MEET OUR HOME: PLANET EARTH

Explore a tactile version of our home, the Earth, made with household materials.

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Curriculumonderwerp
Sun-Earth-Moon, the Earth

Grote idee van wetenschap
Earth is a very small part of the universe.

Trefwoorden
Earth, Tactile, Visually Impaired

Leeftijdsgroep
6 - 12

Onderwijsniveau
Primary School, Middle School, Informal

Tijd
1h30

Groepsgrootte
Group

Toezicht voor de veiligheid
Supervised

Kosten
Low (< ~5 EUR)

Locatie
Indoors (small, e.g. classroom)

Kernvaardigheden
Asking questions, Developing and using models, Analysing and interpreting data, Communicating information

Type leeractiviteit
Partial enquiry

KORTE BESCHRIJVING

Converting a visual to a tactile experience, this activity lets visually impaired students learn about and explore some of the characteristics of our home planet, the Earth.

DOELEN

To explore our home, the Earth, through a tactile hands-on experience for visually impaired students and their non-visually impaired peers.

LEERDOELEN

- Students will be able to recognise and describe features of the Earth using the tactile model.
- Students will be able to explain the importance of building models, identify strengths and limitations of this model, and suggest ways they might improve aspects of the model.

EVALUATIE

Use the descriptions below or ask students to volunteer their own description of a feature on Earth. Ask students to point at the feature on their model as soon as they know which one it is. First give a description and a couple of seconds to think about it. Then give the name and a couple more seconds to point it out. Encourage students to ask questions about different characteristics of Earth represented by the different textures.e.g.:

- The part of the world where nearly all humans live. (Land).
- These cover nearly three quarters of the Earth's surface and are very wet. (Seas and oceans).
- These are very cold parts of the world, made of ice. (Polar caps).
- These are in the sky and where rain comes from. (Clouds).

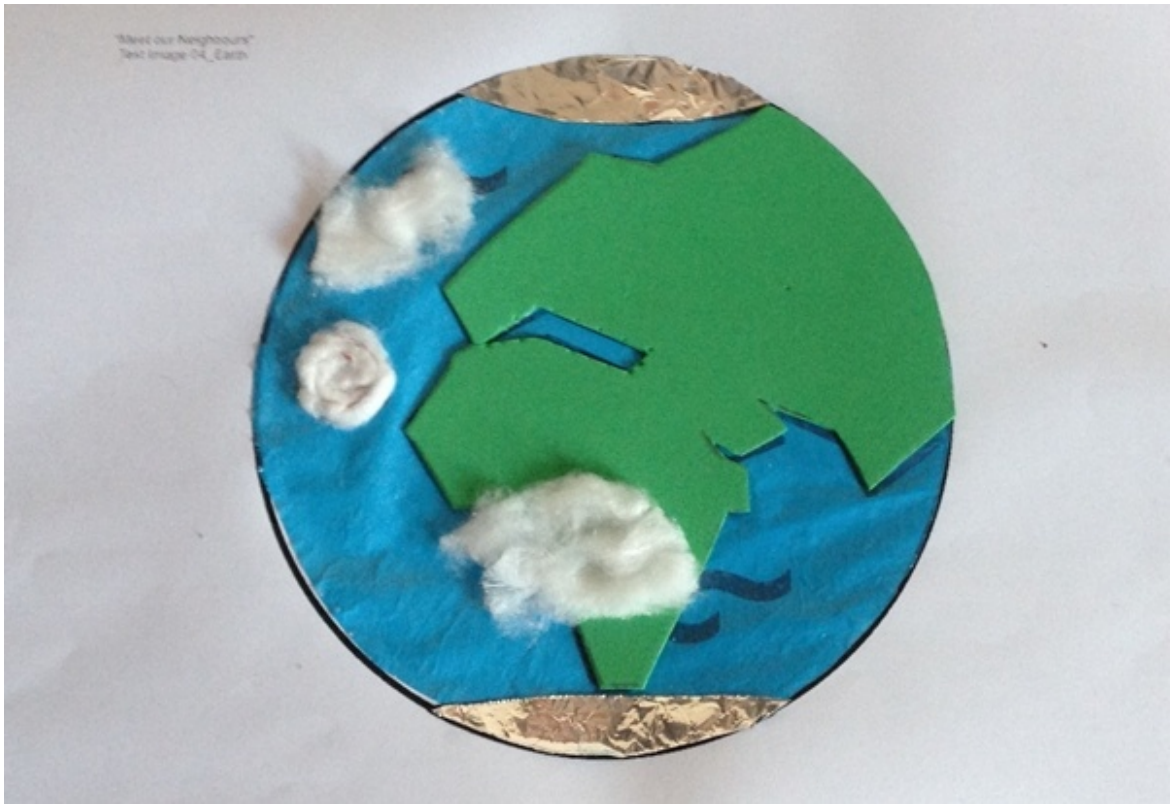
- These are huge storms where the wind is really strong (Hurricane).

