

What is a Greenhouse & What is The Greenhouse Effect on Earth

Educational Activity with the Use of ICT Tools and Augmented Reality (AR)

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The content is based on the Traditional Educational Material (TEM)

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IN A NUTSHEL



Overview

Students engaging with selected materials, worksheets, and ICT resources, including Augmented Reality apps, to enhance their understanding and develop the ability to clearly distinguish between the natural greenhouse effect and the human-induced climate crisis.



9+ years old



By the end of this activity, students will be able to:

- Describe the natural phenomenon of the greenhouse effect.
- Distinguish between the greenhouse effect and the climate crisis



Geography/Earth Sciences, Science , STEAM, AR /ICT



4 class hours (classroom setting)

1 Week (whole school setting)

2 hours outdoor learning



Teacher Preparation:

Prepare ICT tools (PC/ tablet, projector, Wi-Fi, interactive board, AR apps)

Set up the classroom for group work

Familiarize yourself with the ICT software, including datasheets and links

Print the live poster in color and high resolution

Test one QR code and marker in advance to check if everything loads

Review all materials and worksheets

Prepare guiding questions and feedback prompts

Teaching Methods

Experiential Learning (Hands-on experiments and real-world data analysis)

Inquiry-Based Learning (Students explore concepts through questioning, experimentation, and data analysis).

Visual learning (Students use of diagrams, AR visuals, simulations, and posters to support understanding)

Collaborative Learning (Students work in pairs or small groups to complete tasks and discuss findings)

Technology enhanced learning (ICT tools, AR apps, simulations, and online data platforms)

Materials / equipment

PC/laptop, Video projector/screen, Wi-Fi, Interactive board

Smartphone/tablet, AR app, AI tools

Poster with image markers and QR codes

Worksheet and Pens

For the experiment: 2 shallow open boxes lined with soil, 2 thermometers, 1 thick plastic sheet (to cover one box), 1 notebook and pen/pencil



STEP BY STEP

What is a Greenhouse & What is the Greenhouse Effect on Earth

Part A: Learning Activities in the Classroom Setting

Introductory Phase: Experimenting with the Greenhouse Effect!

Activity goal: The goal of this activity is to engage students in exploring the greenhouse effect through hands-on experimentation

Setting: Whole school setting

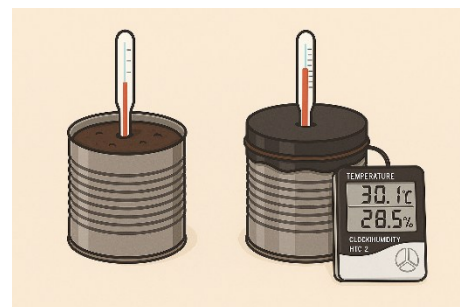
Estimated duration: 1 Week

Mode of Student Work: Students works in groups

Instructions for Teacher: The goal for this activity is to engage students in exploring the greenhouse effect through hands-on experimentation enabling them to observe, record, and analyze temperature differences in controlled conditions in order to better understand the mechanisms of climate change.

Over the course of one week, students use two thermometers and two shallow open boxes lined with soil—one left uncovered and the other tightly sealed with a thick plastic membrane.

They record temperature readings in a notebook at different times of the day and evening, keeping systematic records to compare the heat retention between the two conditions.



Students' tasks:

- Over the course of one week, you will investigate how heat is retained differently in two soil boxes.
- Measure the temperature in both boxes at different times of the day.
- Write down each reading in the [Temperature Data Table](#).*
- Make sure to note the day, time, and temperature for each box.
- Repeat this process every day for a full week.

Instructions for Each Column Record Data:

- ✓ Day: Write the date.
- ✓ Time: Record the measurement time (Morning, Noon).
- ✓ Temperature Box A (°C): Measure and write the temperature of the uncovered box.
- ✓ Temperature Box B (°C): Measure and write the temperature of the covered box.
- ✓ Difference (B – A): Subtract Box A temperature from Box B temperature and write the result.
- ✓ Notes / Observations: Record anything unusual or important, sunny, cloudy, etc.

*The table embedded in the worksheet is provided as attachments in XLS and PPT file formats.

