Space Weather

Rich Task 4 Activity 1

Introduction:

Space related research and business is growing here in Ireland, but what exactly is happening and how exactly is it being done? Throughout this rich task expect to explore different ways we can explore space whether it be physically or through the use of technology and look at space travel from a more philosophical view of how it is impacting our lives and should we even be doing it. All of this content is als framed with a background in current Irish space science and asks questions of the ethics of exploration and research.

This activity provides an opportunity for students to explore space weather events, like storms and Auroras which is a prominent area of study for researchers in Dunsink Observatory, DIAS. It is based around the content created for the Magnetometer Network of Ireland. The students should learn some background information and then formulate ideas around how space weather impacts us on Earth (overlapping with some areas of Electricity), as well as looking at the evolution of scientific ideas. This activity acts as the first stage of the ISLE process: Noticing a pattern and forming a hypothesis. This activity scaffolds the next (Rich Task 4 Activity 2), which looks at some of the benefits and hazards of space exploration.

Preparation Required:

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

Downloadable Materials:

- Worksheet 4.1
- Expected Student Responses Worksheet 4.1

Some of the relevant Junior Cycle Learning Outcomes:

Students should be able to….

E&S LO 8: Examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration in society.

NOS LO 1: Appreciate how scientists work and how scientific ideas are modified over time.

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

NOS LO 10: Appreciate the role of science in society; and its personal, social and global importance; and how society influences scientific research.

Learning Intentions:

Students will be able to…

- Suggest connections between solar flares and magnetism
- Analyse and compute data based on voltage and current
- Consider the dangers of space weather storms
- Formulate a story explaining the discovery of the Northern Lights

Prior Knowledge/Horizon Content Knowledge:

- Making and recording connections
- Noticing patterns or anomalies in data
- Formulating hypotheses
- Graphing data
- Electricity
- Magnets

Differentiation and Accessibility Suggestions:

This activity is accessible for all students and does not require prior knowledge of the specific topic. Students can be allowed to use internet research if facing difficulty.

Q4 can be done in pairs or groups to allow for discussion and debate.
Q5 may require the use of the internet to investigate ancient ideas of the Northern Lights / imagination can also be used.

Activity Outline:

Activity Name	Space Weather
Alignment to ISLE investigation	Experimenting to investigate hypothesis
Rationale	To analyse data to learn about space weather and its possible dangers to human technology..
Activity Description	(*please see downloadable materials for the resources for this activity)* (Q1. *worksheet 4.1)* Students watch the video to learn what a solar flare is. Students then draw the magnetic field lines of a magnet and

	estimate what it looks like on Earth. (Q2. *worksheet 4.1)* If students haven't been introduced to Oersted's experiment in worksheet 1.5 or elsewhere watch this video. Next, students hypothesise what might happen if an electrically charged solar flare comes into contact with Earths' magnetic field. (Q3. *worksheet 4.1)* Students calculate the expected current using V=IR. Students then plot the actual current against time and estimate when the solar flare hit Earth. Students should attempt an explanation as to why the solar flare changed the expected current. (Q4. *worksheet 4.1)* Students draw lines to connect the technology to the harm done by a space storm. Each connection should be explained in the boxes below. (Q5. *worksheet 4.1)* Students should write an article, as a scientist, talking about the myths associated with the Northern Lights and their actual scientific explanation.
Link to other activities	Scaffold for Rich Task 4 Activities 2 - 4
Link to current research in DIAS Dunsink Observatory	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. Through their research, scientists can get daily updates on the activity of the Sun (https://solarmonitor.org) along with information about the Earths' magnetic field and space storms. More information on space weather and why we predict it can be found here: https://www.magie.ie/education/