

STEM Program



Shadowlands

Light Waves and Refraction

Welcome to the Shadowlands. The science principles for making shadows is relatively simple but there are lots of fantastic ways it can be applied in scouting.

Suited to Section



Joey Scouts



Cub Scouts



Scouts



Venturer Scouts



Rover Scouts

Key SPICES Growth



SOCIAL



PHYSICAL



INTELLECTUAL



CHARACTER



EMOTIONAL



SPIRITUAL

Challenge Area



COMMUNITY



PERSONAL GROWTH



OUTDOORS



CREATIVE

Likely Scout Method Elements



COMMUNITY INVOLVEMENT



LEARNING BY DOING



NATURE AND THE OUTDOORS



PATROL SYSTEM



PERSONAL PROGRESSION



PROMISE AND LAW



SYMBOLIC FRAMEWORK



YOUTH LEADING, ADULTS SUPPORTING

STEM Program

Shadowlands



Scouts
AUSTRALIA

Plan

There are 4 key components you need to be able to make a shadow:

1. A light source of some variety
2. An object(s) to block the light
3. A surface behind the object for the shadow to form on (a screen)
4. The opaque object is placed between the source of light and the screen

Do

Depending on the youth level there are lots of different applications of shadow science that you might choose to do. Here are some suggestions:

1. Shadow puppet stories eg Patrol makes up a story or tell a favourite story (can be themed to lots of different calendar events) or <https://www.science-sparks.com/the-gruffalos-child-shadow-puppet/>
2. Making shadow pictures - What pictures can you create by arranging objects in front of a blank wall or piece of paper. Shine a light behind the objects and see the shadow picture you have created. Can you create a city scape? How about a T-Rex from kitchen tools? What about a patrol box shadow challenge – can you make a bunch of flowers, a bicycle, a star, a bridge, a snail, a number etc and then create a shadow puppet story with these objects?

3. Shadow animals with hands <https://i.pinimg.com/originals/07/9f/35/079f3599843d7b6d584a1ae957de1d6d.jpg>
4. Shadow Art - You could extend the shadow picture activity to also draw the shadows on paper. Lots of great shadow art ideas here <https://www.science-sparks.com/shadow-activity-ideas/>
5. Shadow tag [Shadow Tag \(thegeniusofplay.org\)](http://thegeniusofplay.org)
6. Make a shadow frame <https://www.science-sparks.com/easy-shadow-frame/>
7. Create coloured shadows <https://innerchildfun.com/2013/07/how-to-make-colored-shadows.html>
8. Human sundial (great one for an SIA at home) <https://rhythmsofplay.com/human-sundial-shadow-science-experiment/>
9. There are some skills in the OAS where you can use shadows to measure objects <https://scoutingeverywhere.wordpress.com/2011/06/25/shadow-method/>
10. <https://inventorsof tomorrow.com/2017/01/09/light-and-shadow-experiments-for-kids/>
11. <https://rhythmsofplay.com/educational-shadow-activities-for-kids/>
12. <https://www.steamsational.com/shadow-activities/>

Review

Depending on your choice of activities how you review it may be different.

1. For shadows that involve the sun:
 - i. How does the time of day affect your shadow?
 - ii. Can you experiment with shadows at different times of day? You should find that the Sun makes the longest shadows at the beginning and end of the day, when the Sun is lowest in the sky and the shortest shadows at midday, when it's highest in the sky.
2. For shadows that involve a generated light source (like a torch or light bulb)
 - i. What happens if you move objects further from or closer to the light source? <https://www.stem.org.uk/resources/elibrary/resource/315603/what-factors-affect-size-shadow-shadow-theatre>
 - ii. Can you make a shadow twice as tall as another with the same resources? How?

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Variations

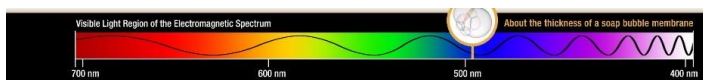
- These activities all involve viewing a shadow on a screen from the same side as the light source. However, the same principles can be applied to view a shadow on a screen from the opposite side to the light source. This can be one way to perform a shadow puppet theatre.

Safety Tips

- When making shadows using artificial light sources be aware of moving around in the dark areas as there might be trip hazards. Some light sources can get quite hot if used for extended times. Try to avoid looking directly into the light sources as this may damage your eyes.

Why Does This Happen?

Light – a wave of energy that travels in a straight line



Light source – something that creates and emits (gives off) light e.g. sun, light bulb, laser (not the moon – it reflects light from the sun)

Scatter - The further a light beam gets from its source the wider and less bright the beam becomes – scatter



Dark – absence of light

Shadow – caused by a light source being blocked by an opaque object

Transparent – allows light through so you can see clearly e.g. glass window



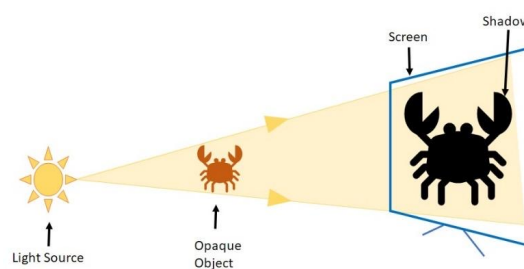
Translucent – partially blocks light and scatters the light in different directions so you can't see clearly through e.g. frosted glass window



Opaque – blocks all light e.g. solid wall



To create a shadow you need a light source to shine on an opaque object which blocks some light reaching a screen. Where the light is blocked this forms a dark area on the screen which is what we call a shadow.



SciScouts Physics of Waves

The SciScouts Physics of Waves is a National Science Week project, undertaken in collaboration with Fizzics Education. These instructions were prepared by Scouts for Scouts. This National Science Week project is supported by the Australian Government.

Scouting has always been strong on STEM skills. Maths to calculate catering quantities and navigate, the science of water purification, the physics of abseiling, and the engineering of pioneering structures – they all have their place. In the current program for our youth members, STEM and Innovation forms one of six Special Interest Areas that enable Scouts to set goals and pursue their own ideas.

