Big Question: How do we use light and sound like we would in the Storyhouse?

AoLE: Science and Technology	Subject: Science - Physics	Year: 8

Big Question / Aim / Objective / Concept	Vision (Proposed outcome) / Purpose of curriculum	Prior knowledge / Learners previous knowledge
How do we create videos with light and sound?	This unit revises work from KS2 on light and sound, which is then extended to consider how light and sound travels and what happens when it meets an object. The work is set in the context of investigating cameras and photography, and also considers how photography has contributed to scientific discoveries and how images are used in today's society. The topic then goes on to consider pitch and frequency, the ear, differences between light, sound, and ultrasound.	Likely areas covered in KS2: • Be able to identify light sources • Know that light cannot pass through some materials, and how this leads to the formation of shadows • Be able to use mirrors and know about reflective surfaces • Know that we see things only when light from them enters the eyes • Know that sounds are made when objects vibrate but that vibrations are not always directly visible • Be able to change the pitch and loudness of sounds produced by some vibrating objects • Know that vibrations from sound sources require a medium through which to travel to the ear • Know that sound causes the eardrum to vibrate and that some loud sounds can cause temporary deafness.

What does progression look like in this Big Question?

Progression Indicator	Description of learning (What matters statements)	Student evidence of progression (Blooms) / Knowledge
Excelling	I can explain how and why various categories of waves are used for different applications. I can apply understanding of waves to ask questions and solve problems. I can use my findings to draw valid conclusions. I can review my own opinions based on new scientific evidence.	Use the law of reflection and knowledge of refraction to predict the formation of images. Compare the properties of sound and light. Compare the properties of transverse and longitudinal waves. Explain how the appearance of coloured objects is affected by coloured lights and coloured filters. Explain how we can see colours. Describe how total internal reflection is used in optical fibres. Explain how the notes on a musical scale are related mathematically.

Advancing	By applying simple rules, I can use waves in order to learn more about the world around me. I can predict the behaviour of waves in different circumstances. I can describe and explain the properties of different types of matter and relate these to how they are used. I can use a range of models to explain and make predictions. I can select relevant scientific knowledge from a range of evidence sources to evaluate claims presented as scientific facts.	Describe some scientific discoveries made using photography. Recognise that light has been investigated by many scientists in many different cultures through the ages. Explain some of the evidence to support the idea that light takes time to travel. Explain some of the evidence to support the idea that white light consists of a mixture of colours of light. Consider the benefits and drawbacks of some uses of sound. Describe how photography can be used in scientific investigations. Describe how the human eye works. Explain why a prism splits light into the colours of the spectrum. Describe how the appearance of coloured objects is affected by coloured lights and coloured filters. Explain how light is refracted. Describe how the ear works. Explain why certain materials are good for soundproofing.
Securing	I can explain how the properties of sound and light will affect how they are experienced. I can explore and describe the properties of materials and justify their uses. I can identify questions that can be investigated scientifically and suggest suitable methods of inquiry. I can suggest conclusions as a result of carrying out my inquiries. I can evaluate methods to suggest improvements.	Describe some uses of sound and ultrasound. Use the particle model to explain how sound is carried in different media. Describe how light is refracted at plane surfaces. Use a light sensor to measure light intensity. Predict how light is reflected at plane surfaces. Measure angles precisely and identify patterns in the data. Describe how a prism affects white light. Explain how filters and coloured objects transmit or reflect some colours and absorb others. Explain what equipment scientists use to detect and analyse sounds. Identify frequency, pitch, wavelength and amplitude on an oscilloscope trace. Describe how sound energy can be transferred from one place to another. Describe how hearing can be damaged by loud sounds. Explain the evidence linking changes in pitch and loudness to changes in vibrations. Recall that in different media, sound travels at different speeds. Recall the link between pitch and the frequency of a sound wave, and loudness and the amplitude of the wave.
Beginning	By manipulating the properties of sound and light, I can produce a desired effect. I can explore and communicate the basic properties of light, sound I can use my knowledge and understanding to predict effects as part of my scientific exploration. I can recognise patterns from my observations and investigations and can communicate my findings. I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.	Recall that there have been different theories in the past that have attempted to explain how we see things and how light travels. Describe some uses of photography or cameras today. Describe some scientific discoveries made using sound. Recall that light travels at very high speed in straight lines. Classify materials as opaque, transparent and translucent. Distinguish between reflectors and absorbers. Draw ray diagrams. Describe sounds as low/high, loud/soft. Measure sounds and identify patterns in the data. Recall examples of how a variety of different sounds can be produced. Describe how some musical instruments make sounds. Recall that sound needs to travel through a medium.

Authentic learning experiences (Local / National / International)	Skills (Literacy / Numeracy / DCF) / Cross Curricular links
Local Context Light and sound play integral parts in film, music and theatre productions. Storyhouse is a key contributor to young people's lives in the area. Possessing technical knowledge of how these function can be key to careers in the arts at a technical level. Pupils will work on how light and sound are used to compose images, from the use of pinhole cameras and lens to the combining of colours using filters and the production and manipulation of sounds. There are also opportunities for pupils to learn about key Welsh scientists such as Isaac Roberts who was the first scientist to be able to capture a clear deep space photograph of the Andromeda Galaxy. Edward "Taffy" Bowen was a notable scientist and engineer who worked on developing early radar, which would give the RAF a massive advantage in the battle of Britain. National Context Pupils will investigate how science developed the use of the cameras through the understanding of light. Pupils will carry out investigations similar to those undertaken by British scientist Sir Issac Newton and his work on how light travels and how it can be dispersed to separate light into its components.	Numeracy ● Measurement of angles using a protractor. ● Construction of accurate drawings using the identification of acute, right angles, obtuse and reflex angles. ● Calculation of the speed of sound using s=d/t equation. ● Calculator of frequency in hertz by identifying cycles per second ● Calculation of wave speed using v=fλ ● Introduction to standard form in the above calculations ● Measurement of amplitude, wavelength of a waveform Literacy ● Discussion on the scientific development of the camera. ● Development of the definitions for the laws of reflection and refraction ● Describe and explain using connectives to structure reasoning. ● Focus on the command word of describe for the processes of reflection, refraction and dispersion. ● Extended writing formalising sentences and structuring paragraphs. Pupils use connectives to explain their reasoning. ● Summarise information. ● Use oracy skills to present and discuss information. Cross Curricular Links: Art ● The use of colour and photography to construct pictures and videos in monochrome and colour composites.

Assessment (How will we know that students have learnt what we taught them?)	
Formative assessment: Teacher circulating Q&A discussions on various phenomenon and scientific understanding Identify key terms to definitions/examples Peer/self-assessment tasks Group experimental work Explanations of specific phenomenon such as refraction and dispersion Lesson tasks such as measuring angles precisely allows the use of whiteboards or tasks that feedback to the teacher to ensure pupils have learnt the desired process	Summative assessment: Pupils will undertake a practical assessment of how light travels through different types of lenses. Pupils will have to plan, develop and carry out a practical experiment of their design. End of 'Biq Question' test x2 (mid topic and end of topic)

Evaluation (to be completed 2024)		
Strengths	Areas for Development	Pupil Voice