Global Earth

Carme Alemany, Rosa M. Ros and Corina Toma

International Astronomical Union
CEIP El Roure Gros, Spain
Poliechnical University of Catalonia, Spain
Colegiul National Pedagogic “Gheorghe Lazar”, Romania

Justification

- This material is designed for teachers of children before starting primary school. Some content is presented to give the teacher more resources, although they may be too ambitious for such young children, but the questions that they may sometimes ask require more extensive knowledge to be able to properly explain the issues that may arise.

Goals

- Understand the diurnal movement of the Sun: Day and Night.
- Understanding the annual movement of the Sun: Seasons

Global Earth

The "Globe" model is useful to create a more global image of the Earth, to see the beings that inhabit it as a whole, to demystify the physical, cultural and racial borders that cause so much damage.

The "Globe" gives us a starting point to try learning about the lives of boys and girls who live in different places on Earth, to see how their activities and customs are closely linked to the environment.

Global Earth

Using Internet images, we can discuss the reality they show us, what area of the Earth the images are from, and the reasons for our opinions. The dialogues are very rich and allow the introduction of concepts about landscape, climate, work, economy, ways of life, environmental protection.

Credit: joka2000

Credit: Aleh Alisevich

Credit: John Mayshash

Global Earth

Then we will find exactly where the images are from, we will reduce them and place them in the appropriate place, on the sphere. In this way we are finding reference points that help us understand the diversity and complexity of our Planet and its inhabitants.

Global Earth

It can also be very motivating for younger students to look for photographs of different animals and place them on the Earth's sphere according to their habitats.

Global Earth

Another option, also linked to the type of climate that exists in the different areas of the surface of our planet, would be to locate the different types of houses. In this case we will look for different photographs of typical buldings and we will place them, reasoning according to their characteristics, paying attention to the connection they may have with the meteorological particularities of the place.

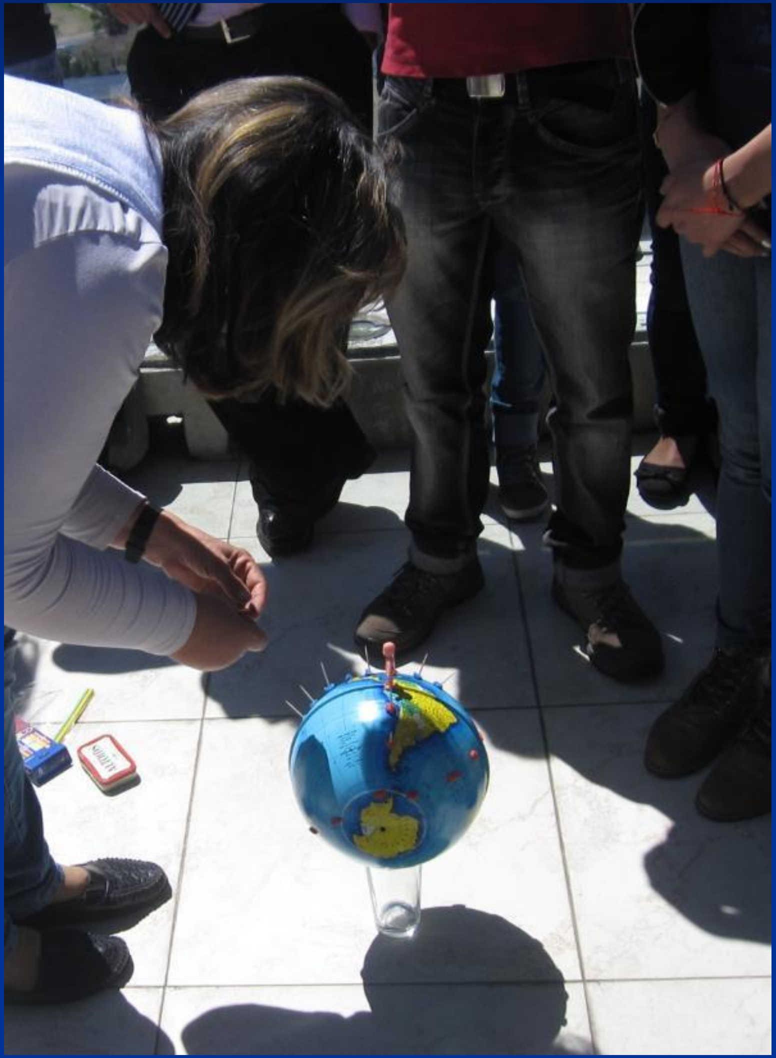
Crédito: Chandra Kanth Reddy

Crédito: Heididorf

Parallel Earth

A spotlight illuminates two spheres of the same shape and produces the same areas of light and shadow as in photography.

