

Lesson #4: Changes All Around Us

Greenhouse Effect Experiment & Caring for Plants in a Changing Climate

Big Idea



Climate change can be a complex topic. We use plants as an entry point into conversations about a changing climate. Support your students for deeper conversations by blending science exploration with personal feelings around climate change to create a supportive -and hopeful- classroom atmosphere.



Suggested Steps:

1. Start by setting up the greenhouse effect experiment, heading up the experiment tray.
2. Watch the Climate Change Introduction video and return back to the first activity.
3. Have a class sharing circle to talk about feelings and questions around climate change.
4. Watch the Climate Change High Five video.
5. Close the lesson with a journal reflection prompt or My Climate Story handout.

Guiding Questions:

- What is climate change?
- How does climate change affect all living things, including humans & plants?
- How are humans involved in climate change?



Learning Objectives

I know (knowledge), I can (skills), I understand (conceptual understanding)



I KNOW

- ↳ The science behind climate change in the warming of gases in the atmosphere.
- ↳ That climate change affects all living things on Earth.



I CAN

- ↳ Express difficult feelings about climate change
- ↳ Look for support from other people, including my teacher, to discuss climate change.



I UNDERSTAND

- ↳ The connection that climate change has between humans, plants, and other living things.
- ↳ That my feelings about climate change are OK to have, and can help me to take action.

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Activity 1: Greenhouse Side Effect Science Experiment

(Thermometer, plant domes, jars)

Time: 25 mins

Process: 10 steps



Materials Needed:

- 1-2 trays or plant pots filled with soil and/or plants that can be covered
- 1-2 clear lids to demonstrate
- Some water to put in the trays
- A quick heat source, such as an accessible lit lightbulb, or windowsill.
- A thermometer (optional)

Process

1. Ask your students to imagine a greenhouse. Have they been one before? What do they notice about the temperature in a greenhouse? How do they feel? How do the plants feel? Do they feel a bit hot and sticky? What do we call this wet air? (humidity)
2. Now ask about the outdoors. Where do they think the warm air goes when the sun goes away? Does it go up into space, or further? Where does the air outside meet outer space?
3. Connect the ideas of the atmosphere and the air outside. Tell students they are going to do a simple experiment to show how a greenhouse works (and on a larger scale, our whole planet).
4. Measure the temperature of the air next to the soil in the tray or pot. If you don't have a thermometer, ask your students to place their hand above the soil and ask about the air temperature. Is it different from the rest of the room? If not, we can say it is roughly room temperature.
5. Now add some water to the tray, and cover it. Find a warm, bright lightbulb that you can put the tray close to. You may need to leave the tray there for 10 minutes or more to really see the full effects compared to the tray before.
6. Revisit the tray after some time, and gather the class around. What do they notice about the tray? Does it feel warmer? Are there water drops inside the cover of the tray?
7. Explain that the Earth's atmosphere holds water vapour in the atmosphere and other gases like carbon dioxide just like the plant tray does.
8. Now measure the temperature inside the tray. As you slowly open it, do you feel the heat escape? Record the temperature and note the difference from before and after. What happened?
9. Connect this activity to the climate change video as part of this lesson. If less heat from the heat source (the sun) escapes outside (back into space) what happens under the glass (or within our atmosphere?)
10. Close the activity with reminding students of the balance between having some heat escape, (with a bit of an opening in the tray) so that plants can live comfortably inside (like us on Earth with the atmosphere). This transfer of some heat absorbed in the tray, and some reflected out via the plastic layer is why we call this "the greenhouse effect".



