

# FOLLOW A SHADOW

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## 1 LET'S GET INTO IT

**Motivational introduction** – at a selected place near the school, you will review the points of the compass, and determine where the sun is in the morning (when the children go to school), at noon and in the evening.

### Additional questions:

Do you know how long your shadow is? Will it be bigger than you? You have a pole 1 metre high. How long will the shadow of the metre stick be? Does its length change? What does the size of the shadow depend on? Will it change during the day? Will it change during the year? How can you find out?

"We'll measure it!" Have a tape measure with you (so that the children can't see it) and pull it out at the end of the discussion. – "Where will we measure the shadow?"

## 2 MEASUREMENT

The individual measurements are short with the children taking turns with the tape. The values for the length of the rod's shadow and the time are recorded by at least one person, preferably one who is interested. One child in the class is enough.

**TIP:** Pay attention to the time changes due to Daylight Savings Time or British Summer Time. There is no need to recalculate anything, just point out the reasons for the sudden value changes.

The student does practical work outside.  
The student determines the approximate cardinal directions from which the sun shines.  
At the same time, the student will show the directions where shadows fall.  
**GOAL** The student measures the length of the shadow of a 1 m high pole using a tape measure.  
After completing the observations, the student will be able to tell when a shadow should lengthen and when it should shorten

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**TIME** This is a long-term activity with short individual measurements repeated **MANY TIMES** during the year. The motivational introduction and final summary take the longest time. Measurements must be taken at approximately the **SAME TIME** daily

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**AGE** Preferably 5–7th grade at elementary school

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**WHERE** A place close to the school which receives direct sunlight all day and where a long stick can be placed stably

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**WHEN** The whole year when the sun shines

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**YOU NEED** A pole 1 metre long (sunk into the ground), a tailor tape measure, pencils and notebooks, chalk for drawing an outdoor graph on the final lesson, plastic markers (may be cut from a plastic bottle) for measuring the shadow during the day and a permanent marker for writing

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### 3 SHADOW CHANGES DURING A DAY

Choose a sunny day when you could go and measure the shadow every hour. It is enough from 8 am to 1 pm.

Invite the children to suggest where the pole should stand so you can measure all morning. Mark the spot for each measurement with a plastic tag (write the length on it). Go out, observe and discuss the results at the end of the day.

The shadow changes not only its size but also its direction, not unlike a sundial.

TIP: Post the graph on the school premises and let the students write on it so that their classmates can also see how a shadow changes.

### 4 REFLECTION

The daily measurements can stop around the summer solstice. Create a large common chart on a larger area near the school. Mark the months (with days) on one axis (which you prepare before the activity). The children (individually or in pairs) then choose a measurement and try to draw the true lengths of the shadows on specific days. You will also create another graph, in the same manner, showing the shadow's changes during the day.

### JOINT DISCUSSION:

Armed with the measurements, the students can answer the questions from the introductory lesson as well as the following:

Based on the graph, determine when your shadow will be longer than you.

Is there a place near the school where the sun shines all year round, where there is no shade?

Where might the pole stand permanently?

Why are sundials often on the walls of buildings?

Is there a place near the school in permanent shade?

### RECOMMENDATION

You can combine being outside with other observations or play.

For example, a short game "Step on someone else's shadow" where players have to move (they can stand, but only for a while) and try to be the first to step on someone else's shadow. It is possible to temporarily hide behind an obstacle (e.g. a tree) to save your shadow. I recommend playing it only briefly as this activity tends to lead to altercations but it can liven up the situation quite a bit if done for short durations. All the students running outside during class when the sun is shining is popular. Or learning about trees...

Very often it is clear that the place chosen in autumn is not suitable in winter, because there is something casting a new shadow in the way. It is advisable to choose the start or end of the lesson closest to noon when the sun is higher in the sky.

One advantage to this project is that there is a minimum amount of notes to take. Children tend not to like to write. Some children record the values on their mobile phones which make it easy to send a day's measurements to the children recording these numbers if or when they are sick or otherwise not at school that day.

If you measured the shadow around noon and are able to choose the location of the final graph then it is better to draw the graph along the North-South axis (as in the measurements) for clarity.

Everything needs to be checked. Students sometimes have a problem when measuring with some measuring tapes which have values on both sides or have markings in metric and imperial which makes it possible for the children to measure using an incorrect unit. They also wonder how to measure a longer length (over 3 metres) when the tape measure is only 150 cm.

This is one of the few long-term observation projects during classes. It is possible to connect this study with long-term phenological observation.



## EVALUATION OF THE ACTIVITY'S GOAL (EVIDENCE OF LEARNING)

- The student learns from a practical study conducted outside
- The student (alone or in a group) creates a stick with marked distances (you can also measure the azimuth during the year)
- The student cooperates in creating a joint graph with the marking of the length of the shadow
- whether or not your shoes are wet

## CONNECTIONS

This activity is part of the fifth grade science class and can be tied to previously learnt science and mathematics. This activity can also be added to geography at a higher level. The summary of the activity is suitable for demonstrating the term "graph".



