Improving young generation's thinking skills by using discoveries made by Curiosity on Mars

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Education in England

Primary education – 4-5 years old up to 10-11 years old – Level 1

Secondary education – 11-12 years old up to 15-16 years old – Level 2

Further education – from 16-17 years old up to 17-18 years old, but also for older students in the form of Access to Higher Education courses

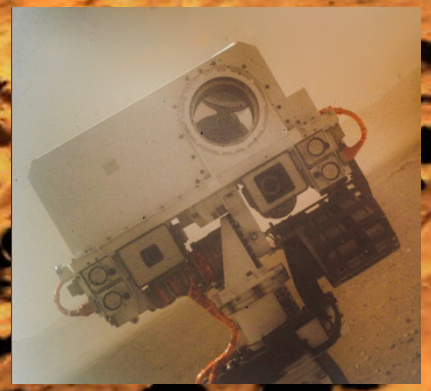
Higher education – from age of 18 onwards – level 4 - 8

- Level 4: Introductory (CertHE)
- Level 5: Intermediate (DipHE)
- Level 6: Final (Honours)
- Level 7: Masters
- Level 8: Research

Using Curiosity on Mars expedition for Level 2 lessons – The Big Picture

The context: 1-2 lessons embedded in the KS4 syllabus, preparing students for the Science exams they will take at the end of the secondary school

Focus: The atmosphere composition on Mars compared to the actual atmosphere on Earth

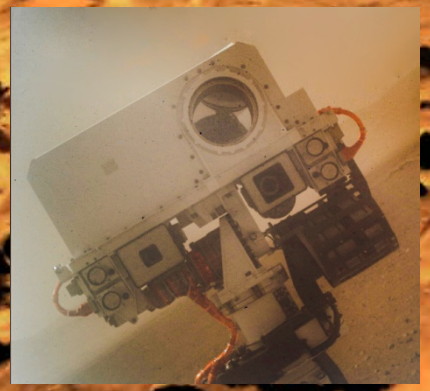


Wakefield College, Wakefield, UK

The learning objective:
To understand the changes to the Earth's atmosphere due to various factors by comparison with the atmosphere on Mars

The outcomes:

- To describe the conditions on primitive Earth – improves the ability to name substances and the understanding of conditions needed to sustain life;
- To compare two sets of data – improves the ability to work with data;
- To explain how Earth's evolution can lead to a less hospitable environment due to human activity – improves critical thinking when it comes to environment pollution.



Using Curiosity on Mars expedition for Level 2 lessons – the lesson set-up

Starter – brainstorming ideas about how Universe formed

The lesson should come after a preliminary discussion regarding the Big Bang theory

Students are expected to have some knowledge about how stars have formed

Main – introducing data regarding the atmosphere on Earth now

Students should have the use of laptops and be able to access the following websites:

http://mars.nasa.gov/msl/mission/science/results/top5science.html

http://www.space.com/16903-mars-atmosphere-climate-weather.html

- **Foundation level** students will compare the atmosphere on Mars and Earth at present and in the past
- **Higher level** students will also be asked to produce a graph comparing data regarding the two planets

Plenary – Students to write two observations regarding the composition of the atmosphere on Earth and Mars, today.

The observed outcome of the session

- This activity allowed students to expand their horizon regarding the use of science.
- It improved their ability to use scientific data
- Students are more engaged when asked to use data collected by Curiosity on Mars as it makes the lesson more anchored in reality

Using Curiosity on Mars expedition for Level 4 assessment

- **The focus** is on testing the possibility of some biochemical reactions to take place in conditions which are different from those on Earth.

The context: At level 4 students are already used to manipulate given data so the challenge is to plan and carry out experiments to test a hypothesis.

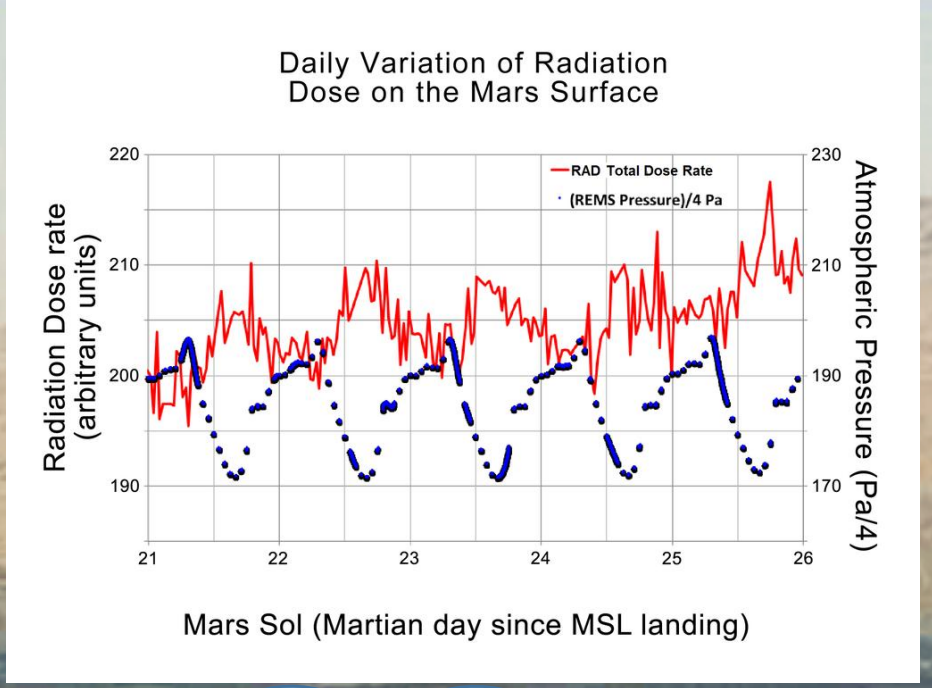
The learning objective:

