TWO PLANETS OF THE SOLAR SYSTEM: EARTH AND MARS

This learning unit is planned to be inserted in a module of Science of a Scuola media inferiore, Second year.

Introduction:

The teacher of English will work together with the teacher of science, who will talk in Italian.
The introductory part (Lesson 1) will see the two teacher working together about the main features of Mars.
In the second lesson, the teacher of English will work alone and will show the students some researches on Mars made by the Pathfinder and some differences/ similarities between Earth and Mars.
The third lesson will contain more specific information about Landers and will be lead by the teacher of science alone.
In the final lesson, there will be a two hours assessment: it will take place in the laboratory.
The students will answer a questionnaire(in English) and then build a simple solar system model.

PLACE WITHIN THE CURRICULUM

In Italy the learning unit about Mars is usually inserted in the following module :

MODULO: IL SISTEMA SOLARE
Unità didattica 1: Il sole
Unità didattica 2: La Terra
Unità didattica 3: Marte (in compresenza)
Unità didattica 4: Venere
Unità didattica 5: Pianeti minori

Timetable dealing with the lessons did by the Science Teacher in Italian language:

Modulo: Il sistema solare
Unità didattica 1: Il sole (3 h)
Unità didattica 2: La Terra (3 h)
Unità didattica 3: Marte (2h)
Unità didattica 4: Venere: Pianeti minori (2h)
Unità didattica 5: Pianeti minori (1h)+ attività pratica(2h in laboratorio: 1h test di verifica + 1h costruzione del sistema solare in laboratorio)

The learning unit about the planet Mars is usually developed in the following way:

UNITA' DIDATTICA: MARTE
Lezione 1: Introduzione(in copresenza)
Lezione 2: Marte e la Terra: some scientific experiments and discoveries about Mars: The Pathfinder *(Teacher of English)*
Lezione 3: Landers (Teacher of Science)
Lezione 4:Verifica(Teacher of Science)

Introduction to the learning unit about the Planet Mars:

Mars is one of the planet that most attracts people attention because of its similarities with the planet Earth. For this reason, scientists decided to send Landers on its soil and explore the planet, collecting some material as powder and other substances useful for the researches.

This learning unit, planned for science, focus on the knowledge of the planet and its features in a very simple language. First of all, students will be introduced to the basic information about Mars, secondly to the information about the Viking Lander and the researches lead by the NASA scientists, finally the teacher will give the students a comparison between the Earth and Mars.

Since students have to understand what the planet is like and how much it is different or similar to the Earth, this learning unit is structured to give them the basic knowledge that allows them to answer to simple answers such as:

1.What is Mars like?

2.How does it differs from Earth?

3.How do scientists collect materials from the planet?

4.What about the future researches?

Learning Unit structure:

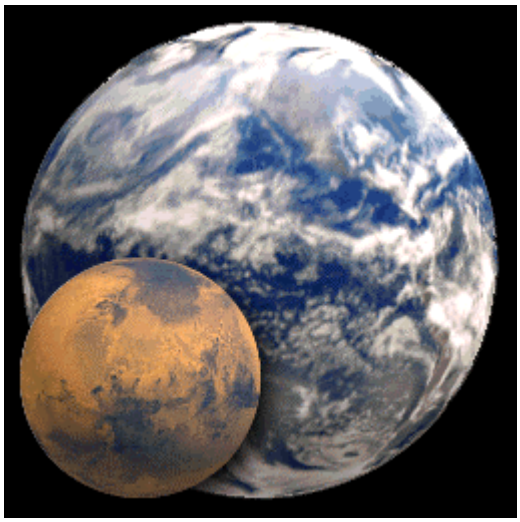
Topic	Mars
Target group	Students of scuola media
Language level	A2+ (European Framework of Reference for Languages)
Time needed	6 hours
Place	Classroom/lab

Prerequisites(language)	• Present Simple(pos/neg.form) • Future(will) • Present perfect • Past Simple
Vocabulary	General Basic
Prerequisites (knowledge)	Knowledge of the basic info about the Earth
Material	Pictures, written texts, web pages
Aids	Computers, books, models of the solar system made by students at the end of the course.
Expected outcome	• Students are expected to know the basic information about Mars and the Lander. • Students are expected to understand the main differences between Earth and Mars. • Student are expected to write a report on what they think possible in the future researches about the exploration of Mars.

