



THE PATH OF THE SUN

Goal(s):

To observe the path of the sun across the sky and how this varies according to the time of day or the season. Ultimately, this will help the pupils to learn about solar energy.

General description of the activity:

The pupils observe the path of the sun:

- **During the day**
- **Throughout the seasons.**

To observe what the path of the sun **during the day**, the pupils go out to a place where asphalt or concrete can be found. The pupils work in pairs. One child stands still. The other one draws the position of the feet and also the shadow outline of the partner's body in chalk. They write a name label next to the outline and the time. The pupils come back once every hour, repeating the drawings of the shadow and notice the changes to its length and angle from the original position. This may well be called "the human sundial"

To observe the path of the sun **throughout the seasons**, a paper with a hole in the middle is hung at a south-facing window. Once a week, at midday (the meridian), the position of the shade of the hole on the floor is observed by all the pupils and a piece of paper tape is fixed there, with the date written on it.

Required materials:

- For the path of the sun during the day, a court or area covered with concrete or asphalt, in a non-shaded area
- For the meridian, a south-facing classroom or room
- Tape
- Chalk
- Direction compass



- Rulers
- Clock

Required pupil skills:

- Measuring in m and cm
- Telling the time
- Reading a direction compass
- Ability to work with a partner
- Ability to measure angles
- Fine motor skills for using the chalk

How does this activity fit into the curriculum:

This activity is well suited for lessons in Science, Mathematics, Geography and Literacy.

Safety issues:

Sun-cream and sun-hats should be worn.

Individual steps of the activity:	Required time:
1. A very short presentation of the objectives and the description of the two activities: the shade during the day and the meridian.	Introduction – ½ lesson
2. An agreement should be struck with the school cleaners/caretaker so that they leave the strips of tape on the floor when they clean it.	Preparation
3. The pupils are shown to a sunny place to draw the shadows over consecutive hours.	Sun path during the day
4. The pupils work in pairs, one drawing, the other being the shade-maker (Human Sun-dial).	A whole day of observations
5. It is important that the pairs are spaced well apart so that drawings do not cross over.	
6. The child drawing needs to include the position of the feet, the outline of the shadow, the time and the name of the shade-maker.	
7. Go back into the classroom.	
8. After one hour, the pupils go back and repeat the process. This should go on for as long as possible for maximum impact. Ideally, the activity should begin in the morning, include midday and then continue in the afternoon.	
9. On the following day – or at the end of the same day – all	Analysis and



<p>the pupils look at all the shadows drawn on the floor and discuss the outcomes with the teachers. By the end of this, the pupils should realise why the shadow has changed shape and angle and which direction it has moved in.</p>	reflection – 1 lesson
<p>10. At the beginning of the school year a square of cardboard or paper (about 20 cm large) with a 1 cm hole in the middle, is hung at a south-facing window. It should be put in a place where the shadow at midday hits the floor during all seasons, taking into account the sun height (see Aid 1 below).</p> <p>11. At midday on a specific day, the pupils look for the shadow of the hole on the floor and put a piece of paper tape on that place. They or the teacher write the date on a piece of paper or paper tape. Transparent tape could then be put over this in order to protect the writing.</p> <p>12. The same thing is repeated at midday of the same day, once a week, during the whole school-year.</p>	Sun path along the seasons A whole school year of observations
<p>13. At the end of the school year, the recordings of the meridian are discussed. When was the sun the lowest? When the highest? A yellow wool thread (representing the sun rays) could be hung, connecting the hole with its shade position, at the highest and lowest elevations of the sun.</p>	Analysis and reflection – 1 lesson

Suggestions for combination with other AL activities:

“Shine a light on savings” – What types of light bulbs exist on the market and how does their energy consumption differ from one another?

“One day without electricity” – What did they do before electricity was discovered?

Variations:

The sun dial

Older pupils could design and build a sun dial, to be installed in a south facing wall of the school.

Field trip1:

If an old meridian marker exists in the area, the pupils could be taken to visit it. There are some in old churches, with a hole in the church roof and the inscriptions of the days of the week in the place where the rays coming from the hole at midday hit the floor. In Italy for example, there is one in Milano Duomo and another one in Bologna.

Field trip2:

Find a local sun-dial to visit.

Festivals

There are many festivals ancient and modern associated with the sun, particularly the Spring & Autumn equinox and the Summer and Winter solstice. The pupils could research some of these and present the findings.



Available aids:

Aid 1 – Information about the path of the sun.



Information about the path of the sun

The position of the sun changes with the time of the day (depending upon the rotation of the earth) and with the day of the year (depending upon the change of the inclination of the earth's axis with respect to the sun's orbit).

The position of the sun during the day and its angle with respect to the north increases 15° each hour. This is the angle that should approximately appear between shadows recorded every hour.

The position of the sun at midday can be identified when the shortest shadow is observed. It may not correspond exactly to the south of the compass, there may be differences depending upon the longitude of the location in relation to the time zone.

The elevation of the sun at midday alters according to the season. It is at its lowest during the winter solstice (21 December) and its highest at the summer solstice (21 June). The winter solstice elevation is equal to the latitude of the location minus 23° . The summer solstice elevation is equal to the latitude of the location plus 23° . For example, in Milano (latitude 45°) the winter solstice elevation is equal to 22° ($45 - 23$), while the summer solstice elevation is equal to 68° ($45 + 23$).





The path of the sun – Aid 1



Search words:

Energy end-use	General topic	Educational subject	Age level
Transport	General sustainable development	Mathematics	6-8 years
Space heating & cooling	Renewable energy	Science	9-10 years
Hot & cold water	Energy efficiency (saving)	Literacy	11-12 years
Lighting	CO ₂ wise transport	Geography	
Electric appliances			