Don't look now, I'm changing!

Introducing Climate Change in the Classroom

Sujata C

What is that one thing in the world that has the power to change everything? Yes, climate change.

Is there any one species on Earth solely responsible for this change?

The Homo sapiens.

The Industrial Revolution of the 1760s set into motion some irreversible changes whose implications are being witnessed today. Things rapidly changed for the worse due to the massive industrialisation and rising population. About two centuries or so later, the after-effects can be felt with major environmental events like the Great London Smog of 1952, or New Delhi's infamous annual smog event. It came in last year and set new world records with $PM_{2.5}$[1] level crossing 600 on the night of November 8, according to the Central Pollution Control Board (CPCB). This was way above the hazardous level, and hence, extremely

[1] PM2.5 are tiny particles in the air that reduce visibility and cause the air to appear hazy when their levels are high.

unhealthy. That day air quality was as bad as smoking 50 cigarettes a day! Visibility was almost zero which resulted in a pile up of 24 vehicles on the Noida expressway. This was the situation just in Delhi and the NCR region; in many cities of North India, the pollution had also reached dangerous levels of $PM_{2.5}$.

Things are rapidly changing. We have got used to the idea of hotter summers, colder winters, and an interrupted monsoon – a phenomenon we have been witnessing for the past ten years now. We get rain only when there is a low pressure system on the Bay of Bengal. Those days of happy predictability of the 4 o'clock rain are long gone. If it rains, the entire season's rain falls in a day or else it just keeps threatening to rain but actually never does.

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As far back as 1980s, concern about the climate was growing and so the United Nations Environment Programme and the World Meteorological Organisation set up an Intergovernmental Panel for Climate Change (IPCC) with the objective to study the science related to climate change. The UN Convention on Climate Change defines climate change as a phenomenon brought about by human activities that impact the climate and cause an alteration in it. To some extent climate change is a natural physical and geological process. But when this process is hastened by human activities injecting too many pollutants into the atmosphere, it accelerates the warming of the planet and creates distress.

The climate change debate: Even though it is the most catastrophic phenomenon confronting mankind, climate change is still like the elephant in the room, and no one wants to acknowledge its presence. Rising temperatures, warming oceans, melting ice sheets, glacial withdrawal, reduced polar ice, rising sea levels, extreme weather events, ocean acidification – despite these events

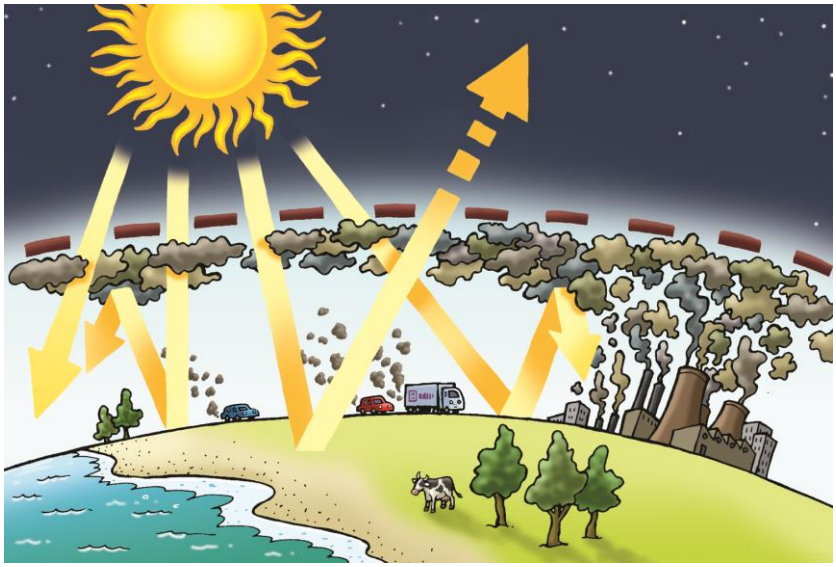
playing out in front of us there is a strong lobby of climate change deniers who call it a Chinese hoax! There are many who bankroll the lawmakers – oil lobby, fossil fuel lobby, tobacco lobby, etc. – to resist regulation that would force them to shut shop. Hence, they fund pressure groups to sway the opinion to their side.

