



PARSEL teaching –learning materials compiled by the consortium
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Planning a space trip to Mars (Teachers)

Subject

Planning a space trip to Mars as a way to discuss ecosystem dynamics and environmental problems.

Objectives

The objective of this task is facilitate reflection on environmental issues, namely on the need to adequately manage environmental resources in order to survive.

Competences

Substantive knowledge – when student uses different knowledge from biology, ecology and physics for explaining his/ her plan for survival; when he/ she explains the importance of technology in preserving environment; when he/ she understands how important balanced and responsible use of environmental resources for preserving life on Earth is; when he/ she understands interactions between science, technology and society.

Reasoning – when student collects and analyses information; when he/ she relates knowledge from different knowledge area; when he/ she evaluates his/ her and others positions and arguments and justify his/ her own arguments and positions; when he/ she takes decisions; when he/ she shows work organization and management and critical thinking.

Communication – when students presents, explains and debates ideas; when he/ she presents arguments for sustaining his/ her ideas; when he/ she can uses Internet for researching issues.

Attitudes – when students cooperate with his/ her peers; when he/ she is tolerant to peers and to different ideas; when he /she can discuss and defend values such as responsibility, respect for human being and environment.

Developers: Galvão, C., Reis, P., Freire, A. e Oliveira, T. (2006). Avaliação de competências em ciências: Sugestões para professores do ensino básico e do ensino secundário. [Competence evaluation in science. Suggestions for basic and secondary education teachers]. Lisboa: ASA.

Institute: University of Lisbon

Country: Portugal

Task description

Activity consists in students planning a spatial trip to Mars. Each student is allocated with a different character within the group, so that each one feels responsible for the work. Furthermore, students' individual assessment will be facilitated. The characters are: 1) doctor; 2) scientist; 3) person responsible for the mission; 4) engineer. All of them together have the responsibility for planning the trip, for maintaining the spaceship and for guarantying crew's survival. Note that, it is not allowed to use techniques for suspending life during this trip. Each group will develop its plan and options.

Procedure

1. Compose groups of 4 students and make sure that each student chooses a character to play.
2. After choosing a character, each student collects and analyses information with the aim to write an individual report that resumes his/ her contribute to the trip (maximum two pages A4).
3. Students can seek information on the following websites:
NASA <http://www.nasa.gov/>
ASK-A-SCIENTIST – NASA-wide resources: *Extremely interesting site with varied information about spatial trips, universe, solar system, effects from lack of gravity, etc.*
<http://science.msfc.nasa.gov/FAQ/ask-a-scientist.htm>
Exploring Mars <http://www.exploringmars.com>
Life on Mars? <http://www.jsc.nasa.gov/pao/flash/>
Mars Missions <http://mpfwww.jpl.nasa.gov/>
<http://mars.jpe.nasa.gov/classroom/teacher.htm>
4. Given the complexity of the theme under analyses, teacher should provide students with possible questions that might support students' search and analyses of information (Table 1.). Following, there are some guiding questions that each character might consider in his/ her analysis.

Character	Guiding questions
Doctor	What health effects result from lack of gravity? How these health problems can be overcome? How can one guarantee no health problems to the crew?
Scientist	Which provisions are necessary? How can one get food for such a long trip? How can one store food? How will the air and water needed for survival be recycled? What to do with garbage and other waste? How can crew take a shower? How can crew eat fruit?
Person responsible for the mission	Who should form the crew? Who should take leadership and how should the leader manage the crew? Which rules should be drawn to ensure mission success? How can one get financial support? How can one justify citizenships the need for doing this trip?
Engineer	Which form should the spatial trip have in order to optimize its movement? Which materials should it be built from? How will it move? How can we obtain energy for spaceship working and maintenance? What is its maximum speed?

Table 1 – Relationship between character and investigation questions

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5. After writing the individual report, the group discusses each character contribution and writes up a trip proposal taking into consideration each character points. The idea that, trip success will depend on the environmental conditions created inside the spaceship such as earth's survival depends on environmental conditions, should be make clear to the students. This idea should be considered in each group's trip proposal that should reflect on which conditions can guarantee crew survival and ship environment preservation.
6. In the end, each group will present its work to the overall class that will discuss viability of the proposal and will establish a parallel between spaceship and earth environmental conditions, and both (ship-system and earth) survival.

Population

7th - 12th grades

Curriculum context

Chemistry sciences and Natural sciences (Biology and Geology)

Kind of activity

Problem solving + decision making

Anticipated time

1 hour at home + 3 lessons at school (40-50 minutes each)