

What's the Angle?

Summary

Students will determine the relationship between the angle of the sun and the length of shadow it projects. Students will understand how the tilt of Earth causes this angle change, and affects temperatures in certain regions and thus causes seasons.

Time Frame

3 class periods of 45 minutes each

Group Size

Individual

Materials

- rulers
- [student worksheet](#)
(attached)

Background for Teachers

Time needed:

Notes to Teacher:

Each data collection should be recorded at the same time of day. The longer you collect data, the clearer the pattern will be to your students. Plan to avoid a daylight savings change but if you can chart the sun over a solstice (Dec. 22 most likely) this would be very instructive.

Student Prior Knowledge

Students should understand the angle of isolation and solar radiation. It would be helpful to complete the "Angle of Insolation" lab before you begin this lab.

Instructional Procedures

Assemble needed supplies.

Run off enough copies of the student sheets for all participating students.

3. Hook

: When students arrive in class have them all follow you outside. Have students stand in a single file line so each person can see his or her shadow. (Do this without telling them why they are facing the direction they are.) Direct students attention to their shadows. Ask for several volunteers to explain what they think will happen to their shadow as the day progresses. Take as many responses as you get. Come to a class consensus. Hopefully students should realize that their shadow will get shorter as noon approaches and longer past noon. Bring students back to the classroom.

Ask if anyone knows how your shadow might change throughout the year. Take any responses. Tell the students they will be collecting data on shadow length for the next few weeks to answer this question.

Pass out the student sheets. Allow students to read through the background information in their labs.

Review with students what the angle of insolation means.

Have students read through the lab procedures and make their predictions.

Allow students to 10 minutes once a week to collect data.

Provide time for students to answer questions when data collection is complete.

Discuss questions.

Answers to Analysis Questions:

The angle of sunlight gets larger as summer approaches.

Higher

Warmer because the solar radiation is more direct, it is not scattered as it would be at a smaller angle.

This marks a turning of the seasons, the days become shorter because the sun is not as high in the sky. The smaller the angle the cooler the temperatures will become as the radiation begins to scatter more and more as the winter solstice approaches.

The sun's angle changes because the earth is tilted on its axis. As it rotates around the sun sometimes the northern hemisphere is tilted towards the sun and at other times the southern hemisphere is tilted towards the sun.

When a hemisphere is tilted towards the sun the angle of insolation is greater because the sun is higher in the sky. This will cause a warm season. When the hemisphere is tilted away the opposite occurs. This is the cause of the seasons, seasons are a part of the climate of an area because they affect long term weather patterns.

The earth's distance from the sun at various points in its rotation is irrelevant. The seasons are caused by the tilt of the earth affecting the angle of insolation. The earth is actually closer to the sun in the winter.

Not significantly. This means there are no significant seasonal changes. The climate remains the same throughout the year.

9.

Rate of change should be consistent between all students (within reason). The rate of change would be greater the further you are from the equator, with the greatest change at the poles.

Conclusions:

Answers will vary but should be detailed and relevant. Students should also use complete sentences.

Assessment Plan

Sample Grading Rubric:

Bibliography

Lesson Design by Jordan School District Teachers and Staff.

Authors

[Utah LessonPlans](#)