What do scientists say? Here are some facts on Global Temperature Data according to climatologists of IPCC:

- 1998 was the warmest year of record.
- 2006 was the warmest year of UK.
- The 1990s were the warmest decade on record.
- The 1980s were the second warmest decade on record.
- The 10 warmest years have occurred since 1983.
- The mean temperature of Earth increased about 1°F (0.4 °C) in the 20th century.
- The 20th century was the warmest century of the millennium.

To get a clearer picture, here's a low-down on a few main concepts:

Greenhouse effect: Greenhouse effect is a phenomenon whereby the Earth's atmosphere traps solar radiation because of the presence of gases such as carbon dioxide, water vapour and methane. This is a natural phenomenon that helps to maintains optimum temperatures conducive for life and growth. These greenhouse gases have the ability to heat up the environment and absorb and radiate infrared radiation. Ozone, chlorofluorocarbons (CFCs), hydro-chlorofluorocarbons (HCFCs) and perfluorocarbons are some of the greenhouse gases. But when does the greenhouse effect turn negative? Land use



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changes, burning of fossil fuels, rise in cattle and dairy farming, deforestation, use of fertilizers in agriculture, excessive use of natural gas and petroleum products – the list is long. Chemistry tells us that each molecule of a gas has a lifetime. This means they are found to exist in the atmosphere for a certain period.

The lifetime of various greenhouse gases is as follows:

Water vapour: 9 days

CO_2:30–95 years

Nitrous oxide: 121 years

Methane: 12 years

CFC gases: 30–130 years

This means every molecule of these gases released today will continue to trap the heat and warm up the globe for the next 12–130 years.

Global warming: Almost every tropical country has been experiencing severe summer temperatures for the past 6–7 years with heat waves becoming a regular occurrence. The death toll due to these conditions is also on the rise. A 2^0 rise in temperature will have nearly 40% of the earth's species facing extinction, including polar fauna. Rise in 3^0–5^0 of temperature will cause a dramatic drop in crop yields. Small island nations will cease to exist as rising sea levels will engulf them. A 6^0 rise in temperature will bring catastrophe and all life forms will cease to exist.

Melting glaciers and ice sheets: Oceanographers discovered striking changes in sea levels as early as the 19th century. Melting of the polar ice caps and glaciers contributes to increase in the volume of water in the oceans. Mountain glaciers also pose a threat when they start to melt. For example, the melting of Himalayan glaciers will cause greater inflow into the rivers and disturb the downstream river ecosystem causing floods in the plains and the lower regions. Similar situations of depletion

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will be faced in other mountain glaciers of Alps in Europe, Andes and Rockies in America and Kilimanjaro in Africa.

Rising sea levels: In the last century global sea levels have risen by 8 inches according to NASA ocean studies. Marshall Islands, Kiribati islands, Maldives are some of the islands that face the threat of being engulfed by the ocean. All coastal cities like Tokyo, Shanghai, New York, Jakarta, Chennai, etc. too face similar threats.

Citizens of the island nations of South Pacific Ocean have been witness to the realities of climate change, like paucity of fresh drinking water, for the past few years. New Zealand is already offering shelter to refugees affected by climate change from surrounding islands.

No one likes it hot

Climate change will severely impact the economy and society of every nation affected by it. Environmental disasters, waning health conditions, lack of food availability, hunger and malnutrition – all contribute to the negative impact of the GDP of a nation.

How bad is it going to be?

