Students Using Chemistry through the Use of the Internet

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INTRODUCTION

As a teacher I draw from my past educational experiences in order to better serve my students. A realization I made as a student was that hands on activities were more conducive to learning. Not only does it increase understanding and develop skills, but it is much more exciting, rewarding, and memorable. Therefore, as a teacher I am always trying to find ways to make learning more tangible.

When teaching chemistry it is important and necessary to insure the students are being exposed to technology as a medium for learning. And the computer is by far the most practical tool since all my students will need to be computer literate for high school, college and their future jobs. What's even more important is for each student to know how to use the Internet for finding accurate information.

Using the Internet efficiently comes with practice. You have to actually do it in order to learn how to find the information you want. The unit I am developing will provide the students with practice in using the Internet in order to find information about one of 30 elements on the Periodic Table. It will also provide the opportunity for students to organize information in a logical format.

The main idea of the unit is to have each student conduct a scavenger hunt on the Internet for one of the 30 elements I have chosen. The information will be collected and used to create a biography about the element. Each biography will contain specific information about the element along with pictures downloaded from the Internet. The idea is for students to access information about their elements from a variety of sources including some which may not be very obvious.

Upon completion of the scavenger hunt each student will have accessed a total of four web sites. In order to insure students are using the Internet and not a book, specific questions will be asked which could only be answered from a given web site.

I teach eighth grade science. This project was developed in order to introduce the Internet to my students while teaching them about the elements of the periodic table. Being able to use the Internet is very important for my students since they rely on it tremendously when researching their science fair projects.

I am gearing the project towards my traditional students who have had little or no experience using the Internet. These students may not even have computers at home.

Therefore, I am setting up the project so that each student can work independently of his or her classmates. Since my students do not have computers at home, I will be using the computers in the computer lab at school as well as the one computer in my classroom. Just recently my school received Internet access. Our science department had to continuously push for this, and spent one Saturday morning "dropping wire." I feel it was greatly worthwhile.

My traditional students are predominately newly transitioned ESL students. Therefore, their language skills are not as strong as they should be for eighth grade. These students may be unmotivated by school and at times are absent frequently. Thus, having students work at their own pace is more beneficial.

The three lessons that I will be presenting include an introduction on finding information on the Internet, using the Internet to find information about a particular element, and presenting the information found on the element.

Last year when my students and I were working on science fair projects, which involved all kinds of topics, it was necessary for each student to complete a research paper about his or her project. In order to do this, information concerning the topic had to be obtained, analyzed, and then used to write a hypothesis and conclusion for the project. Since some of the topics may be obscure, it can be difficult to obtain information about these topics from books. Therefore, the Internet becomes the ideal source. The problem was my students had never been shown how to find information on the Internet. I was sending my students home with the assignment to find information on the Internet about their topics, when they didn't know the first thing about using the Internet. Therefore, the first lesson of this project involves teaching my students how to search for particular addresses or how to use key words to tap into the information they need.

The second lesson involves the student in a scavenger hunt on the Internet. I have created 30 scavenger hunts each involving a different element. After using the scavenger hunt the student will have found different types of information about his or her element.

The third lesson will involve the student in making a biography of the element and then presenting some of this information in front of the class.

BACKGROUND

Every atom in the universe is one of approximately 114 elements. The atom is so small it has never been seen, although models of atoms have been constructed.

Each atom has two main parts, a nucleus and an electron cloud. The nucleus contains protons (positively charged particles) and neutrons (particles with a neutral charge). The electron cloud surrounding the nucleus contains negatively charged "particles" known as

electrons which orbit the nucleus in various energy levels or shells.

The number of protons in the nucleus determines the atomic number. Atoms of the same element have the same number of protons and thus the same atomic number.

The atomic mass or sometimes called the atomic weight is the mass of the protons and neutrons of the atom. Electrons are not included since their mass is so insignificant. Since the atomic weight is so small to begin with, grams are not used but rather atomic mass units. One atomic mass unit is 1/12 the mass of a carbon-12 atom.

All elements are arranged in a particular order on the periodic table.