Ask students to discuss the importance of building models, strengths and limitations of this model of the Earth, and how they might improve the model.

Ask students to write down two things they learned from the activity in their groups, and two things they want to learn more about.

MATERIAAL

- Thin wire (for hurricane feature)
- Cotton (for clouds and hurricane)
- Aluminium foil (for polar caps)
- Thick fabric (for continents)
- Plastic (for liquid water)
- Glue
- Scissors
- Pen
- Earth Features PDF print out
- Earth Mold PDF (two copies) print out



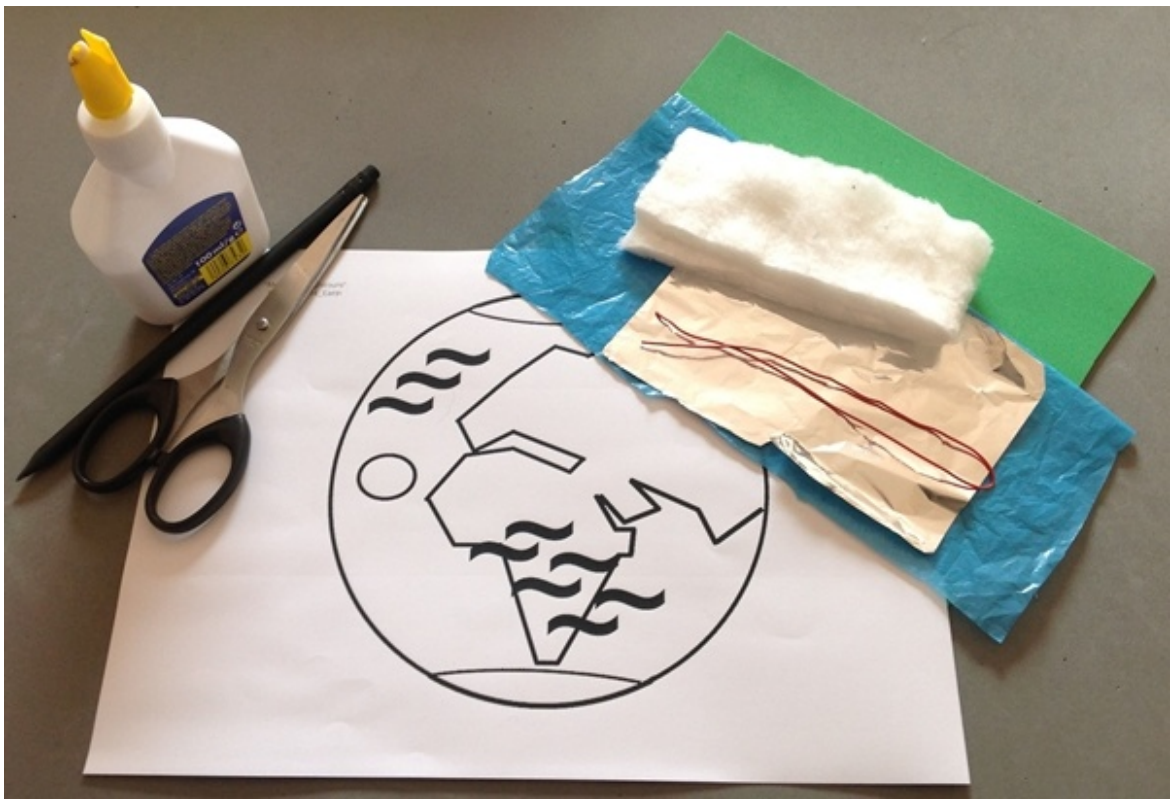
ACHTERGRONDINFORMATIE

Earth

Earth is our home and the third planet from the Sun. With a mean distance between the Sun and Earth of 150 million kilometres, the average surface temperature is above the freezing point of water (0 degrees C). Unlike on Venus or Mars, whose surface temperatures are either much warmer or colder, this means that liquid water can exist freely on Earth. This has played a fundamental role in the development of life on our planet. The shape of the Earth is very close to a sphere. Because of its slow rotation — once every 24 h — the distortions are small, the difference between the equatorial radius (6,378 km) and the polar radius (6,357 km) being only 21 km. Earth only has one natural satellite, the Moon, which is thought to have played a major role in stabilising the axis of rotation of the Earth. Once again, this may have been a favourable element in the emergence of life.

Tactile features

The tactile model of the Earth includes a number of features that represent real features of Earth. You can find more information about these features below.



Liquid water, continents and polar caps

On Earth, 71% of the surface is covered by liquid water (represented by plastic on the tactile model), so the area occupied by seas and oceans is more than twice that occupied by land. The distribution of lands and seas is unequal and peculiar: the majority of land masses are in located in the Northern hemisphere, as three major continents (Europe, Asia, and North America).

