Day length and seasons

FizziQ activity · Elementary · 45 min

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Primary school groups look up sunrise and sunset times for each season with the FizziQ Junior ephemeris on tablet and link day length to Earth's tilted axis.

Learning objectives

- Understand that seasons are caused by the tilt of Earth's rotation axis.
- Use the FizziQ Junior ephemeris to find sunrise and sunset times.
- Compare day length between different seasons.
- Interpret observed variations and relate them to Earth's orbit.
- Discuss the impact of seasonal variations on agriculture and ecosystems.

Instruments and sensors

Sun-Moon ephemeris

Materials

- Smartphone or tablet with FizziQ Junior
- FizziQ Junior experiment notebook
- Board for pooling results
- Note: the protocol remains adaptable to any comparable ephemeris or astronomical almanac tool.

Protocol

1. Present the concept of seasons to students and explain that they are caused by the tilt of Earth's rotation axis relative to its orbit around the Sun.

2. Divide students into four groups, each representing a season: spring, summer, autumn, winter. Each group chooses a representative date for their season (e.g., the solstice or equinox).

3. Ask students which FizziQ Junior instrument they could use to know sunrise and sunset times. Guide them to the Sun-Moon ephemeris.

4. Open FizziQ Junior, access measurement instruments and select the Sun-Moon ephemeris. Explore the information displayed: sunrise, sunset, day length.

5. Each group finds sunrise and sunset times for their chosen date. Students add a copy of the instrument to the experiment notebook.

6. Ask them to also determine sunrise and sunset times one week before and one week after their date, to observe the evolution.

7. On a collective board, create four columns (one per season). Each group reports their data: date, sunrise time, sunset time, and calculated day length.

8. Ask students to observe variations between seasons. Which season has the longest days? The shortest? Are durations symmetrical between spring and autumn?

9. Discuss with the class the reasons for these variations: Earth's axis tilt means the Northern Hemisphere receives more light in summer and less in winter.

10. Summarize conclusions and emphasize the importance of these variations for agriculture, human activities, and ecosystems.

Expected results

Students will observe that day length varies significantly between seasons. In summer, day length reaches about 16 hours at the summer solstice (in France), while in winter it drops to about 8 hours at the winter solstice. At equinoxes, day length is close to 12 hours.

Students will also notice that sunrise and sunset times change progressively from one week to the next, with faster variations around equinoxes than around solstices. Recorded data may show slight differences depending on the school's geographic location.

Questions

- Why does day length vary throughout the year?
- What would happen if Earth's axis were not tilted?
- Is day length the same everywhere on Earth at a given date?
- Why don't equinoxes correspond exactly to 12 hours of daylight?
- How do farmers use knowledge of seasons to plan their crops?

Going further

- Compare data between two cities at different latitudes (e.g., New York and Miami).
- Plot a graph of day length vs. months of the year.
- Study the midnight sun phenomenon in polar regions.
- Observe the variation of sunrise direction using the compass over several weeks.
- Find sunrise and sunset times for the Moon and compare with those of the Sun.