An Earth Model

Goal	Build a realistic model of the earth and using sunlight as reference understand phenomena related to the position of the earth with respect to the sun
Age	6 upwards
Difficulty	Medium to Difficult
Skills	Creativity, 3-dimensional thinking, Mathematical concepts, Geography, Cultural diversity, Internationalism, Crafting, Team work
Materials	A large round ball, papier-mâché, a globe or an Earthball, a bucket, a compass or some other way to tell the North/South, adhesive putty/paste (e.g. Blu tack), toothpicks, reference books/websites (atlas, aerial photographs of the earth)
Pre-requisites	None

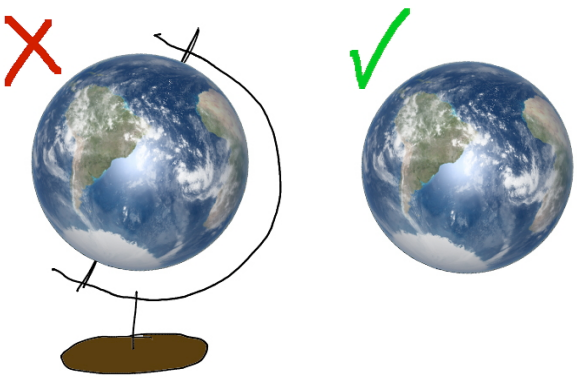
Introduction

In order to explore the relationship between the sun and the Earth, this model and set of activities uses the natural sunlight and the earth model is positioned so that "here" is on top of the model, realistically representing the planet under our feet.

A number of concepts can be explored with this model. This is a very visual activity that you can adapt to your preferred level of difficulty. Not everything needs to be done. The activity can also be carried out both as a short-term and long-term activity lasting up to a year.

Preparation

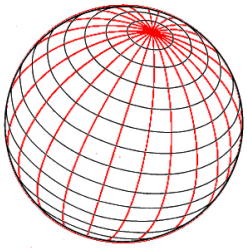
We suggest that the children create the earth model. If this is not possible, a commercially available globe or an Earthball can be used. Note that if a commercial globe is used, it is necessary that it can be used without a stand:



How to make an earth model: Guided children's creation

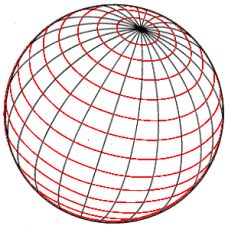
The following steps will help you create a realistic-looking model of the Earth:

- Decide where to place the poles on the round object and mark them. The round object can be a beach ball, a gym ball, etc.: the larger, the better.
- Draw parallels and meridians: 5 meridians and 15 parallels. This is the most laborious part.



← Meridians are lines that all cross at the poles.

Parallels are lines that go around the globe without crossing each other. →



- Mark one meridian as zero, origin or 0˚.
- Draw the outline of the continents: Divide the work for groups. Each group should look at maps, atlases and try to map the continent on the meridian/parallel grid on the earth model.
- Fill in the continents with papier-mâché and paint them. Use as a reference satellite images or aerial photographs.
- While doing so, discuss the various climates and vegetation areas of the planet. Discuss the most significant features of each continent.

Note: It is best if the model is either weather resistant or protected from rain but not form sunlight.

Positioning the model

The model should be placed outside on a sunny day.

It is important to get the positioning of the earth model right otherwise this activity will not work.

- First identify where you are on the Earth.
- Place the earth model on the bucket such that the place you are is on top.
- Find the direction of the North or the South with the compass and orient the earth model so that the North pole points in the direction of the real North pole and the South pole points in the direction of the real South pole. Always keep your own on top of the earth model.

- Do not touch or change the orientation of the model until the activity is over.

Place toothpicks in adhesive putty so that they stick out in several places around the world. The choice of places can be a game with the children (What country should we see people from? Where is that country?).