1st Phase: Activation / Prior Knowledge Investigation

Activity goal: Activate students' prior knowledge, spark curiosity, and introduce the greenhouse analogy

Setting: Classroom (In-Class)

Estimated duration: 15 minutes

Mode of Student Work: Individual thinking, in-pairs reflection, and whole-class discussion

Description:

Display or distribute the following reflection questions to students (**project on video projector/interactive board screen and hand out on [Greenhouse Exploration Worksheet](#)**)*:

- *Have you ever been inside a greenhouse on a cold winter day? What did you notice?*
- *Have you ever bought fruits or vegetables grown in a greenhouse? Why are they grown there?*
- *How does a greenhouse work to keep plants warm?*
- *Have you ever thought about how Earth acts like a greenhouse because of its atmosphere?*

Ask students to think individually (Worksheet - Section A), pair up (Worksheet - Section B), and discuss their reflections (Worksheet - Section C).

Bring the class together for a plenary discussion. Students' ideas are elicited and recorded.

On the board, list key features of a greenhouse as students mention them (e.g., *glass walls, warmth, sunlight trapping, and controlled environment*).

Encourage students to include these features in their diagrams (Worksheet – Section D).

Explaining: A greenhouse keeps plants warm by letting sunlight in and trapping heat inside.

Introduce the analogy: The Earth is like a giant greenhouse!

2nd Phase: Exploration

Activity goal: Exploring the Greenhouse Effect

Setting: Classroom (In-Class)

Estimated duration: 30 minutes

Mode of Student Work: Students work in groups to complete the task collaboratively

Whole-Class Discussion

Description:

Give each group of Students the [Poster](#) that includes four (4) marker images and QR codes for viewing AR objects.

Ask students to scan the QR codes on the **Marker Image 1** using their devices.

Ask students to complete [Worksheet 1](#) by labeling the key parts of a greenhouse and answer the following questions in complete sentences. Once students have completed the worksheet, ask them to share their answers and discuss what they learned.

Ask students to scan the QR codes on the **Marker Image 2** using their devices.

Ask students to complete [Worksheet 2](#), by labeling how the atmosphere warms the Earth and answer the questions in complete sentences. Once students have completed the worksheet, ask them to share their answers, and discuss what they learned.

Consider with the students how the greenhouse analogy helps explain how Earth stays warm:

The atmosphere works like a greenhouse, trapping some of the sun's rays to keep our planet warm.

Earth stays warm because its atmosphere traps the sun's rays. Gases in the atmosphere, keeping our planet at a temperature that can support life, absorb some sunlight bounces back into space, but much of it.

This greenhouse analogy helps us understand how our atmosphere works to maintain Earth's warmth.

Ask students to use the simulation to explore how the greenhouse effect works on Earth: <https://www.oce.global/animations/green-house-effect-final-version/greenhouse.html>

Encourage them to make observations, and explore freely. Remind students that they can move back and forth between screens to review or gather more information.

Encourage them to share observations in their groups and clarify the following questions:

- *How sunlight actually reaches Earth's surface.*
- *What happens to the incoming energy—how is reflected back to space and how is trapped.*
- *What do you observe when greenhouse gases increase?*
- *What might happen if the balance of heat-trapping gases changes significantly?*

Bring the class together to share key findings. Lead a discussion connecting these observations to Earth's temperature, climate, and the importance of greenhouse gases in supporting life.

3rd Phase: Concept Introduction / Explanation

Activity goal: Exploring the role of the greenhouse gases

Setting: Classroom (In-Class)

Estimated duration: 10 minutes

Mode of Student Work: Students work in groups to complete the task collaboratively

Whole-Class Discussion

Description:

On the [Poster](#), ask students to scan the QR codes on the **Marker Image 3** using their devices.

Once students have explored the AR objects, have them work in small groups to discuss what would happen to Earth's temperature, oceans, plants, animals, and humans without greenhouse gases.

Ask each group to consider:

- How cold would it be?

After the group discussion, invite students to scan the QR codes on the **Marker Image 4** using their devices.

After students complete their exploration, guide them to conclude that without the gases in the atmosphere that trap heat from the sun. Earth would be much colder and unable to support life as we know it. Conclude that Earth's average temperature would drop to about -18°C instead of the current $+15^{\circ}\text{C}$.

Ask each group to consider:

- Could life survive?

Ask students to share their ideas with the whole class about the role that greenhouse gases play in keeping Earth warm.

