Time, seasons and height of the sun in the sky

What is this activity ?

Integrated into a sequence on the seasons, this activity helps children understand the influence of the rotation of the Earth, and seasons on the height of the Sun in the sky.
Pupils are divided into groups of 3-4 and use a tablet to measure the vertical tilt of the Sun, without looking directly at the Sun for safety reasons. They then study the data from an ephemeris on an application to find out the position of the Sun in the sky on different dates. They experimentally verify these data and compare the maximum heights of the Sun for different dates. They also discover the discrepancy between solar time and our clocks. By analyzing the data, students determine the dates when the Sun is highest or lowest in the sky and think about how these variations correspond to the seasons. Finally, they discuss the importance of understanding these variations for various practical applications, such as the design of energy-efficient dwellings, the understanding of climatic variations and the impact on ecosystems.

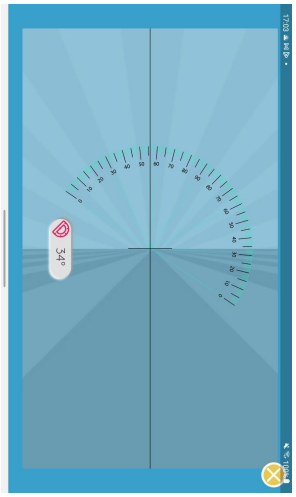
Type of the activity
Life and earth science - outdoor

Materials and equipment
FizziQ Junior app on smartphone or tablet

FizziQ Jr functionalities used
Sun - Moon instrument
Vertical angle
Experiment notebook (text and photos)

Instructions:

- This activity is best done as part of a sequence about the seasons.
- Explain to students why the height of the sun varies in the sky during the day due to the rotation of the earth. Also tell them that the maximum height of the sun depends on the position of the observer on the earth and also on the seasons.
- Divide students into groups of 3 to 4.
- Ask students how high the sun is in the sky by measuring the angle between the horizontal and the direction of the sun. Which FizziQ instrument can they use? **ATTENTION, CHILDREN SHOULD NEVER LOOK AT THE SUN DIRECTLY AS IT MAY MAY RESULT IN DAMAGES TO THEIR EYES AND RETINA**
- A simple way to do this is to use the vertical tilt instrument on the tablet. We lay the tablet flat then lift the left side. The inclination is indicated. By placing the tablet on a notebook on the ground, facing the sun, we see that when we lift the tablet, the shadow of the tablet shrinks. At the point where the shadow is the smallest, the tablet is oriented towards the sun and we can deduce the angle between the ground and the sun.



- Ask them to find on FizziQ Junior the instrument that will allow them to know the position of the sun in the sky for each day of the year.ask them to study the different information given by this instrument. They notice that they can know the elevation of the sun during the day.
- Can they experimentally verify the ephemeris data?
- Ask them when is the sun highest in the sky? By making several attempts by changing the date in the tablet, do they find this result? They will find that there is a discrepancy in our watches relative to solar time.

- Ask them then if the maximum height of the sun during the day is the same for different dates. They can try different dates on the app, and experimentally determine the dates when the sun is highest or lowest. When do these dates correspond?
- Encourage students to reflect on the importance of understanding these variations for various applications, such as designing energy-efficient homes or understanding climate variations.

Scientific background

The height of the Sun in the sky varies during the day due to the rotation of the Earth on its axis. The Earth completes a full rotation on itself in 24 hours, which causes the Sun to appear to move from east to west in the sky during the day.

In the morning, at sunrise, it is near the horizon to the east. As the day progresses, the Sun appears to rise in the sky until it reaches its maximum height at solar noon, when it is closest to the zenith (the highest point in the sky). After solar noon, the Sun begins to descend and approaches the western horizon until it sets.

The maximum height of the Sun in the sky depends on the inclination of the axis of rotation of the earth,the latitude and the position of the Earth in its orbit around the Sun (thus the seasons).

Tilt of Earth's Axis of Rotation: Earth's axis of rotation is tilted about 23.5 degrees from the plane of its orbit around the Sun. This tilt causes the Sun's maximum height in the sky to vary over the seasons.

The seasons: As the Earth orbits the Sun, the tilt of its axis causes the Northern Hemisphere to receive more light and heat from the Sun during the summer, while the Southern Hemisphere does. less. In winter, it's the opposite. During the equinoxes, the maximum height of the Sun is the same for both hemispheres. Thus, the maximum height of the Sun varies according to the seasons.

Latitude: Latitude is the measure of the angular distance of a point on Earth from the equator. The closer we get to the poles (increase in latitude), the lower the maximum height of the Sun in the sky. This is due to the greater angle between the Sun's rays and the Earth's surface at higher latitudes.

At the winter solstice, the maximum height of the sun is equal to (90 - latitude - 23.5) degrees, in summer the maximum height of the sun is (90 - latitude + 23.5).

Security

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Students should be careful when using their tablet outdoors. They shouldn't get distracted, drop the tablet on the floor, or get water on it. Tablets are fragile objects.

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