



Science - Earth and Space - Shadows and sun clocks

<p>Learning Intention</p> <p>Understanding daily changes in the environment</p>	<p>Curriculum Outcomes</p> <p>Science</p> <p>STe-1WS-S observes, questions and collects data to communicate ideas</p> <p>STe-6ES-S identifies how daily and seasonal changes in the environment affect humans and other living things</p> <p>ST1-10ES-S recognises observable changes occurring in the sky and on the land and identifies Earth's resources</p> <p>ST2-10ES-S investigates regular changes caused by interactions between the Earth and the Sun, and changes to the Earth's surface</p>
<p>Lesson -</p> <p>Students make a sun clock by tracing shadows at regular intervals in different colours and labelling the time for each shadow. Students then investigate and explain what makes the shadow move and how the location and length of the shadow might change throughout the day and seasonally.</p>	<p>Activities</p> <p>1A - Making a sun clock</p> <p>1B - Deeper learning- What make the shadows move?</p>
<p>Online Links (optional)</p> <p>Scientific American- It's time to make a sundial https://www.scientificamerican.com/article/its-about-time-to-make-a-sundial/</p> <p>Shadow art ideas https://kidsactivitiesblog.com/137133/how-to-make-shadow-art-with-kids/</p>	
<p>PLEASE NOTE- This activity will only work on a sunny day and is best if you start earlier in the morning.</p>	

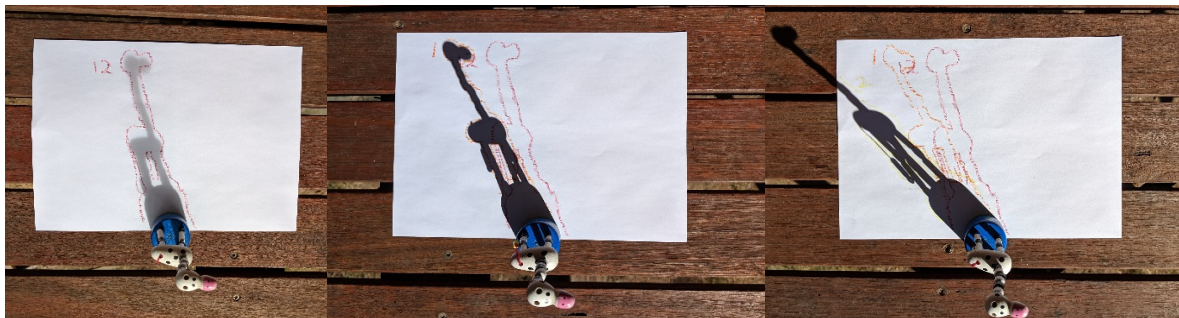
1A- DIRECTIONS

MATERIALS

- A4 blank paper OR an area of concrete that receives full sun
- Coloured crayons or markers OR (if drawing on concrete) coloured chalk
- A clock or watch
- A small object (10-20cm high) that can stand by itself and cast an interesting shadow. If it is light use a blob of blu tack to stick it to the ground
- An area of ground that receives full sun and has a smooth surface (or you could place the paper on a large book/ piece of board)

METHOD

1. Stand in the full sun facing the sun and place your object on the ground. Move your object so that it has the largest shadow.
2. Place your paper on the ground so that one long edge is touching the base of your object and the object is in the middle of the long edge. If it's windy, secure your paper and object. If you are using chalk and concrete just position your object.
3. Arrange your coloured pencils/crayons/chalk in rainbow order
4. Using your red pencil/crayon/chalk trace the outline of the shadow cast by the object. Write the time in red at the top of the shadow.
5. Go do something else for an hour (or whatever time period you choose). Make sure that you come back!
6. What has happened to the shadow? This time use your orange pencil/ crayon/ chalk to trace the shadow again. Label the time in orange.
7. Go do something else for another hour (or the same period of time as before). Make sure that you come back!
8. This time use your yellow pencil/ crayon/ chalk. Don't forget to label the time.
9. Repeat every hour for at least two more colours.



1B What make the shadows move?

Describe what happened to the shadows?

Why do you think this happens?

Explainer: What makes the shadows move?

Shadows move in response to the angle and height of the sun in relation to a location on Earth as it passes east to west across the sky. Seasonal changes, caused by the tilt of the Earth on its axis as it orbits the sun.

Younger children might be surprised to learn that while it might look like the sun moves across the sky but actually it is Earth that is moving.

The Earth rotates on its axis at a speed of approximately 460 metres per second which results in a shadow moving approximately 15 degrees every hour.

Extensions - Extend this experiment

- 1- Draw a line through the vertical centre of each shadow. Measure the angle between the centre of each shadow using a protractor. Is it close to 15 degrees?
- 2- You could make a permanent sundial in your garden or on your verandah using a rock, sculpture or simply a stick. Watch what happens to the accuracy of the sundial as the seasons change.