

Primary: Glass in the Arts

Lesson: Glass in the Arts	
Age Group (Grade): P-6	Lesson duration: 1 hour
<p>Aim: Glass has long been used for art. Students will gain an understanding of glass, how it is made, and its properties that lend itself to be beautiful in many applications. The activities will help students understand the applications of glass in both visual and auditory art.</p>	
<p>Safety considerations: Glass pieces are used in this activity for upper primary students. It is recommended that teachers undertake a Curriculum Activity Risk Assessment (CARA) process. It is recommended that students are briefed as to the risks of cuts and the use of gloves when handling materials should be considered. It is recommended to conduct the activity in smaller groups where appropriate.</p>	
<p>Links with Curriculum (KLAs): P-Y2: Use and experiment with different materials, techniques, technologies and processes to make artworks (ACAVAM107) Y3/4: Use materials, techniques and processes to explore visual conventions when making artworks (ACAVAM111) Y3/4: Create, perform and record compositions by selecting and organising sounds, silence, tempo and volume (ACAMUM086) Y5: Light from a source forms shadows and can be absorbed, reflected and refracted (ACSSU080) Y5/6: Develop and apply techniques and processes when making their artworks (ACAVAM115)</p>	
<p>Key Vocabulary: Light Reflection Refraction Specular Diffuse Wavelengths Sound Vibrations Resonant frequency</p>	
Content	Resources
<p>Focus Questions:</p> <ul style="list-style-type: none"> • How is glass made? • How does light travel through glass? • What is reflection? • What is refraction? • What is a refraction index? • What determines the colour of light? • What causes a rainbow? • How does glass create sound? • How do vibrations make sound? • How do we hear sound waves? • How do different types of glass make different sounds? 	<p>Activity 1 materials:</p> <ul style="list-style-type: none"> • Cellophane Version (for lower primary) <ul style="list-style-type: none"> ○ Coloured cellophane ○ Glue ○ Acetate ○ Paper and pen or pre-made templates • Glass Version (for upper primary) <ul style="list-style-type: none"> ○ Reused colourful glass pieces – glass beads, glass stones, glass shards with blunt edges (glass shapes can be purchased or made, see links below) ○ Sheets of acetate

	<ul style="list-style-type: none"> ○ Clear glue ○ Paper and pen or pre-made templates <p>Activity 2 materials:</p> <ul style="list-style-type: none"> ● Glass bottles and containers ● Water ● Rubber tipped drum mallets ● Tuning instrument (see link below for online metronome) ● Simple sheet music (see link below for free sheet music)
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Lesson Outline

Introduction

Ask students

- What is glass made from?
- How is glass made?
- What is glass used for?
- What glass can we see in this room?

Introduce topic

The theme of this lesson is to understand how light and vibrations change / react to glass. Topics to be covered include what glass is, how light passes through glass, how light colours glass, and how vibrations create sound.

Discuss safety (upper primary)

Inform students of the risks associated with glass. Advise students to inform an adult of any glass breakages. Ensure that students know not to touch any broken glass. Consider using gloves when handling glass and have students work in small groups.

Main Lesson

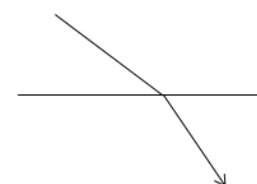
What is glass? Glass is made by melting a mixture of sand, limestone, and soda ash at very high temperatures. When melted, glass acts like a liquid, meaning it can be poured, blown, pressed, and molded into plenty of shapes.

Light

How does light travel through glass? When light travels through the air and into glass, it is both reflected and refracted.

What is reflection? Reflection is the reason we can see anything. It is light ‘bouncing’ off an object and back into our eyes. There are two main types of reflection: specular and diffuse. Specular reflection happens when you have a very smooth surface to reflect light upon, reflecting back a well-defined beam of light (e.g. glass, a mirror, or a polished spoon). Diffuse occurs when there is a rough surface, scattering light all over the place (e.g. light on a dusty or bumpy surface does not show your reflection).

What is refraction? Refraction is light changing directions / bending when it comes into contact with a new medium (e.g. when a pencil sits half in water and half in air it appears to bend in the liquid). This occurs because the speed of the light reduces as it passes



through the new material. This can be compared to us running through air versus water –water is denser than air, making us slower.