Observations

Take note of the following facts:

- Some areas are illuminated while others are in the shade. This is day and night right now on Earth.
- Mark the line between day and night every hour for a few hours. Observe that the shadow moves from East to West. Infer the direction of rotation of the world.
- At noon, observe where in the world is sunrise and sunset. Note that they both look the same: it is the divide between light and shadow. You need to know the direction in which the shadow moves to know which divide is sunrise or sunset. (Sunrise is the divide to the West of where you are and sunrise is the divide to your East.)
- Observe how you can guess what time it is in different parts of the world right now.
- Note the seasons (this can be done at once or over a year): During the winter of your hemisphere, the pole of your hemisphere will never be in the sunlight. During the summer of your hemisphere, the pole of your hemisphere will never be in the dark.
- The first day of spring and autumn the shadow crosses both poles.
- Over a day, observe the evolution of the shadows of the toothpicks. (The shadow turns around as the sun travels across the sky.)
- Over the seasons observe how the length of the shadows of toothpicks changes (Shadows are shortest in summer, longest in winter.)

Observations when placing toothpicks along a meridian:

- All shadows go point either East or West but in the northern hemisphere they all point toward the North pole and in the southern hemisphere they point toward the South pole.
- In the morning all shadows point West, toward midday North/South and in the afternoon to the east.
- At noon the shadows are aligned with the meridian they are on.
- Shadows are shortest at noon.
- The longest shadows are those of the toothpicks close to the poles.

- The shortest shadows are those of the toothpicks the closest to the equator.
- Draw the conclusion that all the points on one meridian share the same time of day and night.
- Ask the children if they know where to find the warmest and coldest regions on earth? They might mention deserts and tropical forests as well as ice caps and snow at the poles. The reason it is warmer around the equator and cooler at the poles is that sunlight falls straight down at the equator (short shadows, more heat) and obliquely nearer the poles (longer shadows, less heat). Light and heat are therefore linked.

Observations when placing toothpicks along a parallel:

During the course of a day, which is the same as looking from West (sunrise) to East (sunset), the shadows of the toothpicks point westward to eastward always to their pole (North or South if in the northern or southern hemisphere.

Observations over the course of a year:

- The cause of the seasons is the inclination of the North-South axis of the earth: when it is summer in the North it is winter in the South, and inversely.
- Ask the children about annual celebrations, e.g. Christmas (happening in the winter in the North and in the summer in the South) or spring (happening in March in the northern hemisphere but in September in the southern hemisphere)
- Observe the direction of rotation of the earth (counterclockwise from above the northern hemisphere and clockwise form above the southern hemisphere).
- In winter, nights are longer than days; in summer days are longer than nights. In spring and autumn there are an equal number of hours of day and night.

Extend the activity and connection to real life

A realistic earth model is a powerful way of seeing times and seasons elsewhere on the planet without having to go there. It gives an overall picture of the Earth (imagine kids going to bed while other are getting up: who is late and who is early?)

When talking about people (toothpicks) in other places, other continents and other countries, you can show some cultural specificities of each place. This helps demystify borders, physical and cultural. Make sure no country borders are drawn and show observe that seasons and times (and weather) obey no borders because

country borders are determined by people.

If you can, combine this with an exploration of the world via webcams: they show that night is indeed occurring where night should be.

Look at satellite or aerial photographs of different places on the planet and discuss the climate: if the seasons are weak, like around the equator, the trees will always have leaves, etc. Places closer to the poles are very different in summer and in winter.

Such discussions can lead to a number of topics such as geography, climate, labor, economy, ways of life, culture, environments, etc.

You can print small photographs of different places and stick them where they belong on the earth model. Such reference-points help understand the diversity and complexity of our planet and its inhabitants.

Bibliography

• Lanciano, N., Strumenti per i giardini sky, Ed. Junior, Rome, 2002
• Arthus-Bertrand, Y., The Earth from the sky, Lunwerg editors, Barcelona, 2002
• Arthus-Bertrand, Y., 365 days in the land, Lunwerg editors, Barcelona, 2002

http://phobos.xtec.cat/a8028072/ciencia/

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