Mars Exploration Theme

Background

The exploration of Mars is the focus of continuing international activity in space science. The recent Mars missions have attracted considerable public interest and support, more than any other science topic, and this is certain to continue with a steady stream of approved missions and exciting advanced planning in Europe for a programme of robotic exploration leading to a first human mission in around 2033 (currently called the Aurora programme, which will be discussed at ministerial level during the next year). Human exploration of Mars is also an area in which NASA is beginning to direct its efforts.

Data from in-orbit around Mars is currently being generated by a variety of missions – Mars Global Surveyor, Mars Odyssey and Mars Express. These all generate large volumes of imaging data, which would need to be efficiently selected and retrieved through the Grid. Creating the interfaces to these resources, much of which is publicly available is a crucial issue.

National Curriculum Links

Below is a list of National Curriculum topics at KS3 that can be addressed within the above theme. Existing educational materials are identified. Potential sources of data are outlined below the table.

Science

		Classroom Space Activity
Scientific enquiry	Ideas and Evidence	Finding Evidence for Water on Mars; Impacts 2; Lava in the Laboratory
	Investigative skills	Finding Evidence for Water on Mars; Impacts 1; Impacts 2; Lava in the Laboratory; Regolith Formation; Searching for Signs of Life; The Temperature on Mars; Topography; Volcanoes on Earth and Mars; Water on the Moon
Life processes and living things	Cells and cell functions	Searching for Signs of Life
	Humans as organisms	
	Green plants as organisms	Searching for Signs of Life
	Variation, classification and inheritance	

	Living things in their environment	
Materials and their properties	Classifying materials	Impacts 1; Impacts 2; Searching for Signs of Life; Water on the Moon
	Changing materials	Finding Evidence for Water on Mars; Regolith Formation; Volcanoes on Earth and Mars; Water on the Moon
	Patterns of behaviour	
Physical Processes	Electricity and magnetism	
	Forces and motion	Impacts 1; Impacts 2
	Light and sound	Beagle 2
	Earth and beyond	Water on the Moon
	Energy resources and energy transfer	Water on the Moon

Plus “Express to Mars” fact sheet 2.

Data sources for Classroom Space are mainly Viking, but other imaging and altimetry data from the more recent missions could easily be used here.

A new aspect of Mars Exploration that could be included is the human space flight, dealing with the **Humans as Organisms** element of SC2. In the context of how to we keep humans alive and healthy on a mission to Mars, it will be possible to deal with:

> Nutrition: the need for a balanced diet containing carbohydrates, proteins, fats, minerals, vitamins, fibre and water, and about foods that are sources of these; the principles of digestion, including the role of enzymes in breaking down large molecules into smaller ones; that the products of digestion are absorbed into the bloodstream and transported throughout the body, and that waste material is egested; that food is used as a fuel during respiration to maintain the body's activity and as a raw material for growth and repair
>
> Movement: the role of the skeleton and joints and the principle of antagonistic muscle pairs in movement.
>
> Breathing: the role of lung structure in gas exchange, including the effect of smoking
>
> Respiration: that aerobic respiration involves a reaction in cells between oxygen and food, in which glucose is broken down into carbon dioxide and water; that the reactants and products of respiration are transported throughout the body in the bloodstream
>
> Health: how the growth and reproduction of bacteria and the replication of viruses can affect health, and how the body's natural defences may be enhanced by immunisation and medicines.

I have added below all the other curriculum links, taken off the Classroom Space Website.

Geography

	Classroom Space Activity
Geographical enquiry and skills	Regolith Formation; Topography; Volcanoes on Earth and Mars; Water on Mars
Knowledge and understanding of places	Topography
Knowledge and understanding of patterns and processes	Regolith Formation; Topography; Volcanoes on Earth and Mars; Water on Mars
Knowledge and understanding of environmental change and sustainable development	

ICT

	Classroom Space Activity
Finding things out	Topography; The Temperature on Mars; Volcanoes on Earth and Mars
Developing ideas and making things happen	Topography; The Temperature on Mars; Volcanoes on Earth and Mars
Exchanging and sharing information	Topography; The Temperature on Mars
Reviewing, modifying and evaluating work as it progresses	

Mathematics

		Activity
Number and algebra	Using and applying number and algebra	Impacts 1; Impacts 2
	Numbers and the number system	Impacts 1; Impacts 2
	Calculations	Impacts 1; Impacts 2
	Solving numerical problems	Impacts 1; Impacts 2
	Equations, formulae and identities	Impacts 1; Impacts 2
	Sequences, functions and graphs	
Shape, space and measure	Using and applying shape, space and measure	Impacts 1; Impacts 2
	Geometrical reasoning	Impacts 1; Impacts 2
	Transformations and coordinates	Topography; The Temperature on Mars; Volcanoes on Earth and Mars

	Measures and construction	Impacts 1; Impacts 2
Handling data	Using and applying handling data	Impacts 1; Impacts 2; Topography; The Temperature on Mars; Volcanoes on Earth and Mars
	Specifying the problem and planning	
	Collecting data	
	Processing and representing data	Topography; The Temperature on Mars; Volcanoes on Earth and Mars
	Interpreting and discussing results	Impacts 1; Impacts 2; Topography; The Temperature on Mars; Volcanoes on Earth and Mars