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Activity 2: My Feelings About Climate Change Discussion

Time: 25 mins

Process: 10 steps

Materials Needed:

- Sharing is Caring Reflection Question handout for reference (*optional*)
- Whiteboard or chart paper to write down feelings (*optional*)
- Markers for writing (*optional*)
- A stone, or other item to designate who will talk (*optional*)

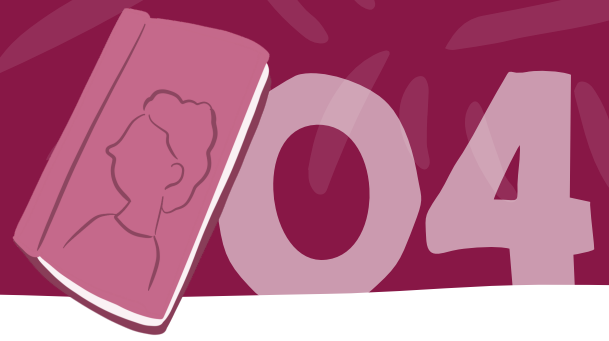


Process

1. Climate change is a complex topic. Gather your class together for a discussion and debrief about what they saw and learned in this lesson.
2. Determine how you'd like students to contribute their responses, either through raising a hand, or passing a stone or other item for designate that person gets to speak.
3. Begin with asking some questions to check for prior knowledge on climate change, either from the class experiment and video, or from elsewhere. Ask your class what they know about climate change. What did they learn today? What have they heard before? What about actions in general that are not good for the planet, or unhealthy?
4. Write out a list of facts or questions they might have, and try to address them when they come up. If you don't know the answer, or think some answers may need more explanation, tell your students. Part of this discussion is admitting to your students that you don't have all the answers either, but you are learning together, and you will look up more information if you need to.
5. Move on to unpacking your students' feelings. Ask your students how they feel when they hear about the impacts of climate change. What positive emotions does it make them feel? What negative emotions? What feelings do they have that might not be either positive or negative? Ask them why they feel the way they do.
6. After you've shared together some of the feelings in the classroom, move on to imagining what we can all do together to make the world a better place. Ask your students what they might do to make the planet and all living things on it healthier. If useful, begin with plants and the habitats they live in around your school and area. List a few down if this is helpful. (Noe: you may want to refer back to these ideas if you plan to do an action project (as outlined in Lesson 8: TITLE.)
7. Now turn to your classroom and your day-to-day activities at school. Ask your students if there are any projects or actions they could do to help plants, people, and the planet in their every day. Write down these solutions and actions as well.
8. Close by returning to an emotional check-in. After thinking through solutions, does everyone feel a bit better? Are there any new emotions you are feeling?
9. Remind students that it's OK to feel different emotions, and sometimes they may not always be happy, and we can feel more than one emotion at a time about complex things. Reinforce that we can choose how we react and feel to different things, even if they are difficult.
10. Close by reinforcing that if we stay optimistic and look for solutions, we can find them together!

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My Climate Story Reflection



As part of planting seeds for climate stories, your students are developing their own story to help them walk through their role in climate change. You can use this assignment in place of -or to support- a journal reflection.

The worksheet for developing My Climate Story for this lesson focuses on five key messages to remember about climate change in the form of a High Five. It can be used to help facilitate class understanding and empowerment around climate change that is discussed in this lesson. Depending on your students, you may want to do this either together, or in partners or small groups.

For further guidelines on helping your students develop their own Climate Story, check out the explanation in the Teacher's Guide (page #).



Reflection/Journal Prompts

- Write about a feeling you feel when thinking about climate change. Why do you feel that way?
- Imagine the day of a plant in extreme weather. How does it survive?
- Write about an action you have seen someone to do that is good for the Earth.

Assessment/Evaluation

Use the greenhouse activity as an opportunity to assess your students' critical thinking and work. During the discussion on climate change, check on your student's reactions. Keep the tone constructive, but also ensure that everyone is feeling OK and no one is sitting with negative emotions at the end of the discussion. Finally, Ending with a journal or other reflection can be used for formative or summative evaluation.

Extension Activities:

- ↳ Debunking myths about climate change at the beginning of this lesson may be helpful. Brainstorm with your students different reasons why people are skeptical about climate change, and think of solutions together to address people's concerns.
- ↳ There are great connections to Geography in learning about climate change. With your students, explore the way that your local region is being impacted by climate change using maps projecting future changes to the environment from impact data from Environment Canada, or through local government agencies, researchers, or climate action hubs.
- ↳ For older students you may be able to assess the largest climate change impacts in different ways. We suggest starting with a graffiti activity with students going around the room, drawing or writing their reactions to different climate change-connected prompts.

