

## Nature of STEM

Although there are a handful of “nature of” subjects to pick from, I have selected to focus on the Nature of Science. The five tenants of science are: The tentative nature of scientific knowledge; the empirical nature of science; the inferential, imaginative and creative nature of science; the subjective and theory-laden nature of science; and the socially and culturally embedded nature of science (Science Learning Hub – Pokapū Akoranga Pūtaiao, 2011). The tenant that my teaching currently addresses and has a large focus on is the empirical nature of science and the inferential.

The empirical nature of science occurs often naturally at the beginning of my science units. I have found out how invaluable it is to give students the time to explore and observe before diving into content. When I first started teaching in kindergarten, observing our environment was fundamental for all of our learning. Kids at a such a young age take in so much around them visually and process the settings that they are exposed to, so we were constantly practicing observing our surroundings and taking notes on what we perceived. When I first started teaching, my district didn’t have a set-in-stone science curriculum for kindergarten. I was given general topics and free range on how to best introduce them to my students to lay the foundation for first grade.

I found that something as simple as giving the students a clipboard, a piece of paper, and a pencil was extremely impactful. They were given minimum instructions; they only had to draw or take notes on what they were observing. We did this one day while sitting in a garden, and I was astounded by how much my students were taking in. I had expected my students to just draw or take notes on some different colored flowers that we were sitting next to. Instead, students were using their pencils to measure the different heights of all the plants that we were near (not

## Nature of STEM

just the flowers), they were cataloging all of the objects in the surrounding environment, and they were making hypotheses about how and why certain organisms existed in a nearby ecosystem (a small koi pond).

After that moment, I realized how impactful observation can be. We used their notes as a guide for the rest of our science lessons. Not only were the students excited because we were exploring the outdoors hands on, but the thrill of answering their own questions and learning about topics that they “discovered” led to a higher level of investment in their learning. Now that I am in second grade, I have brought my understanding of the power of observation with me. Most of the science lessons in our curriculum jump right into teaching content knowledge, but I make sure to start each unit with a meaningful exploration of resources that students will be using in their learning. This period of hands on investigation creates a thrill in students as they get to examine their learning tools and subject area. They start the unit off with a buzz of excitement and an “inside scoop” about our learning trajectory, which is irreplaceable.

Although I find that I touch on many of the other tenants in the nature of science, my teaching can definitely be enhanced in these areas. Something that I think I often overlook is the subjective and theory-laden nature of science. I am very fortunate to work in a school district that is exceptionally diverse. In this year’s class alone, I have students who have moved to New Jersey from Salt Lake City, Utah all the way to Taiwan and India. Something that I don’t often don’t consider is the fact that my students may have certain biases based on their backgrounds. Although we often do KWL charts (know, want to know, learn) to assess students’ prior knowledge, I never really considered that they may have different views in science based on what they’ve experienced. I just sort of assumed that science was... well, science. Just facts, no matter who is learning it or where they are from.

### Nature of STEM

Something that I could do differently to better enhance this tenant in my classroom is have students share experiences about where they are from, and how that connects to what we are currently learning. A student's prior knowledge that they bring up in the KWL chart might help other students re-evaluate how they thought about a concept, or give them a new perspective. A lot of students also love to share how they came to certain conclusions. Instead of trying to find one conclusion that fits a general mold of my class, the students could be broken up into smaller groups to share their findings with each other. Then, we could come together and have multiple conclusions that students have more ownership over. This autonomy would not only lead to more excited learners, but also more invested scientists who are able to better articulate and take pride in their thoughts.

These tenants could enhance my teaching not just in science, but across other disciplines as well. Another tenant that I took great interest in was the inferential, imaginative and creative nature of science. Having come from a kindergarten classroom, I relish in creativity and imagination in all subjects. Although the article that we read talks about how students can come up with new ideas in science, there are applications for this creativity throughout the school day and across all of our subjects. One subject that I could see benefiting from the tenants of science is social studies.

In my district, social studies is sometimes viewed as the dull, overlooked, and mandatory subject that "we just have to get through." Using the tenants of science, our social studies curriculum could be given a breath of fresh air. One of our units is learning about Native Americans. Currently, students are given books and websites to explore and learn about Native American culture and home life. I believe that the inferential, imaginative and creative nature of science tenant could do wonders for this unit. After exploring and learning about what Native

## Nature of STEM

American homes looked like, students could use their creativity to build a model replica of a Native American home. This would require lots of imagination to design homes that can help students better understand the daily lives of Native Americans.

Another “nature of” document that I found interesting was the Nature of Mathematics article. One overlap that I found was that mathematics principal of equity and the subjective and theory-laden nature of science. Both are founded on the idea that students may not look the same or they may come from the same backgrounds, but they can all bring something to the table and the learning must be accessible to all students. Although the science tenant did not talk specifically about access, it promoted inclusivity, which is in line with this math principal.

Another correlation I discovered was the learning principal of mathematics and the empirical nature of science tenant. Although they are phrased differently, both talk about the importance of building on knowledge. In the nature of math, learning is talked about as a stepping stone for students to be able to reflect and persevere as they tackle bigger learning concepts (National Council of Teachers of Mathematics). In the tenants of science, observations are needed in order for there to be an understanding of a concept. Once those observations are made, a deeper understanding of a topic can take place. Although phrased differently, both natures lead to creating a solid foundation that learning can be built upon.

The last connection that I found, although it might not be obvious at first glance, is the technology principal of mathematics and the socially and culturally embedded nature of science tenant. Currently, in our society, there is a surge of technology present in our day to day lives. Not only is it used in almost every public and private venue, but it is also paramount to the learning taking place across our schools. The nature of mathematics talks about how technology needs to be present in math to assist students in their learning. The nature of science tenant

## Nature of STEM

discusses how elements in culture and society influence how science is conducted. It can be argued that with the recent technology explosion in the 21<sup>st</sup> century, these natures go hand in hand. Technology is needed to learn and explore both subjects.

Although this paper has focused mostly on the nature of science, with a slight intermixing of the nature of mathematics, the other two STEM subjects weren't discussed. There are endless possibilities for how those subjects can be interwoven in the classroom. I would like to think that with enough awareness about these topics and natures of subjects, all teachers have the ability to make their students responsible and dynamic 21<sup>st</sup> century learners.

### Bibliography

- National Council of Teachers of Mathematics. (n.d.). Principles and Standards for School Mathematics.  
[https://www.nctm.org/uploadedFiles/Standards\\_and\\_Positions/PSSM\\_ExecutiveSummary.pdf](https://www.nctm.org/uploadedFiles/Standards_and_Positions/PSSM_ExecutiveSummary.pdf).
- Science Learning Hub – Pokapū Akoranga Pūtaiao. (2011, October 7). *Tenets of the nature of science*. Science Learning Hub. <https://www.sciencelearn.org.nz/resources/413-tenets-of-the-nature-of-science>.