



TEACHER GUIDE

HUMAN IMPACTS ON THE ENVIRONMENT GRADES 6-8

COMMON MISCONCEPTIONS

- **We are not able to repair the negative impacts humans have had on the planet.**
Earth systems are resilient and natural ecosystems recover naturally. In order to mitigate our negative impact, we need to protect the planet's existing ecological systems and modify human behaviors that created these problems in the first place. Conservation efforts and changing the consumption habits of humans will allow these systems a chance to recover. New technologies such as biodegradable plastics made of plants rather than fossil fuels will also help solve some of our planet's environmental problems.
- **Climate change is caused by the sun.**
The output of energy from the sun has been monitored by satellites for thirty years and has not increased during this period of rapid global warming. Evidence strongly supports the idea that manmade carbon dioxide is the primary cause of recent warming. There is strong agreement in the scientific community that emissions of heat-trapping gases from human activities such as the burning of fossil fuels significantly contribute to present-day global warming.
- **Ocean cleanups and recycling can solve the garbage patch problem.**
Since the size of microplastics is so small, according to NOAA, it would take 67 ships an entire year to clean up less than 1% of the North Pacific Ocean. Furthermore, current technologies would harm marine life, scooping them up along with the plastic trash. Recycling is not able to solve this crisis either since only 9% of all plastic ever produced has been recycled.

ENVIRONMENTAL CONSERVATION

Environmental conservation are efforts by humans to protect our planet and conserve its natural resources so that every living thing can have an improved quality of life. Conservation works in two ways. First, it is meant to protect the environment by protecting vital resources. Wildlife refuges and environmental policies that protect land and wildlife are a part of this conservation work. Second, it is meant to change our way of living to work against the irresponsible practices of businesses and large corporations. By embracing and promoting changes in lifestyle, including the use of alternative energy sources and green living choices such as using reusable storage containers and grocery bags, money is directed away from businesses and corporations with practices harming the environment.

CLIMATE CHANGE

Scientists predicted effects that would result from global climate change in the past that we are now observing taking place today. Glaciers are shrinking, sea levels are rising, and more intense heat waves are taking place throughout the world. Scientists predict that global temperatures will continue to rise for decades, largely due to greenhouse gases produced by human activities. Some of the long-term effects of global climate change will include warmer winters, changes in precipitation patterns, more droughts and heat waves, and stronger hurricanes. These effects of climate change have already begun to happen. By the year 2100, sea levels are projected to rise another 1 to 8 feet as the result of melting ice as well as the expansion of seawater as it warms. The Arctic is expected to become essentially ice free in the summer months by the year 2050.

THE GREAT PACIFIC GARBAGE PATCH

The Great Pacific Garbage Patch (GPGP) is the largest accumulation of ocean plastic in the world and is located between Hawaii and California. However, this is not the only garbage patch found in the ocean. There are actually five offshore plastic accumulation zones in the world's oceans. All of these garbage patches are created due to ocean gyres that help circulate ocean waters around the globe. While they circulate ocean waters, they are also drawing in the pollution including large amounts of plastic that is released in coastal areas.

It is estimated that 1.15 to 2.41 million tons of plastic are entering the ocean each year from rivers. More than half of this plastic is less dense than water, meaning that it does not sink. The GPGP covers an estimated surface area of 1.6 million square kilometers, an area twice the size of Texas. Due to seasonal variabilities of winds and currents, the location and shape of the GPGP are constantly changing.

TEACHER TIPS

Consider building the models of the gyres with plastic before students arrive and reuse them with the next set of students. Use a variety of plastic with differing densities and sizes. A food processor or heavy-duty blender may be used to help break down the plastic but test with a small amount of plastic first and do not use for food preparation afterwards. Small beads of plastic can also be purchased at a craft store. Place a variety of plastic materials into the 2-liter plastic bottle, fill with water, and tighten the cap. The goal is to have small plastic pieces float at different levels once rotated due to density. This will provide more to observe and include in student arguments of how plastic in the ocean impacts marine life.

ABOUT THIS LESSON

This lesson was created by the National Science Teaching Association (NSTA) to pair with the Generation Genius video and support NGSS.

They have requested we provide the following background with this lesson:

The Next Generation Science Standards (NGSS) are the national standards on how students learn science, and they are based on contemporary research presented in *A Framework for K–12 Science Education (the Framework)*. The shift in science teaching and learning required by the Framework is summarized in this infographic: [A New Vision for Science Education](#).

At the start of each Generation Genius lesson, students are presented with a phenomenon, then they try to explain it. Students will notice they have gaps in their knowledge and ask questions, which motivates them to build ownership of science ideas they need in order to explain how or why the phenomenon occurred. The way students build ownership of science and engineering ideas is through active engagement in the science and engineering practices (SEPs). This

process of sensemaking, or doing science to figure out how the world works, is one of the major shifts the *Framework* encourages.

To engage in the SEPs, students should be part of a learning community that allows them to share their ideas, evaluate competing ideas, give and receive critiques, and reach consensus. Students can start by sharing ideas with a partner, then with a small group, and finally, with the whole class. This strategy creates opportunities for all students to be heard, build confidence, and have something to contribute to whole-class discussions. Each Generation Genius lesson provides conversational supports to facilitate such productive student discussions to contribute to sensemaking.

Excited to continue your shift toward the new vision for science education? Check out the [Generation Genius Teacher Guide](#) page on the NSTA website for resources and strategies to engage every student in your classroom in **doing** science.