- Droughts and floods will be common.
- Crop failures are likely to be widespread causing hunger and malnutrition.
- Many species will lose their habitats and face extinction.
- Pests in agriculture and horticulture will increase due to increased humidity.
- Vector borne diseases will increase as mosquitoes and flies would have a field day spreading diseases and debilities.
- The White Continent is likely to turn shades of green.
- Forest fires are likely to be more frequent and more intense.
- Heat waves will become more intense.
- Cyclones and hurricanes will turn deadly.

So that's bad news of epic proportions. The good news is that governments and international bodies on climate change have built mitigation and adaptation strategies to counter climate change. There are solutions to curb the damage done so far and show a way forward for a climate resilient future. However, everyone has to be on board together. One person doing the right thing and ten others doing the opposite will not get us anywhere. Only collective action can

bring about some visible change. For that we need cooperation, collaboration and team work. Unlike Hollywood movies, team of superheroes alone cannot save the planet, but the teeming billions of earth's inhabitants can jointly work a miracle. It is time to give the climate change story a happy ending for the sake of our future generations.

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Lesson Plan

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There is no denying that climate change is a doomsday topic. People of our generation have been witness to the changes in the climate over the past decade and it is only now that we seem to realize that the normal weather patterns are really a thing of the past. Many still find it difficult to come to terms with this fact. So while engaging children in activities that revolve around it, the foremost thing to remember is that you as a teacher must not transfer your anxiety about the future to the children. The thing is, this generation of children have not seen what life was like before the climate change process began. What's happening currently is normal for them. As they grow up, the scenario is likely to deteriorate. But remember it is the children who as adults will have to do most of the fixing of the climate, the disaster management and the risk reduction.

Without alarming the children, you can help them become climate aware and climate alert in order to help them take things in their stride and cruise along happily into the future, despite all the climate shenanigans playing out around them. Here's a list of activities that you can use to engage children. Pick and choose according to your class age. Complex activities can easily be handled by the senior students.

Activities:

1. **ABC of Climate Change:** Do a fact hunt and prepare a chart on this topic using the important terminologies associated with climate change.
2. **Bird behaviour:** Climate change severely affects birds. Extreme events like forest fires, floods or droughts destroy trees which provide shelter to birds. Ask students to make a list of birds they find in their locality. They can find out from their elders and grandparents about the varieties seen earlier, and then compare the list. They can then make a list of the missing birds. Encourage them to explore other neighbourhoods and see if and where these birds can be seen.
3. Allow students to prepare a **fact sheet** on the Delhi smog of 2017 – its impact and the measures taken. They can compare with other smog events in the world.
4. **Drawing:** Encourage young children to make simple drawings on themes like the ill-effects of industrialization with factories spewing black fumes into the air that kill trees.
5. Recycling and reusing is the mantra for climate change adaptation. Teach children to **recycle** their electronic waste. They can create awareness to launch a drive to collect old and unused mobile phones, computers and laptops, and deliver it to the local e-waste regulator in their area.

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6. **Modify** old jeans to make a bag. Introduce Do-It-Yourself projects where they can make several bags out of an old *kurta* or a t-shirt.
7. **Adopt a tree and take care of it**. Encourage children to identify a tree in their locality and keep a watch over it. If it is a fairly big tree, it will not need any watering as the roots go down fairly deep. They can check on it once a month to see if it is getting attacked by pests and termites, and treat it with an eco-friendly pesticide to reduce the pest attack.
8. Prepare an **eco-friendly pesticide:** Bio-fertilizers are chemical free and

do not leave any chemical residue in the soil or plant. It is highly advisable to make use of these in the garden. Have students tend the school garden with these:

- A combination of neem oil in cow urine makes a good repellant as well as a medicine for restoring the health of the plant.
- Chili powder added to a mild soap solution works as a good pest repellant.
- Salt and vinegar can control some ant and snail varieties.
- Crushed garlic in soap solution makes a potent potion to kill all types of mites, aphids and similar pests.