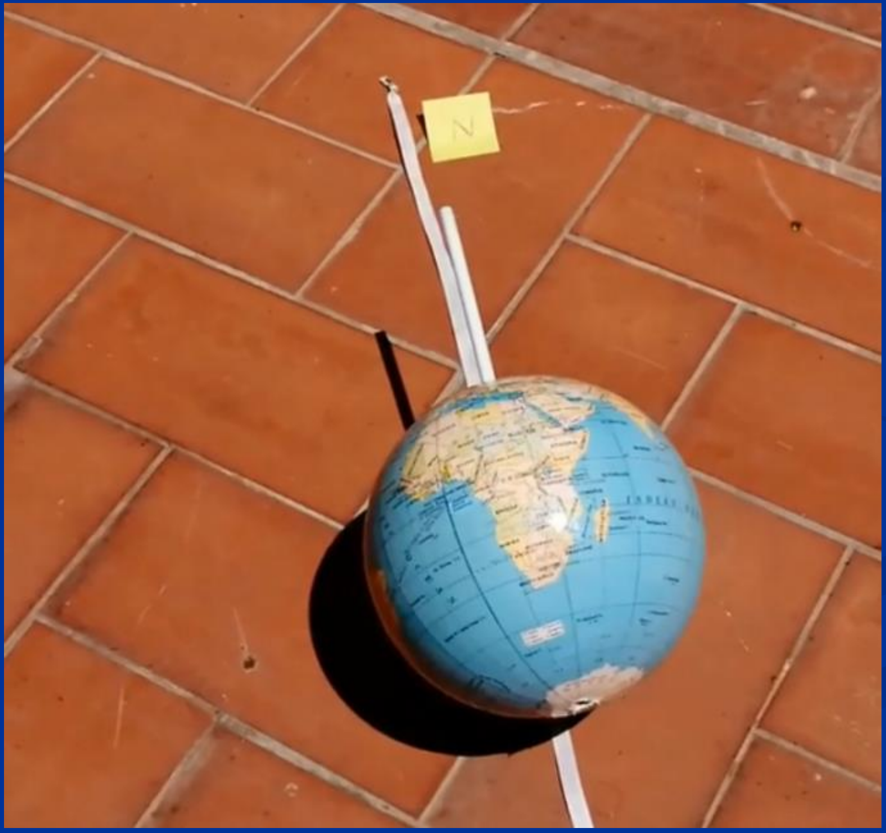
How to place the model



* The terrestrial globe must be removed from its foot and placed outside and on a glass

