



It's elementary my dear Watson

The following is an example of an element story written by a former 4th grade student who happened to sit in a seat designated for phosphorus (K). Phosphorus is used in the manufacture of fireworks. You also need to understand that at Hillcrest Elementary School, children playing checkers often played a version of the game where “kings” are allowed to move diagonally across the checker board, like a bishop in chess. They call this “flying kings.” When Mr. Draper played checkers with the children, he could repeatedly be heard to say, “There is no such thing as a flying king.”

Mr. Phosphorus

4B

Once upon a time there was a bratty kid who loved to mess with phosphorus fireworks. One day he was walking past a fireworks shop and found a \$100 bill on the sidewalk. He picked it up and quickly ran into the fireworks shop and bought everything there! Now since this kid was also very stupid he hated chess. He wanted to tie some chess pieces onto the fireworks to watch them explode. But he spent all his money on the fireworks. He needed to get more money for chess pieces. So he decided to steal some money from local candy stores. He wasn't a very good crook so he always got caught, but he managed to keep some of the money he took. Eventually,

he got grounded beyond belief by his parents. He was wondering if he would ever be able to blast his

fireworks. He was still robbing stores and finally he got sentenced to juvenile hall. He stayed there for five years waiting to get out. When he got out he got his chess pieces and fireworks and blasted them way off and it made a huge explosion. The chess pieces went flying everywhere. Then he thought to himself, “You see Mr. Draper was wrong, there really are such things as flying kings.”

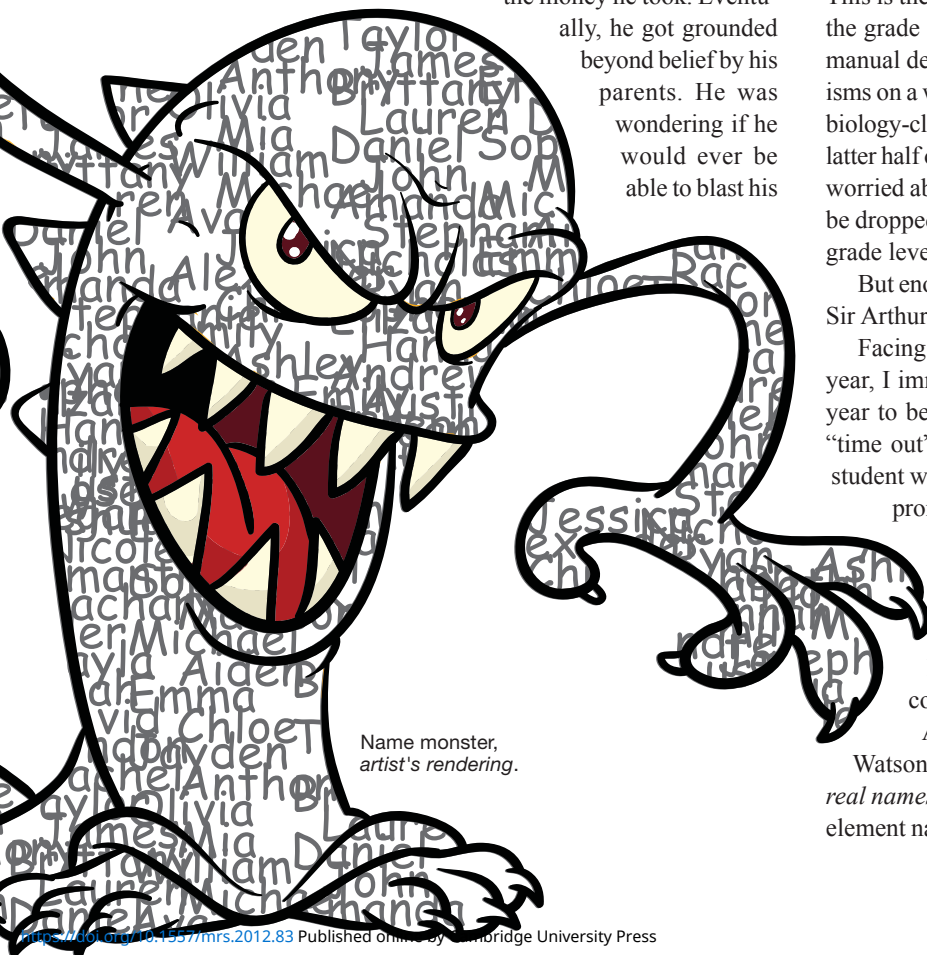
What I have to comment on regarding materials science and public education comes from the perspective of someone that, partly by design and partly by serendipity, had a career path taking him from distinguished member of technical staff at Bell Labs (the one that was the research arm of a regulated public monopoly) to humble elementary school science teacher at Hillcrest Elementary School (school district and state intentionally withheld to protect the innocent). The 5+ years I spent teaching science and math to grades K–6 were incredibly fulfilling. I loved going to school every day and being exhausted going home every night. I was blessed to be in a unique setting where I got to teach every single student in a 500-student population twice a week.

