



Exploring the Climate Challenge: Causes, Changes, Consequences and Actions

Research Project with Presentation (approximately 60-90 minutes)

Task Description / Instructions for Teachers

In this exercise, students will explore the multifaceted aspects of the climate challenge, including its causes, the changes it brings, its consequences, and potential actions to address it. The exercise aims to foster a deeper understanding of climate change and encourage critical thinking about possible solutions.

1. Group Formation

Form small groups of 4-6 students each.

2. Task Overview

Each group will focus on one aspect of the climate challenge: Causes, Changes, Consequences, or Actions.

3. Research and Discussion

- Causes Group: Investigate and discuss the primary causes of climate change, such as greenhouse gas emissions, fossil fuel use, deforestation, and industrial processes. Consider how these factors have contributed to the problem.
- Changes Group: Examine the observable changes in the climate, including rising temperatures, extreme weather events, and sea-level rise. Discuss the scientific evidence supporting these changes.
- Consequences Group: Explore the wide-ranging consequences of climate change, including effects on biodiversity, food security, human health, and vulnerable communities. Discuss both current and potential future impacts.
- Actions Group: Investigate the actions and strategies that individuals, communities, governments, and businesses can take to mitigate and adapt to climate change. Consider policy measures, technological advancements, and lifestyle changes.

4. Presentation Preparation

Each group should prepare a short presentation summarizing their findings and insights. Use visuals, examples, and statistics to support your points.

5. Group Presentations

One by one, each group presents their findings to the rest of the class. Encourage questions and discussions after each presentation.

6. Whole-Class Discussion

After all groups have presented, lead a whole-class discussion:

- Encourage students to draw connections between the different aspects discussed by each group.
- Explore the complexities of addressing climate change and the trade-offs involved in various actions.
- Discuss the importance of collective action, individual choices, and global cooperation in addressing the climate challenge.

7. Reflection

Each student should write a brief reflection on what they've learned and any personal commitments or actions they plan to take regarding climate change.

8. Homework (Optional)

Assign a follow-up assignment, such as a short essay or project, where students delve deeper into one of the aspects they explored during the discussion.

Suggested Solutions

Causes of Climate Change

Climate change is primarily caused by the emission of greenhouse gases into the atmosphere. The combustion of fossil fuels such as coal, oil, and gas is a major contributor, releasing carbon dioxide (CO₂). Deforestation, intensive agriculture, and industrial processes also release these gases. Over the industrial era, these emissions have significantly increased greenhouse gas concentrations, intensifying the natural greenhouse effect and leading to global warming. Since the beginning of the industrial revolution, the concentration of greenhouse gases in the atmosphere has increased significantly, from around 280 to currently 420 parts per million (ppm) according to NASA, and this increase continues rapidly.

(Observed) Climate Changes: In an educational context, it can be helpful to distinguish between the actual climate changes (often referred to as "observed climate change") and the "consequences" or "impacts" of climate change. Observed climate changes are the measurable and documented changes in the Earth's climate system that have occurred due to the increase in greenhouse gases.

Higher levels of greenhouse gases in the atmosphere contribute to an enhanced greenhouse effect by trapping outgoing heat radiation. This has led to a global temperature increase of 0.8-1.0 °C over the past century according to IPCC. Other changes include rising sea levels, more frequent heat waves, changes in precipitation patterns and glacial retreat.

Consequences: These refer to the effects and outcomes resulting from the observed climate changes and refers to how changes in for example temperature, precipitation patterns, and sea levels impact ecosystems, communities, and economies. More frequent and intense heat waves in combination with altered rainfall patterns lead to droughts and floods, and rising sea levels cause coastal erosion and flooding.

Other consequences of climate change include disruptions to ecosystems, threats to biodiversity, and shifts in agricultural and food production. The extent of the damage depends, in part, on the preparedness and capacity to address these issues. However, it is likely that climate change will hit hardest in parts of the world with the poorest and most vulnerable populations.

Actions: To combat climate change and stay within the global carbon budget set by the Paris Agreement, a multifaceted approach is necessary. This includes:

- **Lifestyle Changes:** Individuals can make a difference by adopting eco-conscious habits like consuming more plant-based diets, reducing overall consumption, and minimizing air travel to lower personal carbon footprints.
- **Policy Measures:** Governments and international bodies play a crucial role in setting and enforcing climate policies. These include agreements to limit emissions, implementing carbon pricing mechanisms like taxes, offering incentives through subsidies, and imposing bans on high-emission activities.
- **Technological Innovation:** Developing and transitioning to low-carbon technologies across sectors such as energy, transportation, industry, agriculture, and forestry is vital. While climate-friendly technologies already exist, expediting their adoption is essential for achieving sustainability goals.

These actions collectively contribute to the global effort to mitigate climate change, aiming to limit global warming to a maximum of 2°C, with an ideal target of staying below 1.5°C.

Expected Learning Outcomes

This exercise encourages students to think critically, engage in meaningful discussions, and develop a comprehensive understanding of the climate challenge and potential solutions. It also empowers them to consider their roles in addressing this critical global issue.