What are the problems affecting the habitability of Mars?

Rich Task 2 Activity 4

Introduction:

Our planet is in a seemingly unique position of supporting life. Many of us wonder why Earth is such a habitable environment while other worlds in our solar system are harsh and unforgiving. The question of habitability is pertinent today when we think of the climate crisis and the Earth we are leaving to future generations.

There are also many upcoming and ongoing ESA and NASA missions exploring Mars as a potential planet that Humans could colonise. There are many problems to overcome if we wish to colonise another planet like Mars. This Rich Task is designed to encourage students to think about the reasons why Earth is habitable in comparison to Mars, and to reflect on why the climate crisis poses such a danger to life on this planet. The activities in this Rich Task have been planned to support the teaching of E & S LO 5.

This activity provides an opportunity for students to conclude the investigation of the habitability of Mars. This activity acts as the last two stages of the ISLE process: inferring conclusions and reevaluating the hypothesis. This activity brings all aspects of the investigation together to draw conclusions about the original hypothesis: Humans can live on Mars.

Preparation Required: Printing

Downloadable Materials:

- Worksheet 2.4
- Expected Student Responses Worksheet 2.4

Relevant Junior Cycle Learning Outcomes:

Students should be able to...

E & S LO 1: Describe the relationships between various celestial objects including moons, asteroids, comets, planets, stars, solar systems, galaxies and space

E & S LO 3: Interpret data to compare the Earth with other planets and moons in the solar system, with respect to properties including mass, gravity, size, and composition.

E & S LO 5: Describe the cycling of matter, including that of carbon and water, associating it with biological and atmospheric phenomena.

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

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

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 9: Research and present information on the contribution that scientists make to scientific discovery and invention, and its impact on society

Learning Intentions:

Students will be able to…

- Recognise the factors that affect the habitability of a planet with particular focus on the Carbon cycle and water cycle.
- Draw conclusions from observations and results of an investigation.
- Communicate their ideas in a small group and whole-class setting about the difficulties of Mars habitability without help from technology.

Prior Knowledge/Horizon Content Knowledge:

- Noticing patterns or anomalies in data
- Evaluating a hypothesis.
- Presenting arguments in support or opposition of a hypothesis.

Differentiation and Accessibility Suggestions:

The activity can be completed in small groups, pairs or individually. Arguments can be presented in the style of a debate or each group can share their ideas through a class discussion.

Activity Outline:

Activity Name	Agree or Disagree? Humans cannot live on Mars.
Alignment to ISLE investigation	Inferring conclusions and determining if the results of the investigation serve to agree or disagree with the original hypothesis.
Rationale	To encourage students to analyse all of their observations from the investigation and to draw conclusions. This will allow the students to form an argument in agreement or disagreement with the

	original hypothesis.
Activity Description	(*please see downloadable materials for the resources for this activity)* (*Q1. worksheet 2.4)* Students reflect on everything that they have learned throughout the Rich Task and apply their findings and observations from each activity to address the hypothesis: “Humans cannot live on Mars.”
Link to other activities	Links back to Rich Task 2 Activity 1-3
Link to current research in DIAS Dunsink Observatory	DIAS Dunsink Observatory has many PhD students, postdocs and professors who study different aspects of Astronomy and Astrophysics, including solar physics and planetary science. More information on specific projects can be found here: https://www.dias.ie/cosmicphysics/astrophysics/
Related DIAS Dunsink Observatory Podcast	Podcast Description: An interview with Dr Áine Flood who is a science communicator and the current Education and Public Engagement Manager, at I-LOFAR, Birr. The podcast offers insight for students on the reason why clear communication in science is important and how it is possible to move from one area of STEM to another, because of the versatility of STEM degrees. (physics → science communication) Podcast episode: Coming soon!