Columns running vertically are called groups. Elements in the same group contain the same number of electrons in their outermost shell. For example, all the elements in Group I have one outermost electron. The transition elements vary in the number of outermost electrons, although most contain two.

Horizontal rows are called periods. Elements in the same period contain the same number of shells of electrons. For example, all elements in Period 2 have two shells.

The chemical behavior of elements is due to the electronic structure of their atoms, particularly of the outer shell. Therefore, elements in the same group will behave similarly since they all have the same structure of the outer shell.

Compounds are substances made of two or more elements. In order for a compound to form, there is a change in the electronic structure of the elements' atoms. This is called the valence mechanism.

One type of valence mechanism is electrovalence, which involves the losing or gaining of electrons. For example if a sodium atom loses its one outer most electron, then the atom's electronic structure has changed. The nucleus of the atom is still that of a sodium atom, but the electron cloud now is that of a neon atom. The atom has 11 protons and ten electrons giving is a charge of a +1. An electrically charged particle is known as an ion.

The electron lost by the sodium atom is gained by another atom. The chlorine atom can take this electron because one more electron would make it stable. Now the chlorine atom has eight electrons and seven protons giving it a charge of a -1. This atom is no longer a chlorine atom but rather a chloride ion.

As soon as this happens, you have two oppositely charged ions. These ions are attracted to one another electrostatically producing the compound known as sodium chloride.

Not all elements demonstrate electrovalence. The noble gases contain full outer shells

and therefore are not prone to losing or gaining electrons. This observation can be used to lead a discussion on the activity of an element.

How easily an element loses or gains electrons is a measure of the activity of an element. It takes energy to remove electrons from an atom's shell as well as to force electrons into an atom's shell. Elements in Groups I and VII are more active than elements in Groups III and V, the reason being that fewer electrons are being moved with these elements.

Another thing to consider is how close the electron is to the nucleus. The closer the electron is to the nucleus, the greater the energy needed to remove the electron. It takes more energy to remove lithium's outer most electron than cesium's outer most electron. Similarly, it requires more energy to force an electron into a bromine atom since the nucleus is surrounded by a thicker electron cloud than it does to force an electron into a fluorine atom since the nucleus is not as far away.

Another way in which atoms combine to form compounds is by covalence. This happens when atoms share their electrons rather than give or take electrons.

Each element has its own boiling point and melting point. The boiling point is the temperature at which a liquid begins to turn into a vapor increasing evaporation. The melting point is the temperature at which a solid turns into a liquid.

The elements that I want my students to discover through scavenger hunts are: hydrogen, helium, lithium, carbon, nitrogen, oxygen, sodium, magnesium, silicon, phosphorus, sulfur, chlorine, potassium, calcium, titanium, iron, nickel, copper, zinc, arsenic, bromine, rhodium, silver, tin, iodine, tungsten, platinum, gold, lead, uranium. The following is information about each of these elements.

	HYDROGEN	**HELIUM**	**LITHIUM**
Symbol:	H	He	Li
Atomic number:	1	2	3
Atomic weight:	1.00794	4.002602	6.94
Group Number:	1	18	1
Standard state:	gas	gas	solid
Color:	colorless	colorless	silvery white/grey
Discoverer:	Henry Cavendish	Sir William Ramsey, N A Langley, P.T. Cleve	Johan August Arfvedson
Discovered at:	London, England	London, England Uppsala, Sweden	Stockholm, Sweden
Discovery date:	1766	1895	1817
Origin of name:	comes from Greek word *hydros* and *genes* meaning water and generator	comes from Greek word *helios* meaning sun	Greek word *lithos* meaning stone since it was discovered from a mineral source
Boiling point:	20.28 K	4.22 K	1615 K
Melting point:	14.01 K	0.95 K	453.69 K