How to place the model

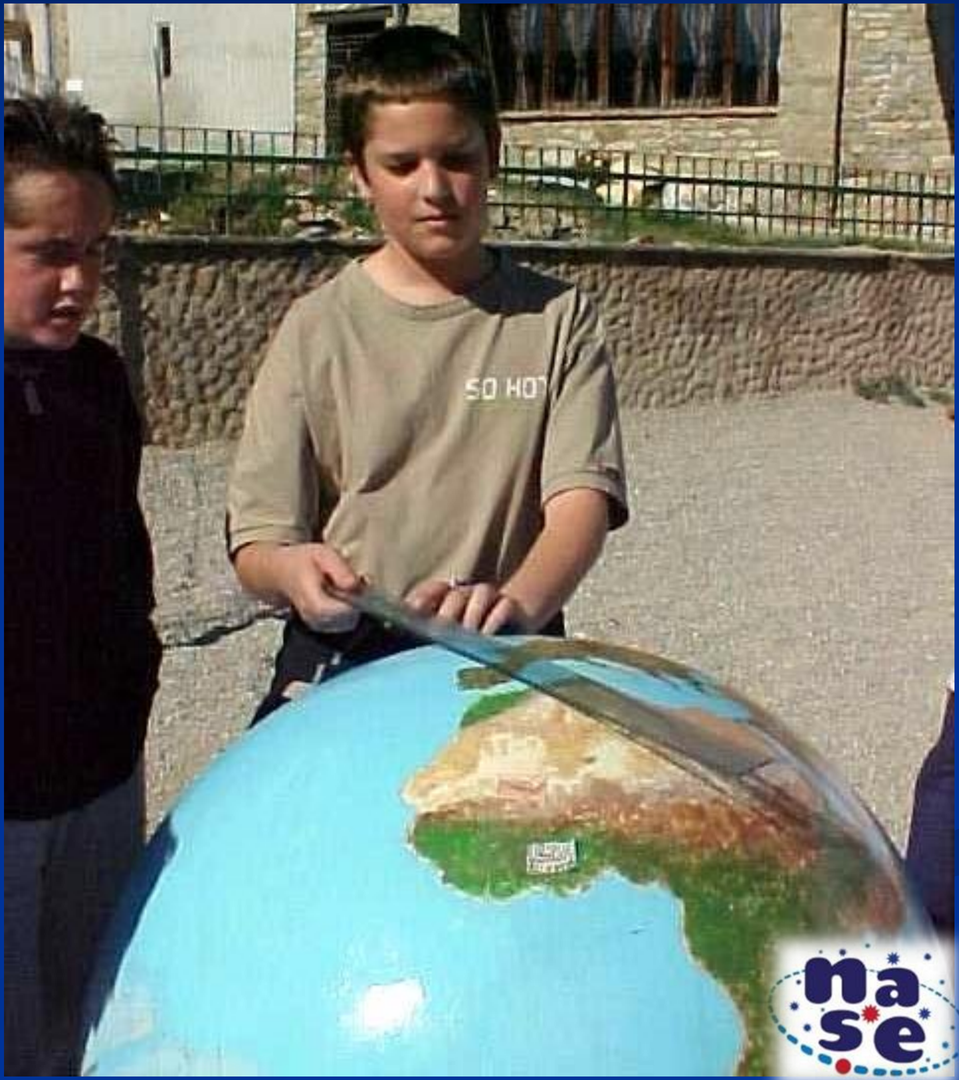
We orient the axis of the model in a North-South direction with a compass.



How to place the model

We place the site from which the observation is made at the highest point of the sphere, so that it is parallel to the ground we are standing on.

To do this we will use a cylindrical pencil and balance it. If it doesn't fall, it means it is at the top of the balloon.



How to place the model

The model will move together with the Earth and both will be illuminated by the Sun.

How to place the model

We locate:

*a doll indicating our position
*pieces of modeling clay to mark the light/shadow line (it will move over time)
*some pieces of toothpicks to study their shadows

Activity 1: How to place the model

If we cannot orient a parallel Earth outside, we can prepare a simulation inside.

1

2

3

4

Activity 1: How to place the model

If we cannot orient a parallel Earth outside, we can prepare a simulation inside.

5

6

7

8

Observation: Continously

We observe the parallel Earth at different times of the day and different times of the year.

Initial observations

- While in some areas of the Earth it is day, in others it is night.
- In the East it is night while in the West it is dawn.
- Every hour the line that separates night from day moves 15º.
- In 24 hours the Earth rotates 360º: one complete revolution, one day.

