Astronomy on the enviromental education of students

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Abstract

Observing the sky can be a pleasant procedure which attracts children's imagination and leads them to the appropriate knowledge of astronomical and environmental subjects. This task includes three activities based on recent innovative pedagogical methods and its purpose is the education of Greek-Gymnasium-students on: 1.The night sky observation with naked eye. 2.The construction of a Planisphere in order to observe the sky. 3.The observation of the sky through a little telescope.

1 Introduction

In this project is described the planning and the realization of teaching material and its purpose is the education of Greek-Gymnasium Students on basic subjects of Astronomy. For each subject is given: I. Informational material covering the field of awareness of the teacher, and II. Pedagogical material which covers the educational task of the students and is consisted of: a) A sheet of pedagogical instructions for the teacher, where they can find whatever is needed for the procedure of the project as the targets, the necessary materials and the time needed for the materialization of the subject. Finally the additional activities are suggested. b) A work sheet for the students with instructions for the step by step activities completion. It must be considered that the material can be completed on the whole or in part, referring to the situations. The teachers with their knowledge and experience succeed to have the creative and active participation of their students. The subjects are followed by bibliography for the student and the teacher, printed or in electronic form as the students are asked to find main information in the library or in the internet. The unit is completed by an Appendix wich includes Tables with information about celestial objects, sky maps, drawings, glossary and index.

2 Subject 1: The night sky observation with naked eye

Information: Starting from the interest of the ancient people for the observation of the Sun, the Moon and the Starry Sky we reach the first catalogue of the stars made by the Greek astronomer and mathematician Hipparhos (2nd century B.C.). Going on the teacher can find information about the stars and constellations and their names. It is described the observer's orientation by using the Big and Small Dipper and is given instructions for finding the bright stars and constellations as well as the planets everyday.

Pedagogical Instructions Sheet 1
Targets: Acquaintance with the names and the shapes of the constellations. Development of the ability to recognize the constellations in the night sky. Development of the abilities of an active imagination and a critical thought, systematic observation and comparison, as well as, collection and presentation of information. A comprehension of the influence of the light pollution in the observation of the night sky.

Materials: Copies of the necessary sky maps and Tables, flashlights, rubber bands, pieces of red cellophane.
Duration: One hour in the classroom and one hour for the observation of the sky.
Indications: Detailed information is given for the preparing of the students in order to do the exercise successfully as it is described in the work - sheet.

Work-sheet 1
1. Observe carefully the map where the brightest stars, visible from Greece, are shown and try to create and name your own constellations. 2.Compare your own map to the officially admitted by the astronomers. 3. Study carefully the map with the most visible constellations. Using mnemonic rules of your preference try to print in your mind their names and their shapes. 4. Study carefully the map where are not referred the names of the constellations and try to write them. 5. Find the Big Dipper and Polaris. Try and find the best way among the constellations. 6. What is the naming of the dots which like a river cross your map? 7. Using the right Table check the possibility to observe this night any of the bright planets and note its position on the map you are going to have with you. 8. Try to observe the sky even from a lit city in order to realize the meaning of the light pollution.

3 Subject 2: Construction of a planisphere in order to observe the sky

Information: The Planisphere describes the global sky on a paper plane and is used like a map of the sky, at any time for any day from Greece. It is consisted from: I. A circular map of the sky of double face which has in each perimeter the months of the year divided into days. The one face shows almost all the constellations that are visible from our latitudes, while the other one the most distinguishable. II. The outer face. A rather oval part of its surface has been abstracted and is covered by a piece of hard clear film. The part of the map that is visible through the oval opening shows the part of the sky that is possible to be observed the exact day and hour, while its limits represent the horizon. The centre of the oval is the Zenith of the observer. On the perimeter of the cover are written the hours from 7p.m. up to 5 a.m. as well as the cardinal points.

Pedagogical Instructions Sheet 2
Targets: Development of the skills of the construction and the use of the planisphere. Development of the abilities of a critical thought, construction, observation and creative imagination.
Materials: Copies of the work sheet and the necessary Pictures and Tables. Thin cardboard, scissors, glue, pins, flashlights, pieces of red cellophane, rubber bands, light colored pencils, hard clear films.
Duration: An hour in the classroom and at least one hour outdoors.
Indications: Show to the students a planishpere that you have earlier made and explain to them what they are finally going to construct. The planisphere can be used like a star map of the night sky throughout the year.

Work Sheet 2
Constructing the planisphere
1. Cut the card board into three pieces - 20cmx20cm each. 2. Cut carefully out of the edge the two copies of the outer face and glue one on each cardboard. Cut out the central oval. Cut the clear film into two pieces and glue it on the back surface of each cardboard. Paint the outer surfaces in a light color. 3. Glue on the third cardboard one of the constellation maps and cut carefully the limit. Cut out the other map and glue it on the other surface of the cardboard. 4. Put the map between the outer faces. Mark on the transparent parts the point that the

pole star is entitled. Pierce and put a pin through all three of them. Rotate the map so as the observing time (written on the face) coincides on the observing date (written on the Map). Through the clear film you can see the part of the sky which on that time is above the horizon.