Steps:

First lesson (1 hour)	**Second lesson** (2 hours)	Third lesson (1 hour)	Fourth lesson (2 hours)
- What is Mars? - Main information about the Planet. (Teacher of science)	Differences/Similarities between Earth and Mars. Pathfinder (Teacher of English)	- Viking Lander and scientists discoveries. (Teacher of science)	- Practical activity. - Assessment(in co-presence)

SECOND LESSON: MARS AND ITS FEATURES



The Earth and Mars

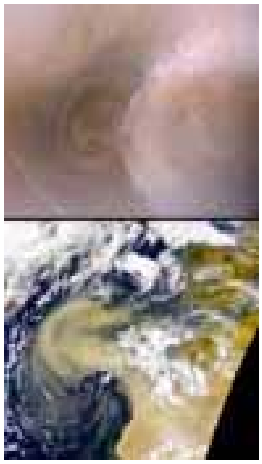
Mars, of all the planets in our solar system, is the most similar to Earth.

These materials describe some of the general characteristics of Mars, concentrating on those important to Martian meteorology, especially observations of atmospheric temperature. Although its diameter is only 53% that of Earth, it has dramatic geological features ranging from a 3000 mile (~ 5,000 km) long canyon system and Martian volcanos, that rise 29 km, more than 90,000 feet, above the mean Martian surface. The axis about which Mars rotates, is inclined approximately 23.98° to its orbital plane, compared to Earth's 23.44°, its day, called a sol, is 24.66 hours, and its year is 669 sols. Currently it has a very thin, cold, mainly carbon dioxide, CO_2, atmosphere about 1% as dense as Earth's, and some water-ice clouds but no liquid water . However, Viking interpretations of orbiter images very strongly suggest that it had running water earlier in its history.

Winds are only considered briefly here: better and expanded descriptions will be covered in future developments. Winds during summer, Pathfinders landing season, were light at both Viking sites, ranging from zero to about 22 miles per hour (0 to 10meters/second). During fall and winter, as the

fronts become stronger, the winds increase. At VL-2, they reached 50 miles/hour (23 meters/sec). It is estimated that VL1 winds reached much higher speeds around the sol 1,720 time frame. The speed can not be calculated as the wind sensors had partial failures but the removal of piles of sand placed by the soil sampler, suggests winds of greater than 60 MPH, (28 m/s). An important thing to remember is that the force of the wind is lower on Mars by about a factor of 10, compared to Earth due to its lower density. The nature of the "fronts" and dust storm features are best observed by examining the data in more detail.

Atmospheric dust causes daily pressure variations proportional to the dust amount; the magnitude of the daily variation can increase rapidly, but decreases slowly as the dust falls out of the atmosphere if its a deep, great dust storm. "Great" dust storms, such as the 1977 A and 1977 B storm, produce large increases in the daily variation which slowly decrease over many tens of sols.



Dust storm on Mars surface

Clouds on Earth View

During these dust storms, the maximum daytime temperature decreases and the minimum, night time temperature increases: the effect is very similar to that of clouds on Earth.

The day to day atmospheric pressure variability, low in summer and higher in fall and winter, (especially at the northern site), is due to weather "fronts" quite similar to those on Earth. Between winter and spring, and more so at VL2, the characteristics of the day to day variation are extremely different for the first, as compared with the second year.

Spring on Mars

1.The pathfinder


Pathfinder landing on Mars

Mars Pathfinder
Spacecraft: Lander with Microrover
Launch: December 1996
Arrival: July 1997
Primary Mission: 30 days

Pathfinder will be the first U.S. spacecraft to land on Mars since the two Vikings arrived in 1976. Pathfinder joined on the Mars surface in 1997 by two landers and two penetrators of the Russian Mars 96 mission. A unique feature of Pathfinder will be its Microrover, a small vehicle which can range up to a few tens of meters away from the spacecraft and examine the composition of surrounding rocks and soils.

