Lesson plan

Eratosthenes' experiment

4th Primary School of Heraklion – TALOS
Class: 6th grade, 20 students
Teacher: Irene Matalliotaki
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Logistics

Teaching space conditions:

- **Classroom** with overhead projector and
- **Outdoor** space illuminated directly by the Sun.

Teaching subject

Title of the experiment - lesson: **Eratosthenes' experiment – the calculation of the circumference and the radius of the Earth.**
The teacher must have basic knowledge of geometry (calculation of cycle length, knowledge about angles and their measurement) and mathematics (corresponding amounts and proportions)

Objectives of teaching

Let the students understand **the thoughts of Eratosthenes**, which led him to calculate the circumference and radius of the Earth starting from an observation and using simple geometry and his imagination.
Also at the end of it they will be able to **calculate the circumference and the radius of the earth themselves performing his experiment**, applying the mathematics they know.

Duration

3 teaching hours are required

Organization of teaching

In the classroom:

We should remind students of their knowledge of geometry of the circle, the basic knowledge they have acquired about angles and their measurement, as well as their knowledge of proportions. The lesson - experiment will be designed based on different models: transfer model knowledge, exploratory and constructivist.

Class organization: Students work in the classroom in the form of a seminar and outdoors in a group.

Educational material required for the implementation of the course:

- Sources: PANEKFE https://panekfe.gr/earth-radius-calculation
- fun fact, https: //www.youtube.com/watch? v = F34Ft-7VpIM

In the classroom an **overhead projector** will be necessary for the **Power Point presentation that includes:**

1. All the stages of Eratosthenes' thought (with the use and help of images), which led him to the measurement of the circumference and radius of the Earth.
2. A worksheet for calculating the circumference and radius of the Earth based on the thought of Eratosthenes as well as in the prerequisite knowledge of the students in mathematics.
3. A map of Egypt showing Alexandria and Syene in A4 size. A photo of a model consisting of the above map printed in size about A4 and glued to a cardboard. On the location of Alexandria and Syene, two pieces of straw are fastened vertically using blue tack.
4. A photo of the experiment performed with the help of the above model and of a lens. With this experiment, Eratosthenes' thought about the curvature of the Earth will become tangible.

5. AVIDEO from https://www.youtube.com/watch?v=F34Ft-7VpIM (fun fact) to summarize and replicate new knowledge.
6. An Internet address from which the appropriate time is calculated for run the experiment at each location.
7. Instructions for calculating the distance of our place (school) from Equador with the help of Google Maps.
8. Detailed instructions for performing the experiment outdoors.
9. Information regarding the reason for conducting the specific experiment date.

Outdoors

For Eratosthenes' experiment they **need:**
A stick, a right triangle (or a level yarn) a piece of string, a little scotch tape and a protractor. The implementation of the experiment is presented in detail in a ppt presentation.

Teaching steps

- We begin by asking questions about whether the earth is spherical or flat, if students know who in antiquity concluded that the earth is spherical and calculated its circumference and its radius.
- Then we mention Eratosthenes and a few words about him and his work. We can follow some links and show the students some related pages. We refer to the relevant experiment with which he measured the circumference and the radius of the Earth.
- We tell the students that we will try to follow his thinking so that we can do the same calculation.
- Then we display the ppt presentation.

Note:
A prerequisite experiment that helps children to observe the change of the length of the shadow of an illuminated vertical stick is as follows:
With plasticine we fasten a pencil vertically to the desk. With the help of a lens located about one meter above it, we move the lens - sun, in a way which reminds us of the movement of the Sun from the east to the west and we observe the length of shadow of the pencil while changing. When the lens-sun is at the "zenith" the pencil does not create any shadow.