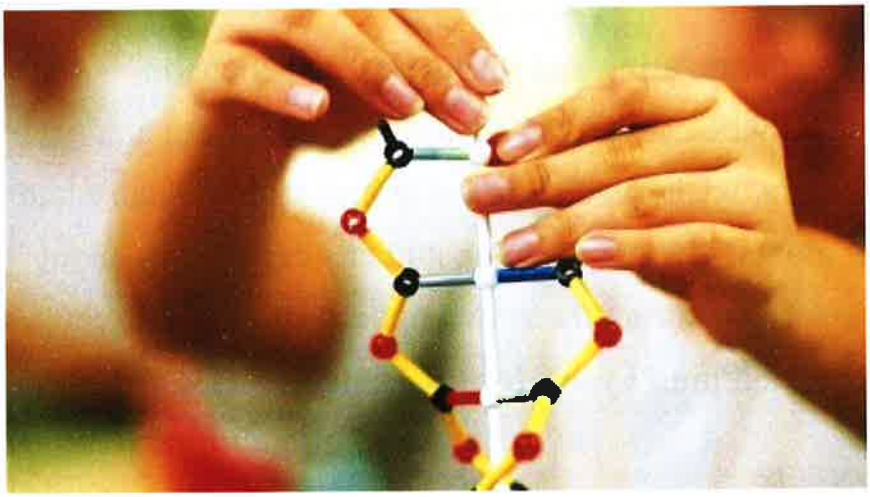
Models & NGSS

February 15, 2016 By Patricia Gustin 8 Comments

At first glance, I thought that my teaching practice was solid when it came to Science and Engineering Practice (SEP) #2: Developing and Using Models. High school chemistry is all about models. My students use multiple models to represent atoms and molecules. (Their favorite is Jimmy Neutron's model. Mine is a dot; I can draw a dot.) They also use collision theory to understand gas laws, chemical reactions, reaction rate and equilibrium.

When NGSS was released, I made the mistake of looking at Appendix F, which maps out the Grade Band Continuum for each SEP. OUCH! I was teaching models at the 6-8 Grade Band. I was doing the heavy lifting. I gave my students models to use. I told them when to use each model. I told them the strengths and weaknesses of each model. I expected my students to use models to **learn science**. With the NGSS, students are expected to be able to develop and use models to **do science**.



Since my students are expected to come up with their own models under the NGSS, I chose to reorganize the chemistry curriculum. Students started the year with a sealed syringe filled with air. They could feel the air push back when they pushed in on the syringe. They used pressure probes to collect pressure-volume data and they graphed the data. THEY came up with a particle model that explained why the pressure increases when the volume decreases. From this point, they

- Generated questions (SEP #1) about the effects of starting volume, number of particles, temperature, and more.
- Planned and carried out investigations (SEP #3)
- Analyzed and interpreted the data they collected (SEP #4)
- Used software to determine the mathematical relationship between the two variables they investigated (SEP #5)
- Constructed an explanation (SEP # 6) and refined their particle-models of gases (SEP #2)
- Engaged in argument from evidence (SEP #7)
- Communicated their results during gallery walks. (SEP #8)

All eight SEP's all in the first weeks of the year! My students were doing the heavy lifting. They developed and refined their models. I was the safety engineer, tech support and cheerleader. I was the learning coordinator rather than the knowledge giver.

We followed up on their work by reading, annotating and discussing an article on Scientific Models and an article on the Kinetic Molecular Theory of Gases from a university-level chemistry text. From there, we moved seamlessly into atomic theory and all the wonderful models there are for atoms. No more telling students everything about each model. My students had the chance to construct their own understanding of each model for themselves. That is the kind of learning I want for my students and the kind of teaching that I expect of myself.