) I can explain how periscopes / Al-Haytham’s Camera Obscura works
	c) I know that certain objects change the path of the light – e.g. water as demonstrated by the research of Ibn Al-Haytham.
5) I Understand the eye is made up of different parts.	a) I can label and explain the major parts of the eye (Sclera, Cornea, Iris, Lens, Retina, Anterior & Posterior Chambers, Vitreous Humour)
	b) I can explain how each part of the eye helps us see things.
	c) I can explain what could make you go blind.

School Value	Topic relevance: How/when/where/why is it needed?
Resilience	- Many have to deal with a lack of light or sight- the resilience shown by people with disabilities is inspirational.
Respect	- Not everybody sees things in the same way - e.g. colour blindness or difference in opinion – we need to respect all perspectives.
Responsibility	- Many take great responsibility in supporting those who need it due to being visually impaired.
Kindness	- It takes kindness too to support those in need - e.g. how to aid someone with visual impairments.

Possible Enrichment activities	**Playing blind football in PE**
	Leading blind individuals through a set course
	Creating codes that you can read in a mirror (link to WWII)

Possible ‘higher order’ questioning	
Remember	Name the parts of the eye.
Understand	Why are shadows the same shape as objects?
Apply	Can you explain how the eye works? Do translucent objects have a shadow?
Analyse	Some shadows are darker than others. Why is this and what does this suggest about how light works?
Evaluate	What happens if sunglasses are put over your eyes? Does this impact of how you perceive shadows, and why?
Create	Can you create an investigation to test whether light does travel in straight lines?