Teaching science and math to all the grade levels simultaneously is logistically challenging if your methodology is hands-on learning, but at the same time it is incredibly enlightening. This is the reason that I can state with absolute confidence that the grade level where elementary school students achieve the manual dexterity necessary to view living microscopic organisms on a wet slide using a conventional monocular high school biology-class microscope with an X-Y finger control stage is the latter half of 3rd grade. I could even quantify for an administrator worried about insurance liability how many glass slides would be dropped on the lab bench or floor and break as a function of grade levels 3–6.

But enough about my background. Why lift a one-liner from Sir Arthur Conan Doyle's fictional detective?

Facing the prospect of teaching over 500 children in my first year, I immediately realized it would take me half the school year to be able to remember their names! You cannot take a “time out” to consult a seating chart before you recognize a student who has his or her hand raised, or worse yet when you promptly need to admonish a student in real time. Totally by serendipity I was visiting the paints and stains department of a Home Depot while starting to get nervous about my upcoming first venture into teaching. There was a display of Mickey Mouse head silhouettes with all these wonderfully vibrant colors (see <http://disneyhome.com/>).

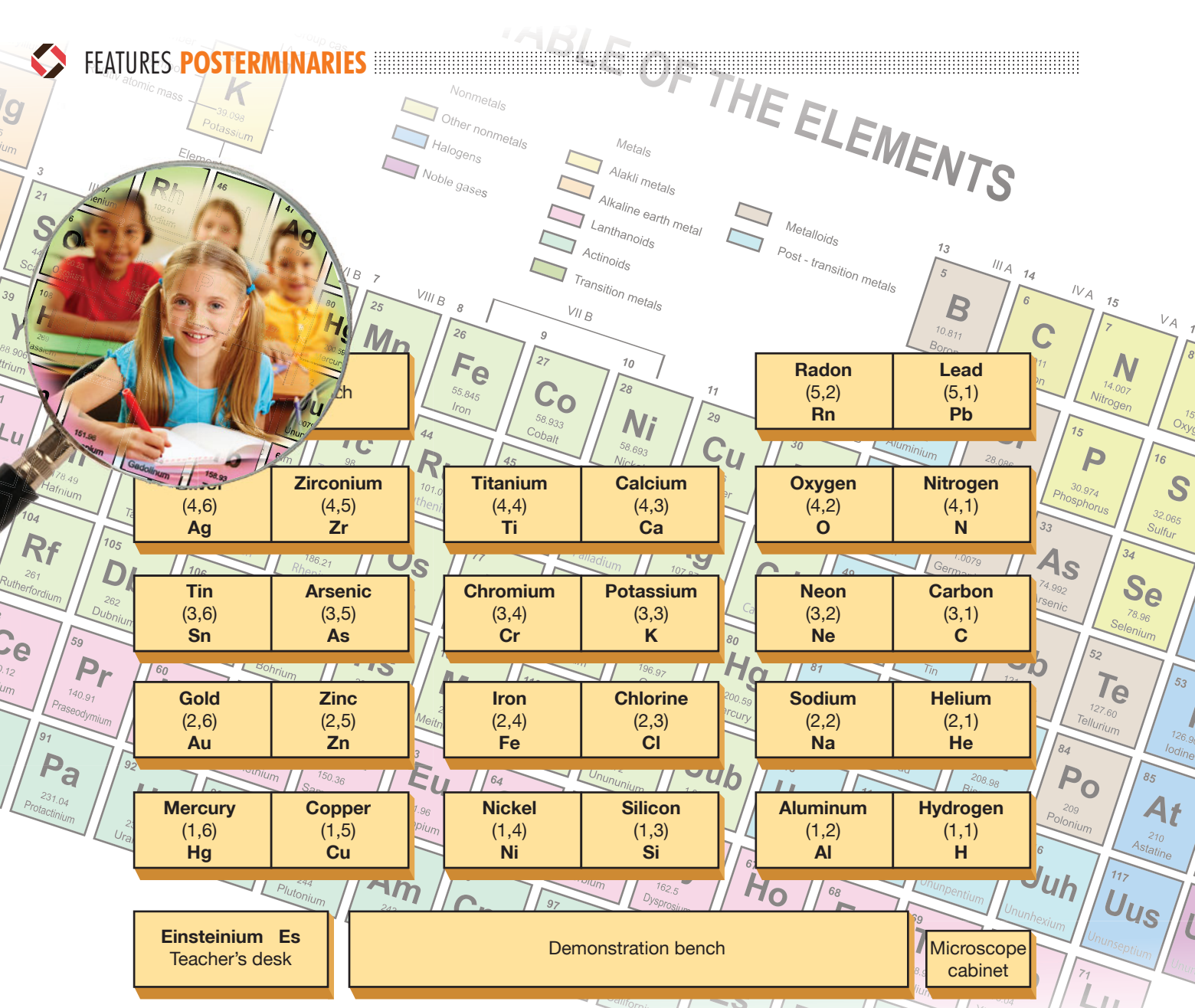
At that instant it hit me, as in “it's elementary my dear Watson.” The answer was “*don't use any of the students' real names!*” Instead, give each seat in the classroom a unique element name from the periodic table. And thus it came to pass