4nd Phase: Analyze experimental data (Application/Elaboration)

Activity goal: Students will analyze the temperature data collected from the greenhouse experiment and present their findings using Excel or PowerPoint

Setting: Classroom (In-Class)

Estimated duration: 20 minutes

Mode of Student Work: Students work in small groups to complete the task collaboratively

Whole-Class Discussion

Description:

Ask students to enter their recorded data using Excel or PowerPoint

Check that all readings are complete and accurate.

Explore the charts you created to visualize your data, and identify patterns in the temperature differences between the two boxes.

Ask them:

- Share your findings with the class.
- Compare results across groups.
- Discuss factors that could have influenced differences in heat retention

Can you make the relation with the greenhouse effect? (the plastic cover provides a simulation of greenhouse gases, trapping heat similarly to the Earth's atmosphere).

5nd Phase: Exploring and Reflecting Data

Activity goal: Students evaluate experimental results, connect new knowledge with your experiences, and reflect on the learning process

Setting: Classroom (In-Class)

Estimated duration: 20 minutes

Mode of Student Work: Students work in small groups to complete the task collaboratively

Whole-Class Discussion

Description:

Ask students work the [Data Catalog - Our World in Data](https://ourworldindata.org/explorers/co2?facet=none&country=~OWID_WRL&hideControls=false&Gas+or+Warming=CO%E2%82%82&Accounting=Production-based&Fuel+or+Land+Use+Change=All+fossil+emissions&Count=Per+capita) on the interactive board device to interact with the 3 following graphs (zoom in, tap on data points, switch between years or countries).

- Explore the global CO₂ emissions line from 1750 to today. Choose at least three points in history where the line changes quickly.

https://ourworldindata.org/explorers/co2?facet=none&country=~OWID_WRL&hideControls=false&Gas+or+Warming=CO%E2%82%82&Accounting=Production-based&Fuel+or+Land+Use+Change=All+fossil+emissions&Count=Per+capita

Write down the years and describe your observations for Questions 1a and 1b on [Worksheet 3](#).

- Look at the graph showing how land and sea surface temperatures have changed compared to 1861–1890.

<https://ourworldindata.org/grapher/temperature-anomaly>

Write down the years and describe your observations for Questions 2a and 2b on [Worksheet 3](#).

- Look at how different countries produce greenhouse gases emissions include those from fossil fuels and industry, and land-use change.

<https://ourworldindata.org/grapher/total-ghg-emissions?country=European+Union+%2828%29~USA~GBR>

Ask to carefully observe the trends, peaks, and changes they see. Ask them to write down your answers to complete the questions 3a and 3b of the [Worksheet 3](#).

Once students have completed the worksheet, ask them to share their answers and discuss what they learned:

- What is the main pattern you notice in the data?
- Is there a time period when the change was especially fast?
- Which countries or regions look different from others?
- How do these changes affect people and the planet?

Greenhouse Effect and Human Impact: The Earth's climate does not change without a reason. Some natural factors may influence it over long periods of time, such as solar variability and volcanic activities. Exactly how much heat will remain in the atmosphere and how much will escape into space is regulated by a delicate balance, thanks to the "greenhouse gases" (GHG): carbon dioxide, methane, nitrous oxides, and water vapor. Scientific evidence is showing repeatedly that this delicate balance is disturbed due to human activities and the Earth's atmosphere is warming up, resulting in global warming.

- How can my classmates and I help?

Extension Phase: From Knowledge to Climate Action Activities

Activity goal: Students apply the concepts learned during the activity to create their own digital elements

Setting: 2 hours (In-Class)

Estimated duration: 20 minutes

Mode of Student Work: Students work in small groups to complete the task collaboratively

Whole-Class Discussion

Description:

Create your own Blippar

Students create their own interactive Blippar AR integrating text, images, videos, or other multimedia elements

- *Choose a topic*

Select a concept or theme from the activity (e.g., greenhouse effect, climate change).

Decide which images, videos, 3D objects, and text you want to include.

- *Create your Poster*

Design your own **POSTER** background.

Add the AR marker and QR code.

Ensure all AR elements appear correctly when scanned.

- *Design your Blip*

Create at least one interactive scene using blippar.

Be ready to explain your design choices and what you want viewers to learn.

- *Share*

Present or share your poster with your classmates.

