

Direct and Indirect Radiation Lab

Summary

Students will determine the relationship between the angle of the sun and the intensity of light. They will do this by calculating the surface area that a source of radiation covers on a piece of graph paper.

Main Core Tie

Science - Earth Science

[Standard 3 Objective 1](#)

Time Frame

1 class periods of 60 minutes each

Group Size

Pairs

Materials

- flashlights or other light source
- colored pencils
- graph paper
- protractors
- textbooks and tape (optional)
- [student sheet](#)
(attached)

Student Prior Knowledge

Students should understand latitude and longitude. They should understand solar radiation and how to use a protractor.

Instructional Procedures

Assemble needed supplies and run off enough copies of the student sheets

2. Hook

: Turn off all the lights in the classroom after students have arrived. Hold a flashlight under your chin and turn it on. (Like you are going to tell a ghost story. You may want to cackle or howl to get a laugh from the students.)

Ask for 3 brave student volunteers. Have the students come to the front of the classroom. Tell your class to watch the light on the faces of the volunteers and the volunteers reaction to the light. Shine the light on the first volunteer at a small angle (indirectly). The next volunteer should be more direct and the last volunteer shine the light directly on their face. (You may want to make sure this is a good natured student.) Most likely you will receive a wince from the last student.

Thank the volunteers and let them return to their seats. Turn the lights back on in the classroom. Ask for students to explain to you the differences in the light on the faces of the 3 volunteers and why they responded the way they did.

Hopefully students will make the connection between the angle of the flashlight and the directness of the light. This should lead well into the lab.

Pass out the student sheets.

Allow students to read through the background information in their labs and complete questions in background.

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

Clear up any questions students may have regarding the lab.

Allow students to complete the lab.

Provide time for students to answer questions.

Discuss questions.

Answers to Background Information:

Angle A 30-degrees has the coldest temperatures

Angle B 60-degrees has moderate temperatures

Angle C 90-degrees has the warmest temperatures

Answers will vary for student explanations. Accept all answers.

Answers to Analysis Questions:

90-degrees

Direct

0-degrees latitude, at the equator. The temperatures would be higher because the radiation from the sun is more direct.

The overall energy is greater per square meter because the sunlight is more direct. Sunlight equals the energy which powers a food chain. There will be more organisms in the ecosystems at the equator because more energy is available.

The larger latitudes near the poles. The temperatures would be coldest because the radiation from the sun is scattered, or less direct.

The overall energy per square meter would be much smaller because the energy from the sun is spread out over a greater distance. There are less organisms at the poles.

If you change the distance of the light source you change the intensity of the light. The distance doesn't matter as long as you are consistent with each angle.

The climate of a region is determined by temperature and rainfall. The directness of the sun's radiation is a major factor in determining the temperature.

Other factors which can influence climate are elevation, proximity to a body of water, and air and water currents.

10.

The angle shown in drawing A represents Utah during the winter. The angle is smaller relative to the angle shown in drawing B. Drawing B represents Utah in the summer when the Northern Hemisphere is tilted towards the sun. This increases the angle at which the sun's rays strike the earth in the N-hemi. This causes the radiation to be more direct and causes the warmer temperatures.

Answers to 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](#)