Name monster,
artist's rendering.



TABLE OF THE ELEMENTS



					Radon (5,2) Rn	Lead (5,1) Pb
					Oxygen (4,2) O	Nitrogen (4,1) N
	Zirconium (4,5) Zr	Titanium (4,4) Ti	Calcium (4,3) Ca			
Ag (4,6)						
Tin (3,6) Sn	Arsenic (3,5) As	Chromium (3,4) Cr	Potassium (3,3) K		Neon (3,2) Ne	Carbon (3,1) C
Gold (2,6) Au	Zinc (2,5) Zn	Iron (2,4) Fe	Chlorine (2,3) Cl		Sodium (2,2) Na	Helium (2,1) He
Mercury (1,6) Hg	Copper (1,5) Cu	Nickel (1,4) Ni	Silicon (1,3) Si		Aluminum (1,2) Al	Hydrogen (1,1) H
Einsteinium Es Teacher's desk	Demonstration bench				Microscope cabinet	

that whatever student I assigned to row 1, seat 1 would be called Mr. or Ms. Hydrogen for the course of the year. All students were required to address each other in class using only their element names. All classroom work, all homework, all communications used only element names and never real names. Because multiple students used the same seats when in my classroom, written work also contained a grade and homeroom teacher identifier. For example, Mr. Phosphorus was in Mrs. Burnett's 4th grade class. Writing a fictional story or comic strip that included a reference to their element in proper context was an annual homework assignment—no dry reports with boring facts allowed.

By adopting the use of element names instead of real names, the students learned many of the elements in the periodic table as part of normal conversation and classroom demonstrations featuring their elements. "Miss Nitrogen, should we use this banana or this hammer to drive the nail into the wood?" Of course the banana after we take it down to 77 K with the aid of liquid nitrogen.

In 5+ years of teaching science and math to over 500 elementary school students in grades K–6, a science textbook was never used in the classroom (except to conveniently adjust the height of an inclined plane). District administrators and school board members frequently came to my science class with visitors from other districts to see science being taught by doing science instead of reading about it. What about student performance on those all-important standardized tests? Well it turns out that learning/assessing the periodic table is not part of the curriculum until middle school. Probably one of the most telling questions I was ever asked by one of those visitors to my class was "Why are you teaching them subjects they don't need to know until 7th grade?"

Instead of replying with some choice words that certainly would have gotten me in trouble with the superintendent of schools, I simply replied, "It's elementary my dear Watson" and left it at that.

Clif Draper