

SCIENCE·3D

GILA MONSTER

In this packet, sample student answers are provided in **red** and notes to teachers are in **blue**.

In this **STEM Project**, students will explore some of the “grand challenges” in engineering. Using online resources, they will research some of the solutions engineers are working on to help reduce the impact of people on the environment.



Gila monsters are built to survive in the harsh climate of the desert. They have to deal with extreme heat and long periods without water. People have to deal with these challenges too! Engineering helps people living in deserts. But, as the climate changes people still need to find better ways to adapt to changing conditions. How do we design buildings that can survive hurricanes? How can we use scarce water resources more efficiently in deserts? The National Association of Engineers declared the 14 biggest engineering challenges to make the world a better place. Many of these challenges deal with environmental issues that are related to changing climate:

- Develop carbon sequestration methods (the removal and storage of carbon dioxide)
- Provide energy from fusion
- Provide access to clean water
- Make solar energy economical

ACTIVITY I: CHALLENGES FOR ENGINEERS

Go online and research one of the four grand challenges mentioned above. **Create** a poster or an info-graphic that describes the challenge and how it relates to living in a changing climate.

Good posters and infographics should contain a clear articulation of the challenge. For example:

- **Carbon sequestration:** Carbon dioxide levels are increasing and will keep increasing even with transitions to renewable energy. To reduce climate change, engineers need to find ways to remove carbon from the atmosphere and store it so it is not re-released.
- **Provide energy from fusion:** We need to reduce our use of fossil fuels very quickly to prevent climate change from becoming even worse. If developed, fusion would provide a clean, carbon free, source of energy.
- **Provide access to clean water:** Almost one billion people lack access to clean water. Freshwater resources will become even more scarce with climate change. Finding ways to use water efficiently and provide clean water is critical to people and ecosystems.
- **Make solar energy economical:** We need to reduce our use of fossil fuels very quickly to prevent climate change from becoming even worse. Solar panels are a great solution, but they still have several challenges including efficient batteries to store the energy and relatively inefficient ways to transform energy from the sun into electricity. The components to build solar panels and batteries are also expensive and damaging to the environment. Increased efficiency will help solar combat climate change.

ACTIVITY 2: FINDING SOLUTIONS

Use online resources to research solutions that engineers are developing to address the challenge you worked on in Activity 1. Use what you find to answer the following questions.

1. What challenge did you research?
2. **Describe** the solution(s) that you learned about.

Good answers will have a description of a particular solution, not a general solution. For example, a description of a particular type of fusion reactor solar cell, or battery would be an acceptable response.

3. What are the biggest challenges in implementing the solution?

Good answers will include challenges like maintaining a fusion reaction for long enough, converting energy from the sun into electricity, costs of components, etc.

4. What will the solution accomplish if the challenges are overcome?

Good answers will describe the solution's benefits to people or the environment.

5. **Describe** the fields of the people working on the solution (for example, electrical engineers, mechanical engineers, chemical engineers, etc.) and how they work together.

Good answers will describe how team members' fields each play a part in developing the solution.