Climate Action Poster

Students create live poster that integrates all elements of the project

- Create images, charts, and infographics
- Produce short videos
- Prepare short multimedia presentations

Poster



Temperature Data Table

Group Name: _____

Greenhouse Effect Experiment

Temperature Data Table (printable version)

Instructions for Each Column

Day: Write the day number (Day 1 → Day 7).

Time: Record the measurement time (Twice per day).

Temperature Box A (°C): Measure and write the temperature of the uncovered box.

Temperature Box B (°C): Measure and write the temperature of the covered box.

Notes / Observations: Record anything unusual or important, e.g., sunny, cloudy, etc.

Date	Time	Temperature (°C) – Box A (Uncovered)	Temperature (°C) – Box B (Covered with Plastic)	Students Notes/Observations

The table is provided in the form of XLS and PPT files

Greenhouse Exploration Worksheet

Group Name: _____

Section A – Think & Reflect (Individual Work)

- Have you ever been inside a greenhouse on a cold winter day? What did you notice?
 Write your observations: _____
- Have you ever bought fruits or vegetables grown in a greenhouse? Why do you think they are grown there?
 Write your ideas: _____
- How does a greenhouse work to keep plants warm?
 Explain in your own words: _____
- How might Earth act like a greenhouse because of its atmosphere?
 Write your thoughts: _____

Section B – Pair & Share (Work with a Partner)

- Compare your answers with your partner.
 Write down one new idea you learned from your partner: _____

Section C – Whole Class Discussion (Plenary Discussion)

- After the class discussion, write down three main points that everyone agreed on:

Section D – Draw & Explain

- Draw a simple diagram of a greenhouse and label its key features



Label the key features as: **glass walls/roof, sunlight, trapped heat, plants.**

Worksheet 1

Group Name: _____



Look at the diagram of the greenhouse below.
Fill in the blank labels with the correct words!



1. Why is it important for heat to be trapped in the greenhouse?

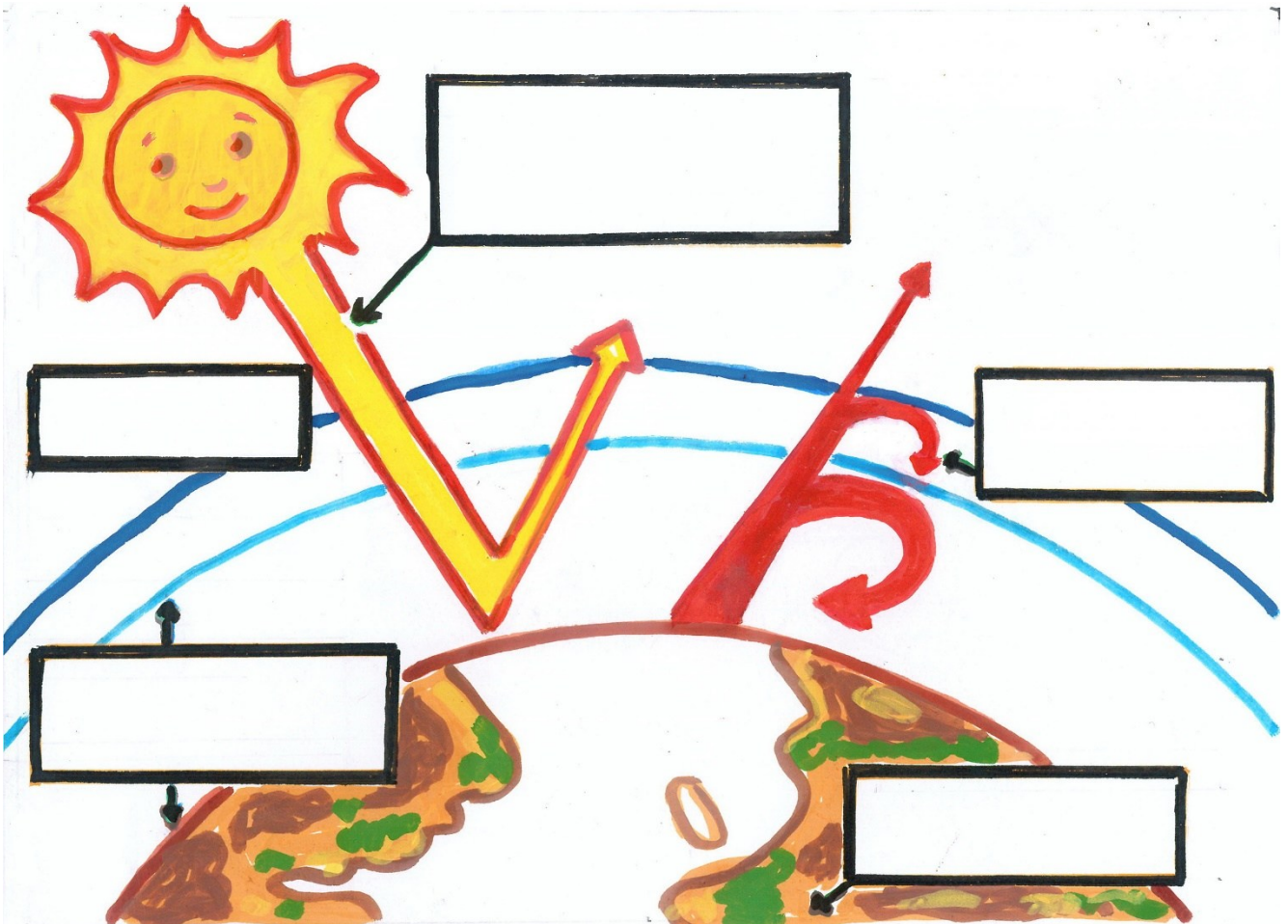
2. What would happen if the greenhouse glass broke?

