

Does the Sun have Seasons?

Rich Task 1 Activity 3

Introduction:

The Sun is our nearest star and provides the conditions for life to exist on Earth. It's about halfway through its lifetime and acts as a nuclear reactor, giving us heat and light. It accounts for 99% of our solar systems' mass and one million Earth-sized planets could fit inside it. Within the Sun there are atoms of Hydrogen and Helium that are densely packed and collide violently with each other. The fusion of atoms that occurs in the Hydrogen core of the Sun generates light, which takes a hundred thousand years to escape the Sun's core and then travel for a further eight minutes to reach the Earth. Understanding the role the Sun plays in our lives is fundamental to understanding the Sun-Earth system (E & S LO 4).

This activity asks students to analyse the differences between Earth and the Sun through examining the states of matter of different elements on each. This activity scaffolds the next ([Rich Task 1 Activity 4](#)), which explores the generation of plasma in the Sun with a simple boiling water experiment.

Preparation Required:

- Printing
- Computer access for students (if available, not strictly necessary)

Downloadable Materials:

- [Worksheet 1.3](#)
- [Expected Student Responses Worksheet 1.3](#)

Relevant Junior Cycle Learning Outcomes:

Students should be able to...

CW LO 4: Classify substances as elements, compounds, mixtures, metals, non-metals, solids, liquids, gases and solutions.

NOS LO 4: Produce and select data (qualitatively/quantitatively), critically analyse data to identify patterns and relationships, identify anomalous observations, draw and justify conclusions.

E & S LO 4: Develop and use a model of the Earth-sun-moon system to describe predictable phenomena observable on Earth, including seasons, lunar phases, and eclipses of the sun and moon.

Teacher Resource

NOS LO 2: Recognise questions that are appropriate for scientific investigation, pose testable hypotheses, and evaluate and compare strategies for investigating hypotheses.

NOS LO 7: Organise and communicate their research and investigative findings in a variety of ways fit for purpose and audience, using relevant scientific terminology and representations.

PW LO 3: Investigate patterns and relationships between physical observables.

Learning Intentions:

Students will be able to...

- Analyse the images, video clips, and table of data and make observations.
- Record their observations.
- Communicate their ideas in a small group and whole-class setting.
- Discuss their observations.
- Apply given information, and prior knowledge of states of matter, melting point and boiling point, to an unfamiliar context.
- Recognise that elements on the Sun are in their gaseous state (*plasma will be investigated in worksheet 1.4*)

Prior Knowledge/Horizon Content Knowledge:

- States of matter
- Melting point and boiling point
- Making and recording observations
- Noticing patterns or anomalies in data

Differentiation and Accessibility Suggestions:

This activity is accessible for all students but requires some prior knowledge. Students can decide the depth of questioning and discussion.

The worksheet may be shared with the students as a pdf for viewing the images in Q1. on a device in the classroom. This will make it easier for students to zoom in and out to identify different features of the Earth's surface and the Sun' surface. This also reduces the preparation time for the task. This is also how the students can access the video links of the Earth and Sun for 3D visualisation.

The teacher could share the pdf as a presentation and facilitate class discussion of the images without the small group element.

Activity Outline:

Activity Name	What is the Sun made of?
Alignment to ISLE investigation	Investigating the hypothesis
Rationale	Analysing data to aid investigation of whether or not the Sun has seasons. To address questions the students may have about the composition of the Sun.
Activity Description	<p><i>(please see downloadable materials for the resources for this activity)</i></p> <p><i>(Q1 worksheet 1.3)</i> Students are given an image of the Sun and the Earth and must compare the features of each. Links are also provided on the worksheet for short video clips of the Sun and the Earth, for 3D visualisation.</p> <p><i>(Q2. worksheet 1.3)</i> Students can predict the state of matter of given materials on the Sun versus the Earth, given the average temperature of the two celestial bodies.</p> <p><i>(Q3. worksheet 1.3)</i> Students can apply their learning from Q1 and Q2 to consider whether or not conditions on the Sun are suitable for Human life.</p>
Link to other activities	Scaffold for Rich Task 1 Activities 4 - 7 and links back to Rich Task 1 Activity 2
Link to current research in DIAS Dunsink Observatory	<p>The Solar and Space Weather group at DIAS Dunsink consists of PhD students, postdocs and professors who study different aspects of the Sun and Space Weather.</p> <p>Through their research, scientists can get daily updates on the activity of the Sun (https://solarmonitor.org) and advise on precautions that can be taken to protect Ireland's power grid from potential solar storms.</p> <p>More information on specific projects can be found here: https://www.dias.ie/solarphysics</p>

Related DIAS Dunsink Observatory Podcast	<p><u>Podcast Description:</u> An interview with Alberto Cañizares who studies energetic explosions on the Sun, at DIAS Dunsink Observatory. The podcast offers insight for students on the reason why the study of the Sun is important and how it is possible to move from one area of STEM to another, because of the versatility of STEM degrees. (engineering → physics)</p> <p><u>Podcast episode:</u></p> <p>Coming soon!</p>