Data Mining Chemical Properties

Data source: http://blog.wolfram.com/2015/10/07/using-the-wolfram-language-in-the-classroom-chemistry/ and the program: http://www.wolframalpha.com/

Currently, in my Regents chemistry classes, we do a unit on periodicity. This unit is used to describe the trends within the periodic table, and why these trends exist. The following three standards are from the New York State Standards, and are part of the Scope and Sequence for the Periodicity unit (Retrieved from http://schools.nyc.gov/NR/rdonlyres/49FC3DAF-2A6A-42B5-80DC-9587487B0243/0/sciencescopeandsequence612_WEB81415.pdf, pg. 141-142).

- The placement or location of an element on the Periodic Table gives an indication of the physical and chemical properties of the element. The elements on the Periodic Table are arranged in order of increasing atomic number. **(3.1y)**
- The succession of elements within the same group demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, metallic/non-metallic properties. **(3.1aa)**
- The succession of elements across the same period demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, metallic/nonmetallic properties. **(3.1bb)**

I have my students graph the different trends, but I do not go much into the analysis nor do I spend much time on how the different trends are related. I have noticed in the last couple of years, my students are able to regurgitate the trends, but they struggle to understand the reasoning behind why these trends exist. I believe this disconnect comes from the lack of analyzing these trends individually, and looking at the relationships between trends and the structure of an element.

Personally, I really enjoy using data, because it can often be tied to real-world applications. These types of connections usually help my students relate to the material which make it less conception and more actual. It also allows students to make connections between chemistry and math. I often hear my students

murmuring, “is this a science class or a math class?” whenever we talk about data, where we plot graphs, use the slope formula, create best fit lines, etc., despite me telling them that the two disciplines are quite closely related and scientists use mathematical skills on a daily basis.

This data is intertwined with the Wolfram|Alpha computer program, so I believe it falls in the scope of science and technology. There is a bit of a learning curve for teachers and students, but once teachers understand how to follow the instructions, the integration of this process is fairly straightforward without much knowledge of the language itself. It’s also a nice introduction to computer language for students, and how computer languages can be used to manipulate and analyze data.

In addition to technology and science, graphing is always a skill that relates to math. Students have to be able to read graphical data: understanding relationships between data points, rate of change/slope information, trends, etc. All of these skills are taught in math, but using them in the chemistry classroom allows students to see how graphical information is applicable to scientific research (aka, “the real world”).

Since this program allows for students to create different lists and analyze different types of data, students can have discussions amongst themselves regarding their findings. Each member of a group can graph a different trend, analyze using different mathematical relationships, and then present their data to the other group members. This would give the students a chance to analyze each other’s data as well as their own.