Continents are represented by the thick fabric on the tactile model. The poles of the Earth are also quite different: there is an ice-covered continent at the South Pole (Antarctica), but an ocean at the North Pole (the Arctic Ocean), which forms an ice cap in winter (both represented by the aluminium foil on the tactile model). On Earth, surface elevations are measured with respect to the mean sea level. They vary between a height of 8,848 m (Mount Everest) and a depth of 11,000 m (the Mariana Trench in the northwest part of the Pacific Ocean). The average depth of the oceans is 3,800 m, and the average altitude of land is 840 m.

Clouds and hurricanes

Earth has a relatively thin atmosphere extending to less than 200 km altitude. Dry air is mainly composed of nitrogen (N_2: 78.08%), oxygen (O_2: 20.95%), and argon (Ar: 0.93%). The remaining 0.04% is a mixture of "trace" gases, mostly carbon dioxide (CO_2), but also rare gases such as neon (Ne), helium (He), and krypton (Kr). On average, water vapour (H_2O) accounts for 0.25% of the mass of the atmosphere, but its concentration varies a lot depending on the local temperature: it can be anywhere between 0.01% and 5%. When lifted to the upper parts of the atmosphere (above 3000 m on average), water vapour condenses to form clouds of very diverse densities and shapes (represented by clumps of cotton on the tactile model); some of these clouds can develop into powerful hurricanes over the oceans (represented by curled wire and cotton on the tactile model). Earth's climate has recently begun undergoing an unprecedentedly fast warming phase due to the action of "greenhouse gases", such as carbon dioxide and methane, that humans have been releasing in large quantities since the beginning of the industrial era. These gases tend to trap infrared radiation from the Earth's surface, causing the Earth's surface to heat up; we call this phenomenon the "greenhouse effect."

VOLLEDIGE BESCHRIJVING VAN DE ACTIVITEIT

Prior to the activity:

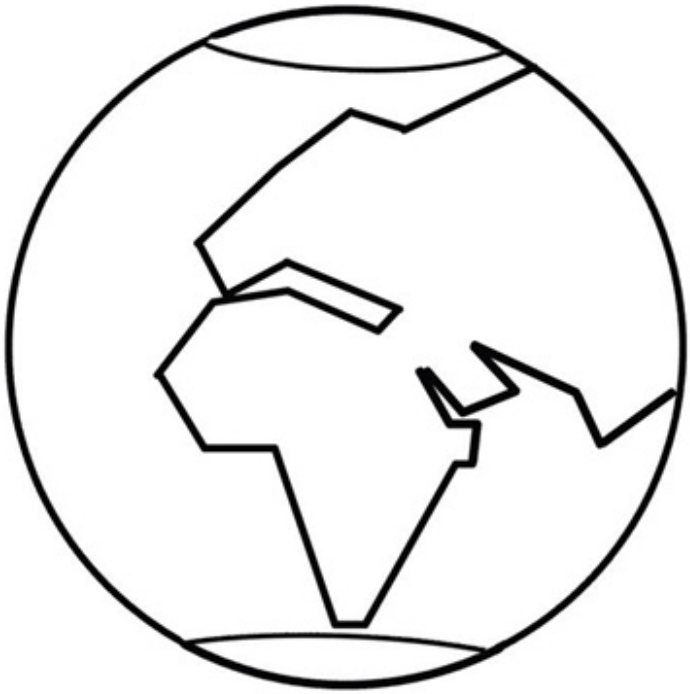
- Print both Earth mold and Earth features PDFs for each group, and prepare the materials listed above.
- Ask students what they know about the Earth, and how it looks from space. Tell students they will be making models of the Earth to investigate its different features.