Worksheet 2

Group Name: _____



Look at the diagram of the greenhouse effect in Action.
Fill in the blank labels with the correct words!



1. What would happen if there were no greenhouse gases?

2. What is the equivalent of the glass or plastic of an artificial greenhouse in the Earth's environment?

Worksheet 3

Group Name: _____



After exploring the graphs below, write down your answers to the following questions:

1. Explore the global CO₂ emissions line from 1750 to today. Choose at least three points in history where the line changes quickly.

https://ourworldindata.org/explorers/co2?facet=none&country=~OWID_WRL&hideControls=false&Gas+or+Warming=CO%E2%82%82&Accounting=Production-based&Fuel+or+Land+Use+Change=All+fossil+emissions&Count=Per+capita

1a. Write down at least three dates in history when Carbon dioxide (CO₂) emissions changed quickly.

1b. When do emissions begin to rise sharply? What do you think caused this rise?

2. Look at the graph showing how land and sea surface temperatures have changed compared to 1861–1890.

<https://ourworldindata.org/grapher/temperature-anomaly>

2a. Write down at least three periods when temperatures rose quickly.

2b. Why do you think the temperature changes more in recent years?

3. Look at how different countries produce greenhouse gases emissions include those from fossil fuels and industry, and land-use change.

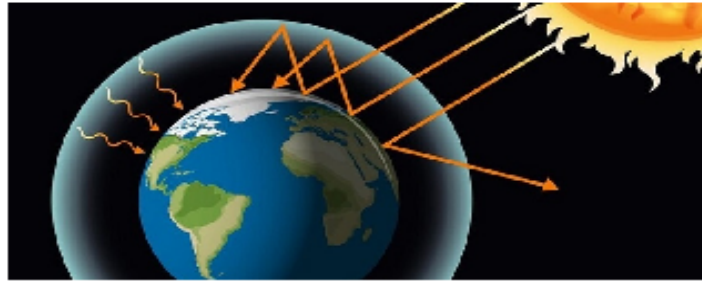
<https://ourworldindata.org/grapher/total-ghg-emissions?country=European+Union+%2828%29~USA~GBR>

3a. Note three countries with the highest greenhouse gas emissions and record their names.

3b. Why do you think some countries have higher emissions than others?

Part B: Outdoor Learning Activities

ACTION BOUND: “The Greenhouse Effect”



Bound: The Greenhouse Effect



Get the Actionbound app for free in the Apple App Store or at the Google Play Store

Scan the QR code with the Actionbound app

Visit actionbound.com with your computer and very easily create your own Bounds for birthday parties, projects, city rallies, bachelor parties or whatever might arise your creative talent.



Physical & Augmented Reality for Climate Change Education



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ISTITUTO COMPRENSIVO
GROSSETO 4



Associated Partners



1st Experimental
Primary School of Pyrgos
Wonder is the seed of knowledge



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