	CARBON	**NITROGEN**	**OXYGEN**
Symbol:	C	N	O
Atomic number:	6	7	8
Atomic weight:	12.0107	14.00674	15.999
Group Number:	14	15	16
Standard state:	solid	gas	gas
Color:	graphite is black diamond is colorless	colorless	colorless as a gas; liquid is pale blue
Discoverer:	known since ancient times	Daniel Rutherford	Joseph Priestly Carl Sheele
Discovered at:	not known	Scotland	England, Sweden
Discovery date:	not known	1772	1774
Origin of name:	Latin word *carbo* meaning charcoal	Greek words *nitre genes* meaning nitrogen forming	Greek words *oxy genes* meaning acid forming
Boiling point:	4300 K	77.36 K	90.2 K
Melting point:	3800 K	63.05 K	54.8 K

	SODIUM	**MAGNESIUM**	**SILICON**
Symbol:	Na	Mg	Si
Atomic number:	11	12	14
Atomic weight:	22.989770	24.3050	28.0855
Group number:	1	2	14
Standard state:	solid	solid	solid
Color:	silvery white	silvery white	dark grey w/ bluish tinge
Discoverer:	Sir Humphrey Davy	Sir Humphrey Davy	Jons Jacob Berzelius
Discovered at:	England	England	Sweden
Discovery date:	1807	1755	1824
Origin of name:	English word *soda*	Greek word *Magnesia*, a district of Thessaly	Latin word *silicis* meaning flint
Boiling point:	1156 K	1363 K	3173 K
Melting point:	54.8 K	923 K	1687 K

	PHOSPHORUS	**SULFUR**	**CHLORINE**
Symbol:	P	S	Cl
Atomic number:	15	16	17
Atomic weight:	30.97376	32.066	35.4527
Group number:	15	16	17
Standard state:	solid	solid	gas
Color:	colorless/red/silvery white	lemon yellow	yellowish green
Discoverer:	Hennig Brand	known since ancient times	Carl William Scheele
Discovered at:	Germany	not known	Sweden
Discovery date:	1669	not known	1774
Origin of name:	Greek word *phosphoros* meaning bringer of light	Sanskit word *sulvere* meaning sulphur	Greek word *chloros* meaning pale green
Boiling point:	550 K	717.87 K	239.11 K
Melting point:	317.3 K	388.36 K	171.6 K

	POTASSIUM	**CALCIUM**	**TITANIUM**
Symbol:	K	Ca	Ti
Atomic number:	19	20	22
Atomic weight:	39.0983	40.078	47.867
Group number:	1	2	4
Standard state:	solid	solid	solid
Color:	silvery white	silvery white	silvery metallic
Discoverer:	Sir Humphrey Davy	Sir Humphrey Davy	William Gregor
Discovered at:	England	England	England
Discovery date:	1807	1808	1791
Origin of name:	English word *potash* (Pot ashes) and Arabic word *qali* meaning alkali	Latin word *calx* meaning lime	named after the Titans characters of Greek mythology
Boiling point:	1032 K	1757 K	3560 K
Melting point:	336.53 K	1115 K	1941 K

	IRON	**NICKEL**	**COPPER**
Symbol:	Fe	Ni	Cu
Atomic number:	26	28	29
Atomic weight:	55.845	58.6934	63.546
Group number:	8	10	11
Standard state:	solid	solid	solid
Color:	lustrous, metallic, greyish tinge	lustrous, metallic, silvery tinge	reddish, metallic
Discoverer:	known since ancient times	Axel Fredrik Cronstedt	known since ancient times
Discovered at:	not known	Sweden	not known
Discovery date:	not known	1751	not known
Origin of name:	Anglo-saxon word *iron*	German word *Kupfernickel* meaning Devil's Copper	Latin word *cuprum* meaning island of Cyprus
Boiling point:	3134 K	3186 K	3200 K
Melting point:	1811 K	1728 K	1357.77 K

	ZINC	**ARSENIC**	**BROMINE**
Symbol:	Zn	As	Br
Atomic number:	30	33	35
Atomic weight:	65.39	74.92160	79.904
Group number:	12	15	17
Standard state:	solid	solid	solid
Color:	bluish pale grey	metallic grey	red-brown, metallic luster when solid
Discoverer:	Andreas Marggraf	known since ancient times	Antoine J. Balard
Discovered at:	Germany	not known	France
Discovery date:	1500	not known	1826
Origin of name:	German word *zinc*	Greek word *Arsenikon* meaning yellow orpiment	Greek word *bromos* meaning stench
Boiling point:	1180 K	887 K	332 K
Melting point:	692.68 K	1090 K	265.8 K