During the activity:

- Put the students in groups of 5 (ideally 3 non-visually impaired to 2 visually impaired).
- Distribute materials accordingly.
- Close supervision is important. Follow each group and explain each of the tactile elements and their correspondence to each object feature.
- Understand the different needs of each group of students to promote interaction between the students during the building of the tactile model. Visually impaired students need to be familiarized with the different materials involved.
- Give enough time to follow instructions and build the tactile image.

Step 1

Print two copies of the 'Earth Mold PDF.'



Step 2

Cut the outer round shape of the Earth from one of the printed papers.

Step 3

Place the paper cutout on top of the plastic and draw the outline.

Step 4

Cut the plastic according to the drawn section.

Step 5

Apply glue on the surface of the Earth in the other printed paper.

Step 6

Place the circular plastic cutout on top of the glued area.

Step 7

Cut the shape of the polar caps on the previously cut 'Earth Mold PDF.'

Step 8

Place the polar caps on aluminium foil and draw the outline.

Step 9

Cut the aluminium foil along the outline.

Step 10

Glue the aluminium foil (polar caps) on top of the previously glued plastic circle on the paper.

Step 11

Print the 'Earth Features PDF' and cut the shapes of Earth's continents.

Step 12

Place the paper cutout (continents) on top of the thick fabric and draw the outline.

Step 13

Cut the thick fabric according to the drawn section.

Step 14

Apply glue on the cutout and paste it on the plastic circle.

Step 15

Curl the cotton around the thin wire to produce the hurricane feature.

Step 16

Curl the wire into a spiral that fits in the round shape of the hurricane.

Step 17

Apply glue and paste the hurricane on the model.

Step 18

Apply glue on the regions denoted by the curved lines.

Step 19

Place cotton on top of the glue to produce the clouds feature. Wait for the model to dry. This may take a while.

Exploring the tactile model:

There are several ways in which you can explore the scientific content of the tactile model.

If you're presenting the final tactile model to the students, first let them explore and feel the different textures. Questions will arise as the students explore; encourage them to write their questions down and share them with the other groups.

Read "Background Information" to understand the different features present in Earth's schematic tactile model, and share with the students as they ask about them, or (if you have more time), prompt each group to choose a feature to learn more about and then have them present their findings to the other groups in the class.

- Water is represented by the plastic texture.
- The continents are represented by the thick fabric.
- The polar caps are represented by aluminium foil.
- The hurricanes are represented by cotton and wire curled up.
- The clouds are represented by cotton.

Discuss the idea of models with the students. Suggested discussion points:

- What is a model? Why is it useful to build models?
- What are the strengths of this model?
- What are the limitations of this model?
- How could the model be improved?

Ask students in their groups to write down two things they learned from the activity, and two things they want to learn more about.

CURRICULUM

Space Awareness curricula topics (EU and South Africa)

Our wonderful Universe, Our fragile planet, Sun-Earth-Moon, the Earth

National UK

KS3 - Chemistry, Earth and Atmosphere KS2: Year 5 - Science, Earth and Space KS2 - Art and Design

AANVULLENDE INFORMATIE

Explore the rest of the planets through 'Meet Our Neighbours' in tactile form at http://nuclio.org/astroneighbours/resources/

CONCLUSIE

Students build a tactile version of Earth using cheap household items and use it to identify the different tactile characteristics of Earth.

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