We put gnomons on the same meridian

- And we observe…

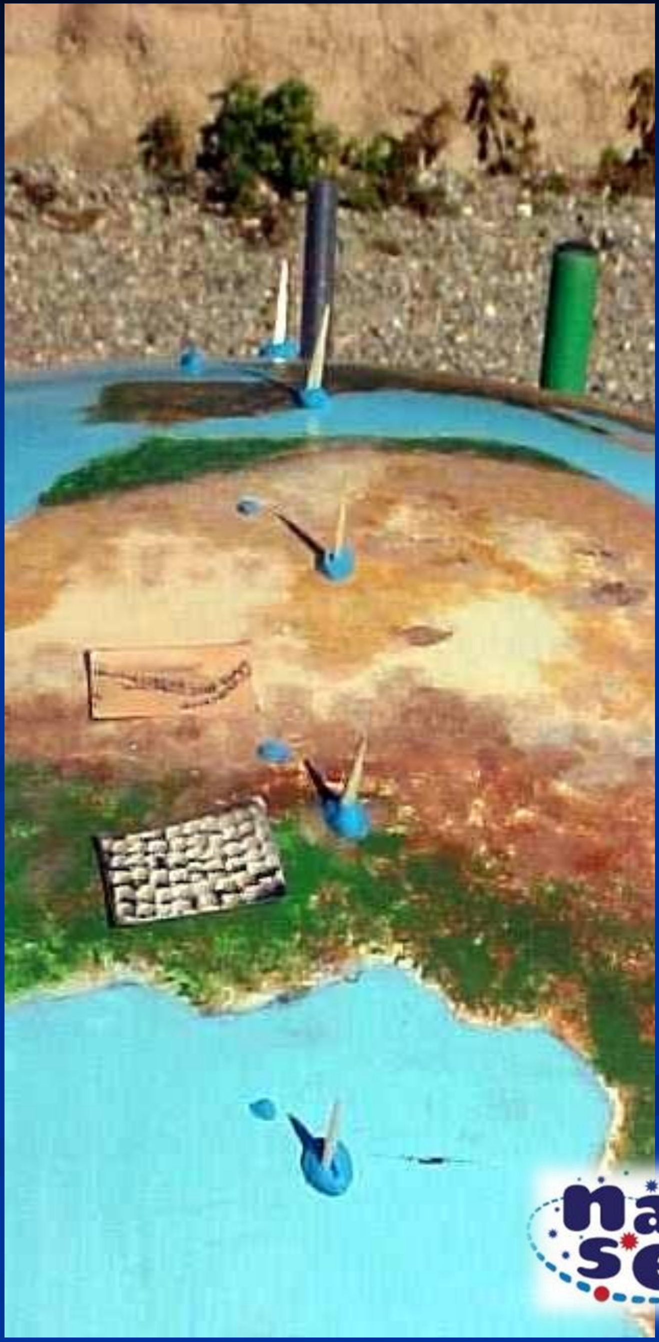
That the shadows, along the meridian, all go in the same direction and sense.

That the shadows in the morning go towards the Northwest, at noon to the North and in the afternoon towards the Northeast.

That the shadows, at noon, indicate the meridian line.

That early in the morning and late in the afternoon the shadows are very long and that, at noon, is the time when the shadows are shorter.

The shadows closer to the Poles are longer and the closer to the Equator are shorter.



We put little gnomons in the same parallel

- And we observe…

That the shadows, throughout the day, go from West to East passing through the North-South line.

By seeing where the gnomon's shadow goes we can know, more or less, the time of the place.

The Earth rotates on itself counterclockwise.

At the same moment it is not the same time in all areas of the Earth. Every 15º towards the East they have one hour more and towards the West they have one hour less.

The further towards the Poles the shadows of the gnomons are longer because the Sun's rays fall less perpendicularly. That's why it is always colder than at the equator, where the sun's rays hit more perpendicularly.

Activity 2: Tales from the Parallel Earth

Another interesting activity to do with students is to invent four characters (four children) who live in areas of the Earth that are 90 degrees, or six hours, from each other.

For example: A Spanish boy named Peter, a Chinese boy named Xanlu, a girl living in New Zealand named Kaylene, and an American boy named Wild Eagle.