	RHODIUM	**SILVER**	**TIN**
Symbol:	Rh	Ag	Sn
Atomic number:	45	47	50
Atomic weight:	102.9055	107.8682	118.710
Group number:	9	11	14
Standard state:	solid	solid	solid
Color:	silvery white metallic	silver	silvery lustrous grey
Discoverer:	William Hyde Wollaston	known since ancient times	known since ancient times
Discovered at:	England	not known	not known
Discovery date:	1803	not known	not known
Origin of name:	Greek word *rhodon* meaning rose	Anglo-saxon word *siolfur* meaning silver	Anglo-saxon word *tin*
Boiling point:	3968 K	2435 K	2875 K
Melting point:	2237 K	1234.93 K	505.08 K

	IODINE	**TUNGSTEN**	**PLATINUM**
Symbol:	I	W	Pt
Atomic number:	53	74	78
Atomic weight:	126.9044	183.84	195.078
Group number:	17	6	10
Standard state:	liquid	solid	solid
Color:	violet-dark grey, lustrous	greyish white	greyish white lustrous
Discoverer:	Bernard Courtios	Fausto & Juan Jose De Elhuyar	Antonio de Ulloa
Discovered at:	France	Spain	South America
Discovery date:	1811	1783	1735
Origin of name:	Greek word *iodes* meaning violet	Swedish words *tung sten* meaning heavy stone	Spanish word *platina* meaning silver
Boiling point:	457.4 K	5828 K	4098 K
Melting point:	386.85 K	3695 K	2041.4 K

	GOLD	**LEAD**	**URANIUM**
Symbol:	Au	Pb	U
Atomic number:	79	82	92
Atomic weight:	196.96655	207.2	238.0289
Group number:	79	82	5
Standard state:	solid	solid	solid
Color:	gold	Bluish white	metallic grey
Discoverer:	known since ancient times	not known	Martin Klaproth
Discovered at:	not known	not known	Germany
Discovery date:	not known	not known	1789
Origin of name:	Anglo-saxon word *gold*	Anglo-saxon word *lead*; Latin *plumbrum* meaning liquid silver	named after the planet Uranus
Boiling point:	3129 K	2022 K	4200 K
Melting point:	1337.33 K	600.61 K	1405.3 K

LESSON ONE

Using a large television which has been attached to my computer at school, I will model how to search for information on the Internet. I will also be explaining the Internet to my students.

It is important to first explain what is meant by the World Wide Web. After this brief discussion I will demonstrate how to connect to the Internet. Once on the Internet, I will model the uses for the buttons found on the location bar, and then I will model how to perform a search using key words as well as addresses.

Since the Internet contains all kinds of information, some of which is inappropriate for our students, I will have my students complete the scavenger hunts on computers at school. In this way I can ensure the safety of my students since these computers have filtering software and I can be there to monitor.

LESSON TWO

Hand out one scavenger hunt to each student (see appendix). Allow students 1-2 weeks to complete scavenger hunt.

LESSON THREE

Now it is time to create the biography of the element. I will have my students produce a book with the information obtained from the scavenger hunt. The book will have a cover showing a picture of their element. The inside of the book will be divided into the following parts: description (symbol, atomic number, atomic weight, group number, standard state, and color), history (who discovered it, where it was discovered, date of discovery, and origin of name), uses, compounds, graphs (amounts of the element found in the universe, sun, crustal rocks, sea water, streams, and humans), boiling and melting point, two interesting facts and comics.

Once the biographies are completed, each student will read two books of other students and evaluate each one.

APPENDIX

Here are some sample worksheets. The instructor can create other worksheets like this for each of the 50 chosen elements.

Elemental Scavenger Hunt: Arsenic

Remember keep track of all your information on your element!

