

## **Nature of Science & Math: Analyzing the Presence in Everyday Communication**

Article: [Scientists turn CO2 to stone in just two years: a solution for climate change?](https://www.csmonitor.com/Science/2016/0609/Scientists-turn-CO2-to-stone-in-just-two-years-a-solution-for-climate-change)  
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By: Jason Thomson, The Christian Science Monitor (6/9/2016)

### Part A - Nature of Science Tenets

#### **Scientific Investigations use a variety of methods**

For years scientists have been trying to find an effective and low-cost way to capture the atmospheric carbon (carbon dioxide) which is blamed for world wide climate change. In China, carbon is filtered and then reused in fertilizers. In the country of Oman, geologists are studying how natural processes changed carbon dioxide into minerals such as limestone and marble from millions of years ago. In Switzerland they designed a machine that sucks carbon directly from the air. Of all the diverse methods used by world scientists, Iceland came up with a radical new approach to capture and store carbon by mixing water and carbon dioxide and then injecting it deep into basaltic rock. Could this new method then be a solution to global warming?

#### **Science is a human endeavor**

The State of the Planet Conference held at Columbia University in New York brings world leaders, CEOs, scientists, and other influential thinkers together to consider the planet's most urgent challenges. It was at this event that Dr. Matter, a professor at Columbia University, and the president of Iceland came together to discuss the idea of storing carbon dioxide in basaltic rock, which the island nation of Iceland itself is built upon. This discussion led to a project where various universities and a team of scientists at the Hellisheidi geothermal power plant in Iceland, came together to employ their creativity and imagination to capture the plants' carbon dioxide emissions. It's this type of forward thinking that could someday lead to industrial power plants all over the world reducing their carbon footprint.

#### **Science addresses questions about the natural and material world**

The Hellisheidi power plant produces electricity and hot water by harnessing geothermal energy below the surface of Iceland. They obtain this energy by drilling deep wells into the ground to access steam from the reservoirs of pressurised water. Along with producing "clean" energy for the inhabitants of Iceland, they also produce about 40,000 tons of carbon dioxide into the atmosphere each year. This makes the Hellisheidi power plant an ideal location for scientists to test their carbon capture and storage (CCS) technique. This technique entails mixing carbon dioxide with water and then injecting that slurry into basaltic rock, where it solidifies into its natural veins. The natural process of turning carbon dioxide into rock typically takes thousands of years but this new radical approach takes less than two.

## Part B - Mathematical Practices

### **Reason abstractly and quantitatively**

Since the world wide problem of climate change is believed to be caused primarily by the emission of carbon dioxide gases, scientists and mathematicians alike need to make sense of the amount of carbon dioxide gases released into the atmosphere and its impact on global warming. The Hellisheidi geothermal power plant pumps out 40,000 tons of carbon dioxide per year. While this may only be 5% of what an equivalent coal-fired plant would produce, these emissions provide a great source for testing the abstract method of carbon capture and storage (CCS) into the basaltic bedrock below. The idea of a power plant using their own infrastructure to produce and eliminate their own carbon emissions is a concept that just makes sense.

### **Use appropriate tools strategically**

The scientists were right on point when they chose to conduct their carbon collection investigation at the geothermal plant in Iceland. The deep boreholes needed to bury the carbon dioxide were already in place so no additional drilling expenses needed to be paid for. The majority of the island is sitting on basaltic rock, the key material needed to store the carbon. Lastly, the byproduct of the geothermal plant was the carbon dioxide that needed to be eliminated. Now the amount of water needed to encapsulate one ton of carbon dioxide is 25 tons. This amount of water may be problematic as many countries are in short supply. However, if scientists can find a way to use seawater instead of fresh water then we would have an abundance. It was also stated that only about 10 percent of continental rock is composed of basaltic rock, though it accounts for almost all the ocean floor. If seawater does prove to be effective, then power plants located near the coast could prove ideal hosts for this new method.

### **Look for and express regularity in repeated reasoning.**

In the 2012-2013 pilot project, scientists successfully disposed of 250 tons of carbon dioxide using their carbon capture and storage technique. Their concoction of water and carbon dioxide was sent 400 to 800 meters down one of the plants boreholes where it reacted with the minerals in the basalt and began solidifying. In about two years time, 95 percent to 98 percent was mineralized. After evaluating the reasonableness of their results they immediately scaled up the project. In 2015, they sequestered 5,000 tons of carbon dioxide, and planned to track and even double that in 2016. Their eventual goal is to continue capturing all their emissions using the same method.