Connecting Topics with Ocean Acidification Transcription

We have the climate change inextricably linked with ocean acidification. Now we're going to get into the chemistry. Again we're not just changing content. We want to get these kids ready for physics, biology, chemistry, and all these labs do this. We got physics over here; we got thermal dynamics over here. Now we're really going to focus on some chemistry, ocean acidification. By man adding CO2 to the atmosphere, it mixes with the ocean surface, and it makes carbonic acid.

Without getting to heavy into all the chemistry because you just haven't had it yet, they're all familiar with pH and acid. They know the term acid; they know the term pH. They may not be able to define it, or take a test on it just yet, but they can get the idea that carbon dioxide in the atmosphere mixes with the water to form carbonic acid, and we do some net ion exchange equations, and realizing that these sea shells that have calcium are not going to like the acid water. Then we try to show that to them.

What we do is we do a couple of labs down here. We're going to add carbon dioxide to water. Students first complete a lab investigating the pH of various common solutions using universal indicator fluid in water. They then need to devise a way to acidify the solution with no chemicals provided to them. It doesn't take them long to think, Wow. What if I just breathe on it? What if I just add all of that CO2 from my breath? Am I going to change that acidity of the water? Once they do that I say, "Well, let's try it." So I have some straws that they are going to use. I'll show you that in a minute.

I'll show you this pH indicator fluid. You are probably familiar with most of this. The indicator fluid changes color depending on the pH. Green is kind of neutral. Red is going to be acidic. We have vinegar and lemon juice in these two beakers which turns it red. Carbon dioxide is going to make it a little bit acidic, which is going to be yellow. Tap water which is a chemistry lesson in itself is a little bit basic. Again, we explain that they put lime in the water to make it less basic so it doesn't corrode the pipes. Then we add ammonia which makes it very basic. So they get the idea of how these colors are going to change.

Just again to show a quick video, these are the kinds of labs I like to do. This took about 10 minutes, but it's a lab they'll never forget. They'll always realize how easy it is to acidify something with just a little bit of carbon dioxide. So they're just going to blow bubbles into this water. "Marcus, what are you doing?" "You're not helping out?" "Look at the one in the back here." . . . back here.

Alright, so how do we make connections with another lab we're going to do? This brings in a little bit of biology, but not a whole lot. We're going to do a clam shell lab. Ocean acidification isn't just going to affect just us. What's it going to do to the clam shells? Students investigate the pH of different common liquids. We've already done that. They then make their own solution in which they place a clam shell to observe changes in mass over time.

I've already shown you this picture. I didn't point out before; these have clam shells in them. OK. So we put them in these different solutions, and we just let them sit for 2 weeks. They weighed the clam

shell before they put them in, and of course they are going to weigh them when they're done. Notice here and I didn't really make them aware of this at the time, but there are two different shells. Here's a blue shell; here's a white shell; they're different species. They're actually a variable that I threw in there that we're going to talk about later.

After two weeks, again we very informally posted the data. Each class, I have four different classes, one used lemon juice, one used vinegar, one used carbonated water, then ammonia. Here are the numbers. Negative means they all lost mass. This means they lost mass. The two different columns happen to be the two different shells. The blue shells didn't lose, and this is the percentage lost, this is 6 to 8% of mass they lost in the lemon juice. The white shell lost almost up to a fifth or a quarter of their mass in the lemon juice.

So they had to figure out these patterns. Why is the blue shell less? The base obviously doesn't affect either shell. This was a zero for both columns. As the water got closer to neutral it affected the shell less. It's something you can predict, but it was a good hands-on way to measure the different acidities on the clam shell.