To investigate the effect of atmospheric conditions on biochemical reactions

The outcomes:

- To research the atmospheric conditions on Mars using data provided by Curiosity's mission;
- To plan and carry out an experiment reproducing as accurate as possible Mars atmosphere;
- To produce a report about this investigation explaining any difference in the rate of reaction.

Students should use NASA website to identify new data obtained by Curiosity mission on Mars regarding the atmosphere on Mars



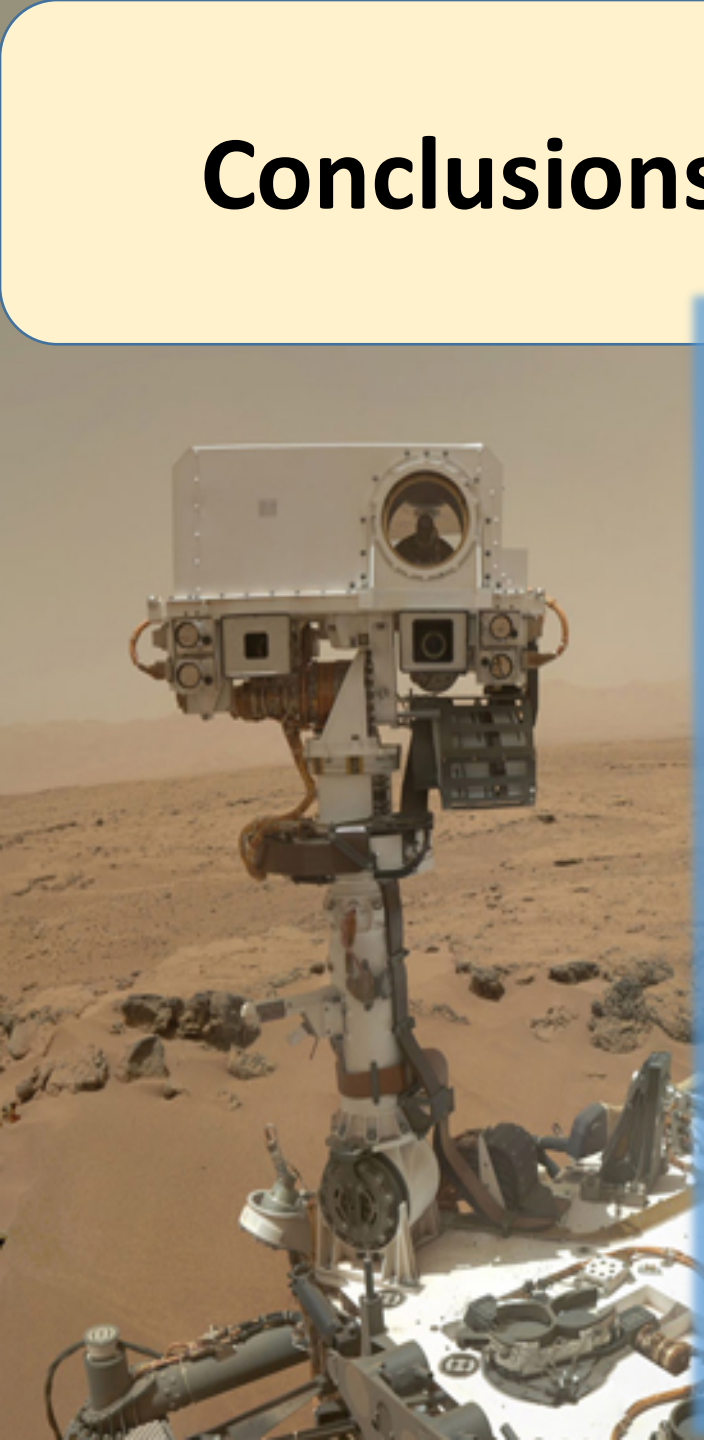
Students are asked to chose a simple biochemical reaction and show how they are going to test the possibility of that reaction to take place in conditions which are as close as possible to those on Mars.

Students should research into the effect of cosmic radiation on water molecules on Mars

The main outcomes of the session

- This activity allows students to improve their research ability and analytical thinking regarding the data they need to use.
- It improves students' ability to plan and perform an experiment.
- It improves students' ability to critically analyse data obtained and produce a lab report.

Conclusions



- Curiosity expedition on Mars is an effective learning tool at all educational levels:
  - It gives students the opportunity to see how science can be used to produce instruments allowing collection of data
  - It allows students to expand their knowledge and improve their thinking skills
  - It can be used to improve research and analytical skills in Higher Education
  - Future missions to Mars, such as ExoMars TGO and ExoMars Rover, will provide new opportunities for students to research and discover the Red Planet