What is a refraction index? The refraction index is a measurement of how easily light can pass through something. It is compared to the speed of light in a vacuum, where nothing can slow light down. Glass has a higher refraction index because it is thicker than air.

What determines the colour of light? Light created by the sun, or torches, is made up of all the colours of the rainbow. Each of these different colours are on what is called their own 'wavelength'. The color of a glass, or any object, is determined by the wavelengths that the glass absorb. Any wavelength that is not absorbed, is transmitted, making it visible to us. For example, when a ray of light hits a tomato, the tomato absorbs all the wavelengths but transmits red wavelengths.

What causes a rainbow? This is caused by refraction. When white light moves through the air and enters a water droplet, each wavelength is refracted. Each colour refracts at slightly different angles as each wavelength is different. This causes the colours to spread and create a rainbow.

Sound

How does glass create sound? Glass creates sound when it is vibrated.

How do vibrations make sound? A vibration is a wave of energy that travels through the air to our ears. The stronger the vibrations, the louder the sound. The softer the vibrations, the quieter the sound.

How do we hear sound waves? Sound enters your ears as waves and flows through to your ear drum. This wave makes the ear drum vibrate. There are tiny hairs in your ear that move and sends a signal to your brain to tell you you're hearing sound.

How do different types of glass make different sounds? The addition of water or thicker walls to a glass container makes it more difficult to vibrate. Compare this to a thinner glass with less water, there is less resistance to vibrations. The easier the vibrations, the faster they get, causing a higher frequency.

Activity One: Creating a Leadlight Mosaic

Students will explore how light behaves through glass utilising recycled or reused glass products to create a 'lead light' art piece or mosaic.

Steps:

1. Have students draw a design or pick from a collection of pre-made designs.
2. Place the design under the acetate sheet.
3. Using the varied glass / cellophane materials provided, students will lay out coloured pieces to make their design.
4. Once the design template is filled with materials, glue pieces down onto the acetate and then wait to dry.
5. Once completely dry, hold up to a window or shine a light behind to see colours coming through.

Follow-up Questions:

- Did we notice any refraction when light was hitting our mosaics?
- What happens when we shine coloured light onto our mosaics?
- Were we still able to notice our reflections in the mosaic?

Activity Two: Musical Glasses

Activity Two will explore how glass interacts with sound waves. The goal will be to scavenge reused or recycled glass pieces (jars, bottles, cups, containers) to create a series of instruments to build a musical scale.

Steps:

1. Provide each student with a glass jar, bottle, cup, or container.
Optional: Encourage families to donate glass jars by dropping these at school on behalf of students. Students can be reminded on the value of reusing glass packaging.
2. Have students fill their container with varied levels of water.
3. Tap containers with rubber tipped drum mallets to chime a tune.
4. Using a tuning instrument, align the containers to create a scale.
5. Have students play or create a simple song by tapping their containers (e.g. three blind mice or hot cross buns).

Follow-up questions:

- Did thicker glasses have a higher or lower tone?
- Could you feel the vibrations in the glass / see them in the water?
- What do you think would happen if we put honey in the containers? Or peanut butter?

Evaluation

- Students can identify what glass is made from and what process turns sand into glass.
- Different types of glass can be listed.
- Students can explain how light refracts through glass
- Students can explain how vibrations cause glass to produce sound.
- Students understand how light travels through coloured glass.

Additional suggested activities and support

Website links to artist's work who uses glass, sound and light:

- Stephen Knapp: <https://www.vice.com/en/article/8qv5gk/artist-creates-prismatic-paintings-with-light-and-glass>
- Dale Chihuly: <https://www.chihuly.com/life>
- Sabine Mescher-Leitner: <https://www.recyclart.org/figurine-empties/>

Resources for Activity 1

- Glass shapes for purchase: <https://www.19mosaics.com.au/store/glass>
<https://www.aliexpress.com/w/wholesale-tesserae.html>
<https://www.etsy.com/market/tesserae>

Resources for Activity 2

- Online Metronome: <https://theonlinemetronome.com/instrument-tuner>
- Sheet music: <https://musescore.com/>