Observing the Sky
1. If you would like to observe the sky tonight at 10 pm follow the next steps: I. Turn the map until it is set for the observation time (10pm i.e. 22 hs-1h = 21 hr). II.Hold the planisphere over your hand so that the "North" direction is pointing North. The stars that are visible through the oval opening (horizon) are going to be visible in the sky too. 2. Using the planisphere try to answer the questions: I. Today at 12 p.m. which of the constellations are you going to see? II. Which of them are going to be seen at 10p.m. as well? III. If the map makes one complete rotation, which means that 24 hours have passed, which constellation do not go below the horizon at all; (circumpolar). Find some constellations that are never visible. IV. Turning the planisphere in the right way, estimate the time that a constellation of your choice will rise, be at the meridian and finally set. V. Mark the constellation that characterizes every season. 3. When you have put the map of the planisphere at the hour that you are going to observe the sky, try and find the way that you will easily find the other constellations. 4. Check if during the time of observation some of the planets are visible in the sky and mark their position on the map.

4 Subject 3: Observe the sky through a small telescope

Information: Nowadays modern telescopes observe the celestial objects either from the Earth or from the Space in every wavelength. But a small telescope is a fantastic instrument. The Moon, the Planets, the Sun, the bright Stars are the objects that can be observed by the students in their first attempts. As they are getting experts they will be able to observe Star Clusters, Nebulae and Galaxies. In the information you can find basic knowledge about the above objects. Useful instructions are given about their observation. There are also information about the telescopes. Their kinds are described (refractors, reflectors) and the way of their mounting (alt-azimuth, equatorial). A lot of times it is necessary for the observer to read an astronomical magazine like "Sky and Telescope" or "Astronomy". Considerable information you can have through US Naval Time (http://aa.usno.navy.mil/AA/data/).

Pedagogical Instructions Sheet 3
Targets: Developing the skill of how to use the telescope, the ability to recognize the planets and other celestial objects with a telescope. Developing the abilities of a systematic observation and comparison, collection, elaboration and presentation of information and planning of the work.
Materials: A small telescope, a table calendar, maps of the sky or planispheres, copies of the Tables, flashlights, pieces of red cellophane, rubber bands, pencils or crayons. A ruther dark place and clear sky.
Duration: At least thirty minutes in the classroom and one hour for the observation.
Indications: Before the observation students become familiarized in the place of the lesson with the use of the telescope and the proceeding of the observation. After you have informed the students about the objects they are going to observe with the help of the suitable Map and Tables, the work plan is prepared by them.

Work sheet 3
1. With the help of the teachers before the observation you are going to be trained to the use of the telescope and be occupied with the necessary preliminary work.

2. An easy target of observation during the day is the Sun. BUT BE CAREFULL! You will observe it ONLY if the telescope is covered by a suitable filter. You will observe the photosphere which is the surface of the Sun, and the Sun's spots. 3. During the night you can observe the Moon. Be aware of the time it is going to rise or set as well as the phase it is in. Considerable information you can have through US Naval Time (http://aa.usno.navy.mil/AA/data). 4.The bright planets like Venus, Jupiter, Cronus and Mars will be your first choice. In the Tables II to VII celestial objects are referred that are possible to be observed from Greece. 5. Mark on your map the position of the objects that are going to be observed. 6. Complete the work plan putting the targets in the right order.

Useful Web Sites

Astrovox, http://www.greek-astronomy.com/
NASA K-12 Internet:Live from The Hubble Space Telescope
http://quest.arc.nasa.gov/interactive/hst.html/
The Constellations, http://dibonsmyth.com/stars.htm
Space Day, http://www.spaceday.com/
International Dark-Sky Association, http://darksky.org
Imagine the Universe, http://imagine.gsfc.nasa.gov/docs/homepage.html
The Event Inventor-Telescopes, http://www.keys-world.com/scopeequip.htm
Live from Mars, http://quest.arc.nasa.gov/mars/
Face of Venus, http://www.eps.mcgill.ca/ bud/craters/FaceOfvenus.html
Reaching for the Planets, http://library.thinkquest.org/10591/
Everything You Ever Wanted to Know About The Solar System,
http://my.voyager.net/stargaser/solar-system.html
Views of the Solar System, http://www.solarviews.com.homepage.html
Complete Sun and Moon Data for One Day
http://aa.usno.navy.mil/AA/data/docs/Rs_OneDay.html
Lunar Prospector, http://lunar.arc.nasa.gov
The Event Inventor-Lunar Learning, http://kyes-world.com/lunar.htm
Sun from Space, http://www.kyes-world.com/sun.htm
Sun viewers, http://soho.nascom.nasa.gov
Sky and Telescope , http://www.skypub.com
US Naval Time, http://aa.usno.navy.mil/AA/data

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