9. Ask them to check the **rain water harvesting** pits in their colony or campus. You as a teacher can take the lead and have students assist you in cleaning up the rain water harvesting pits if they find it filled with sand, mud, leaves and other waste.
10. Conduct a quiz on climate change. Winners wear a green sash titled **Climate Guru.**
11. Introduce a topic for debate and discussion in class that would encourage deeper learning and understanding of issues which are critical in today's context. For example, *Should there be a law declaring one vehicle for one family in our country*?
12. Engage them in a poster campaign promoting the use of public transport to work.
13. Ask them to find out about the ten most polluted cities in the world.
14. Make students create a **chart on the major floods** in the country in the past fifteen years. They can document name of the place, lives lost, property affected, etc.
15. Instruct students to **prepare a poster** on the tsunami of 2004 that affected India, and include details like the speed with which the waves travelled, their height, the areas affected, the lives lost, and the rehabilitation work done, etc.
16. Encourage students to prepare a PowerPoint presentation on **Ozone Holes.**
17. *How green is your commute to school?* Encourage students to adopt public transport, carpooling, vehicle sharing means for your daily commute.
18. Encourage students to switch over to energy efficient lights like LED.
19. Be a **citizen climate scientist**: Start up projects in your area: season

watch, worm watch, bird watch, bee watch, butterfly watch, etc. Gather data and turn it to the local authorities.

20. Be **a fact finder:** Help students strain authentic news and information from the fake ones in the internet.
21. Arrange for a screening of the documentary by Leonardo diCaprio called ***Before the Flood*** as well as ***The Inconvenient Truth*** by Al Gore.
22. Get your students to **start a Climate Change club.** Give it a name and a logo. Give each member a badge. Keep a password for members only. Identify some climate change issues in the locality. Write a letter to the local authorities about it. Organize a bike rally, a silent march or vigil to highlight the issue.
23. **Mock drill:** *What are the climate risks that your area is likely to suffer?* Run a mock drill with senior students to face such a situation.
24. Make a poster on the non-polluting energy solutions available to us.
25. Ask students to find out about the world's **biggest CO_2 emitters**. *What is India's per capita emission of CO_2? Who are the famous **climate change deniers?***
26. **Map work:** Lead children to identify island nations that are facing threat from rising sea levels on the world map: Tuvalu, Marshall Islands, Kiribati islands, Maldives.

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Contretemps (countable noun)

Pronunciation: /ˈkɒntrətɒ̃/

Meaning: An unforeseen event that disrupts the normal course of things

Origin and additional information: The earliest usage of the word could be traced back to the 1680s when it was used to mean *a blunder in fencing*, drawing from the French *contre (against) + temps (time)* meaning *motion out of time, unfortunate accident, bad times*. It is derived from the Latin *contra + tempus,* meaning *of or relating to time*. It was later used as a ballet term from 1706, then as a term to denote *an unfortunate accident* in1802, and in 1961 as *a dispute*.

Word section: Jacques Derrida introduces the notion of contretemps in his interjection into the debates on the future of Marxism after the collapse of the Soviet Union. Derrida plays on both the French meaning of disagreement or inopportune action to convey his dispute with orthodox Marxism as well as his call for untimely political movement. This notion of the contretemps has been widely used in various contexts in history. A sudden change in the flow of events in the motion of time has been cited by St Augustine as well, influenced by new-platonism. Here a disjointed time of decay characterizes the earthly city,

strongly bringing in the idea of the modern city with its factories and industries as symbolic of the degeneration of the world.

Usage:

i. Among the many characters is Professor Godbole, the detached and saintly Brahman who is the innocent cause of the *contretemps*, and who makes his final appearance in supreme tranquillity at the festival of the Hindu temple.

A Passage to India by E.M. Forster

ii. There are no *contretemps*, no unhappy moments, no jealousies, no heart-burnings.

Betty Vivian by L.T. Meade

iii. There was one last *contretemps* before the end of the night.

(Source: https://en.oxforddictionaries.com/thesaurus/contretemps)