Pathfinder was launched aboard a Delta II rocket sometime between December 1996 and January 1997. The spacecraft is on a direct course from the Kennedy Space Centre in Florida to the Martian surface. Landing were planned for July 4, 1997, nearly 21 years after the Viking landings.

Pathfinder landed during the Martian night. Just before the spacecraft impacts the surface, giant airbags inflated to cushion the landing. After the spacecraft comes to rest on the surface, the airbags deflated and three solar panels unfolded. These panels are arranged in a way that allows the spacecraft to be flipped over if it should land upsidedown. The solar panels began providing power to the spacecraft as soon as the sun comes up that first morning on Mars.

The Mars Pathfinder Project received a new start from NASA and Congress in October 1993. The project is required to have a cost of less than $150 Million, have a fast schedule (less than three years from new start to launch), and achieve a set of significant but focused engineering, science, and technology objectives.

Pathfinder Objectives

There are two sets of objectives for the Pathfinder mission: Engineering and Science.

The primary objective for Pathfinder is to demonstrate a low-cost approach for cruise, descent, and an upright landing systems to place a payload on the Martian surface in a safe and operational configuration. The technologies pioneered by Pathfinder have the potential for use in future Mars missions. The lander also carries the microrover which will test mobility for small rovers on Mars.

The microrover will also examine the condition and configuration of the Pathfinder landing craft to assess how well the landing system performed.

The scientific objectives include examination of the composition of rocks and soils in the vicinity of the lander. A landing site is being chosen in a way that will hopefully maximize the scientific information returned. The mission will characterized surface morphology and geology, acquire elemental composition information, and obtain atmospheric measurements such as temperature, pressure, and wind velocity.

Science Experiments aboard Pathfinder

There are three major science experiments aboard Pathfinder, and each has a variety of scientific goals. For example, the imaging system can obtain multispectral images of the surface and atmosphere, thus allowing estimation of how much dust is in the air and what types of rocks might be present. The imaging system will also look at a wind sock experiment, allowing determination of wind velocity above the surface. The imaging system may also be able to monitor changes in weather, particularly cloud cover, and can also be used to plan the work of the microrover.

The experiments aboard Pathfinder promise to tell us all something new about Mars. In particular, these instruments will provide information about the element abundance, iron-bearing minerals, and atmospheric properties during descent and on the surface. These instruments and the science objectives they represent will provide us with a new, fresh view of the Red Planet from its surface.

Exercise:

Answer the following questions:

1. Which planet is most similar to the Earth Planet?
2. Are there seasons on Mars?
3. Is it the winds force lower on Mars or on the Earth?
4. If yes, can you give more information?
5. What do dust storms produce?
6. What happens during these storms?
7. When did the Vikings arrived on Mars?

8. When did the Pathfinder joined Mars?
9. What do you think scientists will find out about Mars in the future? Write a 20 words“prediction”.
10. Write a 50 words summary of the main differences/similarities between Earth and Mars?

A. Evaluation grid used by the teacher of science meant to evaluate students ‘reading and producing scientific written texts :

The student is able to	--1	2	3	4	5++
A. recognize the main function of the text					
B. distinguish information and data from opinions					
C. distinguish expressed meanings from intended meanings					
D. identify contradictions					
E. produce a written text having the characteristics of coherence and cohesion and corresponding to the type of text chosen					
G. choose a suitable linguistic register according to the receiver and the function of a text					
H give the reader all the information necessary for comprehension.					

B. Evaluation grid used by the teacher of English to evaluate students:

1.Half a point will be given for every correct answers to the ten questions and half a point will be deducted for every mistakes in the written productions.
Moreover, from 1 to five points will be added according to the following greed:

2.The student is able to	1	2	3	4	5
A. ask questions					
B. use appropriate vocabulary					
C. use appropriate register and style					