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Week 4 Nature of Science Response

A) The 5 Tenets, summarized:

1. Science is 'subject to change'- The most effective way to help students understand that science is subject to change was throughout the pandemic. Almost weekly, we were hearing a new set of rules and regulations regarding masking, distancing, vaccines, etc. Students were quick to point out that it didn't seem like anyone knew what they were doing or what was the truth. This led to an excellent discussion about science being subject to change, finding and identifying reliable sources, and being able to view both sides of an argument before deciding about what might be the appropriate next step in the given situation. This topic was not only relevant to current events, but relatable to everyone. Another example I've used to discuss science being 'subject to change', particularly in earth science, is that Pluto is no longer considered a planet. Students are quick to ask why Pluto got demoted and I try to ask them to think like a scientist. We review things like the geocentric vs. Heliocentric galaxies and students conclude that as we learn more and get better technology that we, as scientists, are able to change our thinking based on the evidence at hand. A lot of what I describe above can easily be used as examples for the other tenets, because they are not meant to be taught in isolation. The tenets of science are interconnected in such a way that any given topic could and should touch upon more than one tenet at a time.
2. Based on empirical observations- Tenets 2 and 5 often clash, whether we want them to or not, particularly depending on the topic. For example, there is empirical fossil evidence to show that life evolved on earth, but certain social and/or cultural /religious perspectives often refute the evidence. Sometimes I get pushback from a student or two about this topic and I refer to tenets 1, 4 and 5 by reminding students that it is important to learn about ALL perspectives to make an educated decision regarding scientific thinking.
3. Imagination and creativity are required for making inferences- I must confess that I haven't focused on this tenet as often as I could but am beginning to view imagination and creativity as an integral part of incorporating engineering practices into my science lessons. While in science we often focus on the Why, tenet 3 can help move us to the How, by building models and/or making designs that will improve or solve a problem, which is more of an engineering practice.
4. There's always a little bit of bias-
5. Social and Cultural perspectives-

I feel that Tenets 4 and 5 are linked and as I reflect, I realize that I absolutely MUST focus on these more, especially being a white female science educator who teaches predominantly young Hispanic and black students. I want to make science relevant for my students, and including relatable social and cultural perspectives would be a great way to start. I don't want my own bias to cloud their ability to enjoy and learn science.

B) The dynamics

I like to attempt to focus on the theme of Homeostasis or Dynamic Equilibrium throughout the year, no matter which subject I'm teaching. I think it's important for students to understand that all of science is

interconnected and that regardless of which subject they are in for the year, they will be touching upon the other science that they have learned in the past and will learn in the future. For example, students learn about plants and animals in biology, fossils and evolution in earth science and organic compounds in chemistry. More often than not, they are learning these things in isolation when we should be teaching them that these topics are interconnected. Earth, life, science, is dynamic. I really like the Live Data Resources Wiki's because I think real time data would be a perfect way to help students understand how science is dynamic. I gravitated towards NOAA's Hazard Mapping System Fire and Smoke Wiki (https://www.ospo.noaa.gov/Products/land/hms.html#maps), simply because of the Canadian wildfires and the real-world effect it had on the students this month. Students were able to better understand how a major wildfire in a country they may have never been to or thought about affected their lives. They were able to learn about weather and wind patterns and how the smoke made its way to us. They were able to understand that an already polluted city experienced even more dangerous air pollution. My school is on the Hudson River and the wildlife essentially disappeared during the smoke. We were able to talk about animal instinct and why the birds fled the area. Having the live data map to track the smoke opened a dynamic conversation about the nature of science. Students were able to hypothesize, view live data, and discuss multiple perspectives related to this real world and relevant topic. For me, it was an interesting way to end the school year, coming full circle to remind students that the nature of science is dynamic, and the tenets are interconnected.

C) Science and Technology

Often times, science is driven by technological advances and vice versa. As our technology improves, so does our understanding of the nature of science. We often call our students 'digital natives', but it has been my experience that in many ways, I am more technologically literate than them. I learned keyboarding in school, the basics of Microsoft office, and how to do research in the good old library. Sure, students can Google, but that's not technological literacy. I often get an entire run-on sentence email in the subject line! Our students need to know how to use technology to its fullest potential. Technology is everywhere, and it isn't going away any time soon. Technology is so prevalent in science that they are practically one in the same. Technology Literacy standard 7 (PDF pg. 25 from the Standards of Technology Literacy reading assignment) states that, "Students will develop an understanding of the Designed World" and all the exemplars given, are fields of science! Students often decide that they 'can't do science' but all seem to love technology. Showing students that technology is used in medical, agriculture, energy, biotech and more will hopefully move students past their 'can't do science' attitudes.

As a science teacher, I hope to bridge the gap between science and technology so that students can begin to think like scientists through the use of technology. Increasing both science and technology literacy will be the first step in this process.