

Mary Douglas
Lesson Implementation
Chemistry in the STEM Classroom

The lesson I chose to implement was from the NASA JPL website called “What’s Causing Sea Level Rise? Land Ice vs. Sea Ice” and dealt with the issue of climate change with a lab activity that can be appropriate for students from grades two to eight. This lesson focuses on sea ice and land ice and has students predicting, observing, and modeling the effect that the melting of each has on the rising level of the sea. This lesson is highly adaptable based on the grade level receiving the instruction. It is also very concrete and “hands on” and allows the students to easily make connections to the topic. The guided inquiry approach that I used with the students allowed for them to take some ownership over the questions and discussions we had while also moving toward a specific purpose.

In the middle school sixth grade classroom, this lesson can build on a variety of skills and concepts like density and displacement while also having the students work to make connections between what they know about the properties of water and how they relate to rise of sea levels and climate change.

As a pre-teaching assessment, I began by presenting the students with a question connected to the topic. I presented the students with a picture of a glass of water containing a considerable amount of ice. We noticed how some of the ice was not completely submerged in the water. In an effort to differentiate, I gave the students the opportunity to choose from several pre-written statements about what will happen to the water level as the ice melts or, if they did not connect with any of the provided statements, I asked them to write their own. Then, using the think-pair-share strategy they discussed their thinking with their partner. Students then shared with the class which statement they believed to be true and why. Students engaged in quite a bit of conversation as they defended, questioned each other, and changed their answers. Students began to discuss what they knew about the properties of water in its various states.

Then, I presented them with the problem that sea levels are rising. I shared a picture example. Providing them with our think-pair-share discussion and the sea level picture as their “Q Focus”, I encouraged them to compile questions in small groups about the two pieces (ice melt and the picture) and how they were related to our topic using the Question Formulation Technique (QFT).

Students in my class are very familiar with the question formulation technique to create questions about a topic so they got to work creating questions about sea level rise. This component was a bit difficult for them as they started to get sidetracked by issues with sea level rise. I think students also were having a difficult time connecting between the ice in the cup that we discussed and the picture of the sea level rising. I brought them back as a large group and

together we compiled some questions that I listed below.

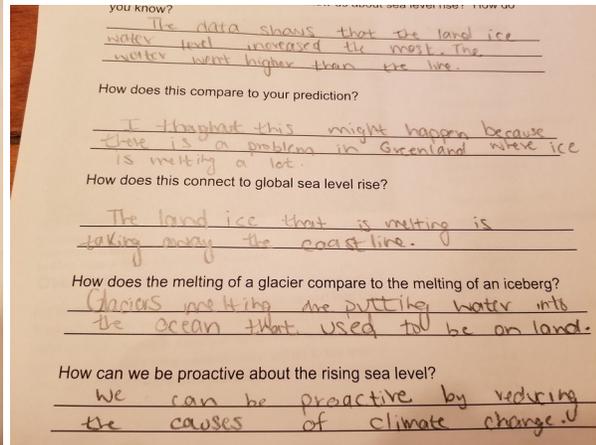
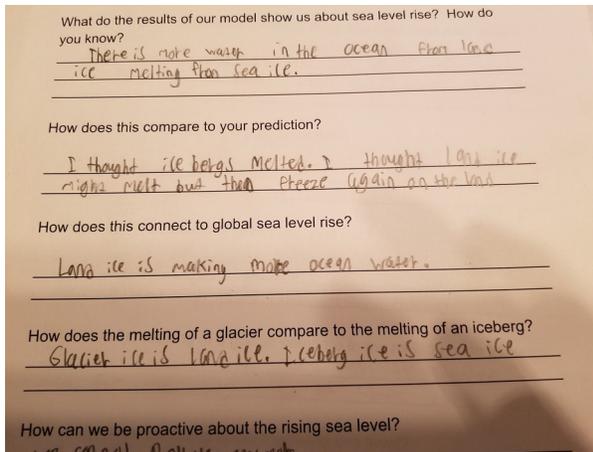
Where is the water coming from?
Are icebergs the problem?
Are there still glaciers on land?
Does water expand when it gets hot?
Is our island in danger?
What is making the sea level rise the most?
Are sea levels rising because of pollution?

From the list of questions created, we created a set of questions to help us further explore this issue. Is there ice in the water? Is there ice on the land? Which one do you think makes the sea level rise more? How can we test this with a model in the classroom?

From there, I explained the concepts of sea ice and land ice. Students predicted which type of ice was the cause of sea levels rising the most. Then, I shared the materials I had available that we could use to develop a model and further explore. In the interest of giving the students ownership over the activity, I had them write their own procedures in groups on how to carry out our investigation. Students knew we only had a 40 minute period to run the investigation so they came up with the idea of speeding up the process with a hair dryer. With plan in hand, we would begin investigating the next class period.