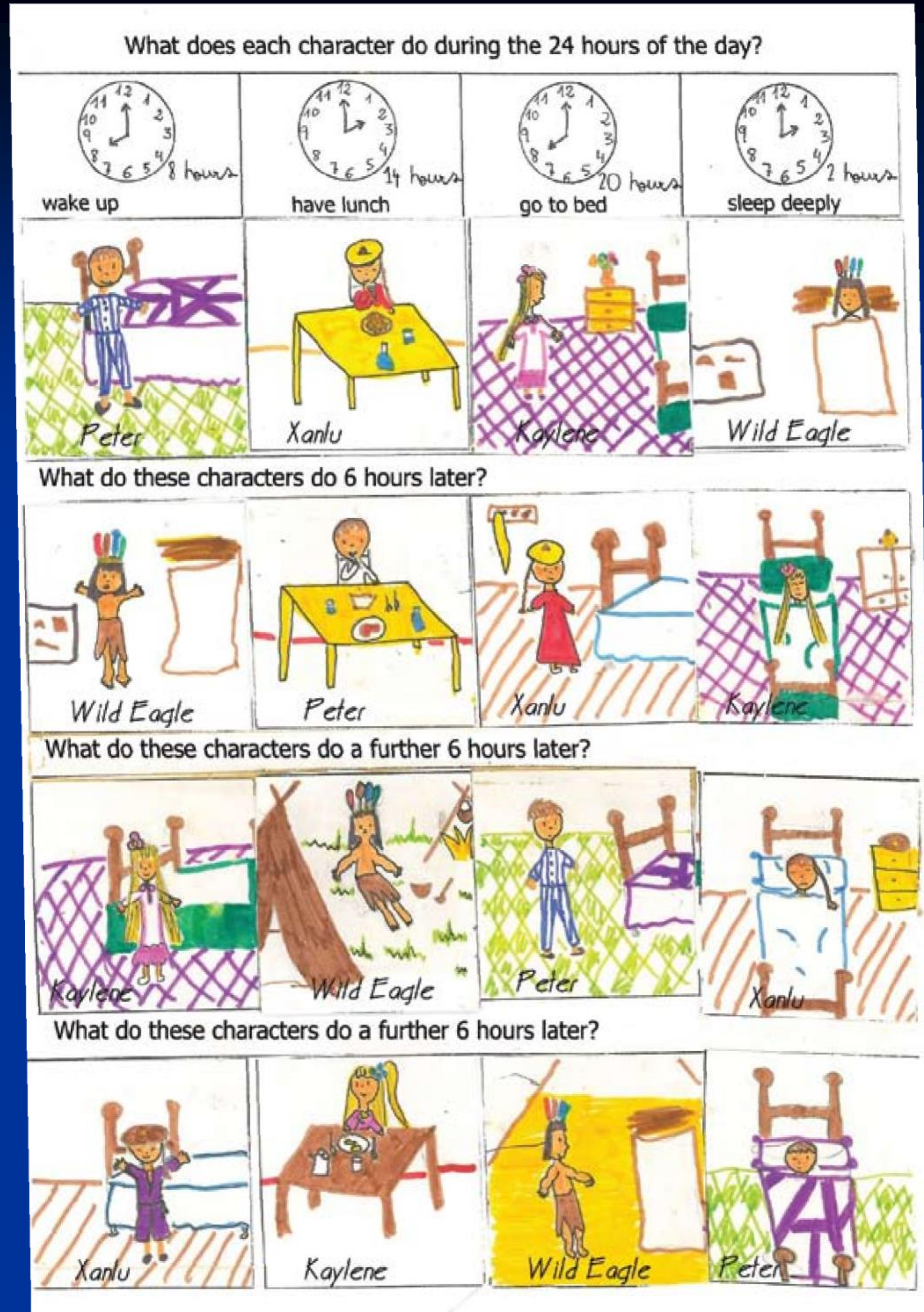
Activity 2: Tales from the Parallel Earth

This experiment was carried out with students on several occasions. We chat about these characters about the place where they live, their cultural characteristics, lifestyles, climate, vegetation, food, etc.

From these dialogues, the students write and draw stories in which these characters are the protagonists and the scripts are designed to include the cultural characteristics of each of them. The characters interact with each other according to their different local schedules.

Activity 2:

Tales from the Parallel Earth



Observation: Seasons

As the Earth moves around the Sun, seasons occur because the Earth's rotation axis is inclined.

The reason is not that the Earth is closer or further from the Sun, but, due to the position of the Earth in its journey around the Sun, there is a time when the Sun's rays fall more directly on the Northern Hemisphere and there it is summer, at the same time that in the Southern Hemisphere it is winter, because the sun's rays hit less directly.

When it is spring in one hemisphere of the Earth, it is autumn in the other.

Observation: Seasons

*The North pole is in the sunny area, therefore it is Summer for the Northern Hemisphere (midnight Sun for the North)

* The South pole is in the shadow and therefore in the Southern hemisphere, it is Winter

Observation: Seasons

* the North pole is within the night zone, therefore in the Northern Hemisphere it is Winter.

* the South pole is illuminated and therefore it is Summer in the Southern Hemisphere (midnight Sun for the South).

Observation: Seasons

* the line separating day and night passes through both poles, that is, the first day of spring or the first day of autumn.

Observation: Seasons

North H. summer | North H. winter | North H. equinoxes

South H. winter | South H. summer | South H. equinoxes

Activity 3: Simulating Sun's movements

We simulate the annual Sun path between the two tropics (Cancer and Capricorn) to North and South and vice versa

Conclusions

- The Earth's translational movement causes the seasons of the year because the Earth's rotation axis is inclined.
- When it is Summer in the Northern Hemisphere, it is Winter in the Southern Hemisphere.
- In Summer there are more hours of day than night and around the pol it is always daytime. In Winter there are more hours of night than day and on the polar cap it is always night.
- At the spring equinox and the autumn equinox there are an equal number of hours of day a night (12 h).

Thank you very much
for your attention!