Begin by searching for the following address: http://www.webelements.com/

1. Click on >> Enter frameless periodic table version <<

2. At this point you will see a periodic table. Print out the table and include it in your biography of your element.

3. Click on your element, arsenic, on the periodic table.

4. Identify the following:

symbol	atomic weight	group number
color	atomic number	standard state

5. Name two interesting facts about arsenic.

6. Answer the following about the history of arsenic:

Who discovered arsenic?	Date of discovery
Where it was discovered?	Origin of name

7. Name three uses for arsenic.

8. Name four compounds containing arsenic.

9. Download graphs representing the amount of arsenic in the universe, sun, crustal rocks, seawater, streams, and humans.

10. How many grams of arsenic are in your own body?

11. Identify the boiling point and the melting point of arsenic.

12. Using the server Yahoo! Search for a Comic Book Periodic Table. Now find two comics about arsenic and download them. Include these comics in your biography. This is your element's claim to fame!

13. Stay with Yahoo! Search for Visual Elements. Download a picture of your element. This will also be added to your biography.

Elemental Scavenger Hunt: Calcium

Remember keep track of all your information on your element.

Begin by searching for the following address: http://www.webelements.com/

1. Click on >> Enter frameless periodic table version <<

2. At this point you will see a periodic table. Print out the table and include it in your biography of your element.

3. Click on your element, calcium, on the periodic table.

4. Identify the following:

symbol	atomic weight	group number
color	atomic number	standard state

5. Where is calcium most often found in the natural environment?

6. Answer the following about the history of calcium:

Who discovered calcium?	Date of discovery
Where it was discovered?	Origin of name

7. Name three uses for calcium.

8. Name four compounds containing calcium.

9. Download graphs representing the amount of calcium in the universe, sun, crustal rocks, seawater, streams, and humans.

10. How many grams of calcium are in your own body?

11. Identify the boiling point and the melting point of calcium.

12. Using the server Yahoo! Search for a Comic Book Periodic Table. Now find two comics about calcium and download them. Include these comics in your biography. This is your element's claim to fame!

13. Stay with Yahoo! Search for Visual Elements. Download a picture of your element. This will also be added to your biography.

Elemental Scavenger Hunt: Copper

Remember keep track of all your information on your element.

Begin by searching for the following address: http://www.webelements.com/

1. Click on >> Enter frameless periodic table version <<

2. At this point you will see a periodic table. Print out the table and include it in your biography of your element.

3. Click on your element, copper, on the periodic table.

4. Identify the following:

symbol	atomic weight	group number
color	atomic number	standard state

5. Why are policemen and policewomen sometimes called "cops"?

6. Answer the following about the history of copper:

Who discovered copper?	Date of discovery
Where it was discovered?	Origin of name

7. Name three uses for copper.

8. Name four compounds containing copper.

9. Download graphs representing the amount of copper in the universe, sun, crustal rocks, seawater, streams, and humans.

10. How many grams of copper are in your own body?

11. Identify the boiling point and the melting point of copper.

12. Using the server Yahoo! Search for a Comic Book Periodic Table. Now find two comics about copper and download them. Include these comics in your biography. This is your element's claim to fame!

13. Stay with Yahoo! Search for Visual Elements. Download a picture of your element. This will also be added to your biography.

Elemental Scavenger Hunt: Zinc

Remember keep track of all your information on your element.

Begin by searching for the following address: http://www.webelements.com/

1. Click on >> Enter frameless periodic table version <<

2. At this point you will see a periodic table. Print out the table and include it in your biography of your element.

3. Click on your element, zinc, on the periodic table.

4. Identify the following:

symbol	atomic weight	group number
atomic number	standard state	color

5. Name two interesting facts about zinc.

6. Answer the following about the history of zinc:

Who discovered zinc?	Date of discovery
Where it was discovered?	Origin of name

7. Name three uses for zinc.

8. Name four compounds containing zinc.

9. Download graphs representing the amount of zinc in the universe, sun, crustal rocks, sea water, streams, and humans.

10. How many grams of zinc are in your own body?

11. Identify the boiling point and the melting point of zinc.

12. Using the server Yahoo! search for A Comic Book Periodic Table. Now find two comics about zinc and download them. Include these comics in your biography. This is your element's claim to fame!

13. Stay with Yahoo! Search for Visual Elements. Download a picture of your element. This will also be added to your biography.