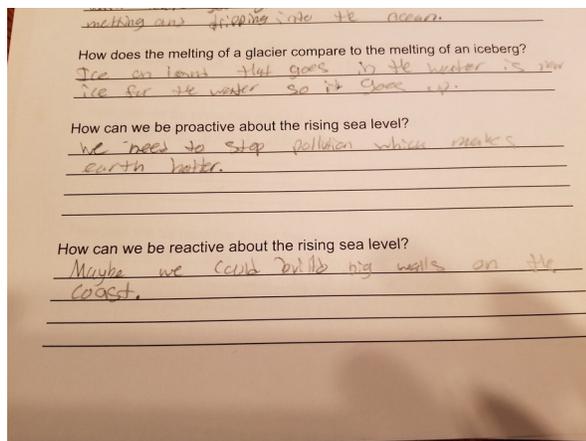
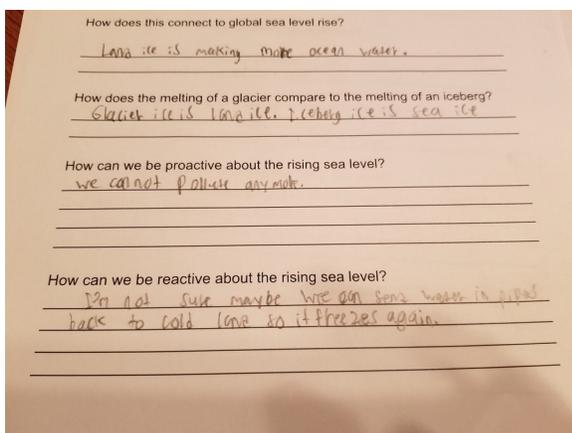
The hair dryer strategy worked a bit but also tended to make the land ice blow around. So, in the future we may need to find another way to increase the melting rate (like the heat lamp that was recommended in the lesson). We also struggled with timely measurements due to this and decided to just use a line marked on the side of the container to best determine which water level rose the most.

Students then reflected on the activity and came up with additional thoughts and questions. Some examples of their reflections follow.



Student Responses to Lab and Discussion

From there, I explained the differences between being proactive and reactive. We talked about some examples from everyday life and then talked about how we can be proactive and reactive when it comes to sea levels rising. Students went back to their reflections and added some thoughts about that.



Student Problem Solving Ideas

We discussed the types of data scientists can continue to gather on the topic, particularly from outer space. I showed them an animation from NASA of the ice on Greenland over a span of 30 years. We talked about the value of the images from NASA. Many children were surprised to know that NASA was not just about astronauts. We watched several short video clips and read information from several sites. Students then worked in pairs to model (on whiteboards) what they understood about sea level rise from our discussions. The students were very intrigued by our discussions and what they modeled with the ice and clay. Many began to share their wonderings for what Long Island would look like in one hundred years if sea levels continue to rise. We needed to have a bit of a side conversation about tides as many of them have some familiarity with them (being that they live in a boating/beach community). Setting this context for the students was very meaningful. The coastal town I teach in was was

hit quite hard by Superstorm Sandy. While these students were young, they remember a bit about what the rising water did to their community. I think it was a very powerful learning opportunity for them and we had some great discussions.

Classroom Resource Examples

<https://www.nasa.gov/feature/goddard/warming-seas-and-melting-ice-sheets> (This offered great excerpts for the students to read and helpful animation videos.)

https://www.youtube.com/watch?v=b6CPsGanO_U (This does get a bit political in its discussion of a petition. At the request of administration, we try not to get too involved in these things so I shared only clips that helped students to understand the concept.)

<https://www.nationalgeographic.com/environment/2019/01/greeland-ice-melting-four-times-faster-than-thought-raising-sea-level/> (This could be printed and used as a resource for students.)

<https://www.sciencelearn.org.nz/resources/2277-climate-change-melting-ice-and-sea-level-rise> (This is an additional teacher resource that is helpful.)

<https://www.youtube.com/watch?v=rod0bYdk0a0> (Greenland ice melt animation)

<http://www.ascd.org/publications/educational-leadership/oct14/vol72/num02/The-Right-Questions.aspx> (Further information about the Question Formulation Technique)

Reference

What's Causing Sea Level Rise? Land Ice vs. Sea Ice. Retrieved from

<https://www.jpl.nasa.gov/edu/teach/activity/whats-causing-sea-level-rise-land-ice-vs-sea-ice/>