Astronomy

Author: Emilia Vasconcelos.
Subject: Physics.
Country of creation: Portugal.
Countries of testing: Czech Republic, Lithuania and Italy.

Aims of the GP

Students learn about the organisation of the universe, they learn to characterise the different heavenly bodies of the solar system and get to know some of the instruments/tools used to explore the universe.

Teaching material

Computers connected to the internet.

Worksheet.

"Stellarium" software http://www.stellarium.org/

Websites:

http://solarsystem.nasa.gov/planets/

http://www.solarviews.com/eng/homepage.htm

http://starchild.gsfc.nasa.gov/docs/StarChild/StarChild.html

Age of the students

12-14

Preparation and teaching time

Preparation: 3 h (in order to acquire a basic knowledge of "Stellarium"). Class time: 2 x 90 min periods.

Lesson plan

- Presentation of the software "Stellarium" to pupils (10 min).
- With the help of the software "Stellarium" and some online research the students have to find the answers to the worksheet questions (60 min).
- Discussion (15 min).
- The students, in groups, carry out some research on a star / celestial body chosen by the group (45 min).
- The students present the outcome of their research to the rest of the class and they write an illustrated text about what there is to be found in a trip to the solar system (40 min).

Extract from the worksheet

1.2. Using the "Stellarium" software, look for and identify three stars and three visible constellations in the northern hemisphere.

1.3. Choose a city or a country in the southern hemisphere. Look for and identify three visible constellations in this hemisphere.

2. Return to the initial city /country and change the date and time. Get at least two pictures.

3. Get pictures of all the planets of the solar system. If they are not visible at this time you need to change it by clicking *Increase time speed*.

4. The units to measure distances in the universe do not always have the same orders of magnitude.

4.1 Complete the table **Error! Reference source not found.** using the values of the distance indicated at the top right corner of the software "Stellarium" (use only two decimal places).

Heavenly bodies	**Distance**
Jupiter	
Moon	
Venus	
Saturn	
Sirius (one of the brightest stars in the Portuguese sky)	
Polaris (indicates the North)	

Questionnaire

Constellations are groups of stars forming imaginary figures and they are all the same distance from us.

Yes / No

The nebulas are heavenly bodies and they are large clouds of gas and dust.

Yes / No

The astronomical unit corresponds to

149.6×10^6 km / 149.6×10^3 km / 149.6×10^3 m

The sun is a star that, in relation to the Milky Way, is

In the core of the galaxy.

At the end of the galaxy.
In one arm of the spiral galaxy.

Select from the following sets of celestial objects, the one that describes the composition of the Solar System

Meteorites, eight planets, Earth, Moon and Sun.
Sun, Earth, Ursa Major, Ursa Minor and the Milky Way.
Milky Way, Sun, asteroids, comets, interplanetary dust.
Sun, eight major planets, natural satellites, comets, asteroids, meteoroids, interplanetary dust and gas.

The only planets that have no moons are

Mercury and Venus.
Venus and Mars.
Mars and Neptune.
Venus and Neptune.
Mercury and Mars.
Mercury and Neptune.

The planet that has the highest day temperature range is

Venus / Saturn / Mercury / Jupiter

The movement of the sun, moon and stars in the sky, from East to West

Is an illusion, because it results from Earth's rotation around its axis from West to East.
Is a real movement of all the stars in the sky.
Is an illusion, because it results from Earth's rotation around its axis, from East to West.

Which of the following heavenly bodies is furthest from the Earth?

Sirius (one of the brightest stars of the Portuguese sky) – 8.57 ly.
Polaris (indicates the North) – 430 ly.
Saturn – 8.6 AU.
Moon – 384.405 km.

A star is 5000 ly from the Earth. The light emitted by the star is seen on Earth after travelling through space for:

500 years / 5000 years / 5000 seconds / 5000 days

Teacher reviews

According to a Lithuanian teacher this GP was the one that the students preferred, among those he implemented, as they enjoyed discovering our universe with the software "Stellarium". During the implementation of the GP "most of the students downloaded the program onto their home computers." Furthermore the Lithuanian teacher commented: "I had some low-motivated students in my class. Nothing interested them. And these students downloaded Stellarium and taught others! I looked and could not believe it."

The Italian teacher gave similar feedback. She said that she used "Stellarium" on the Interactive Whiteboard and the students were impressed as it "looked as if they could touch the sky with their hands and could travel through the Universe. Going to the Moon and looking at the Earth from there is a useful change of perspective." The fact that students had to produce, as a final product of their research, a report of their trip in the Universe, gave her students more motivation to discover uncommon things. This also gives the teacher the opportunity to evaluate the students in a different way.

The SPICE project

SPICE was a two-year project (December 2009 – November 2011) carried out by **European Schoolnet** (http://europeanschoonet.org) together with **Direção Geral de Inovação e Desenvolvimento Curricular** (http://sitio.dgidc.min-edu.pt/Paginas/default.aspx) from Portugal and **Dum Zahranicnich Sluzeb MSMT** (http://www.dzs.cz/) from the Czech Republic.

The primary objective of the SPICE project was to collect, analyse, validate and share innovative pedagogical practices, particularly those using inquiry-based learning, whilst enhancing pupils' interest in the sciences. SPICE supported this objective by singling out, analysing and validating good practice pedagogies and practices in maths, science and technology (mostly ICT-based) and disseminating them across Europe. SPICE involved 24 teachers from 16 different educational systems (from 15 different countries). This teachers' panel helped the SPICE partners in defining good practices that were then tested in classes by 41 teachers during the school year 2010-2011.

For more information see: **http://spice.eun.org**

Education and Culture DG
Lifelong Learning Programme

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