

Writing Poetry in Chemistry Class

Raymond W. Zanetti

Overview

This unit incorporates enrichment exercises for high school students taking introductory level chemistry. While students have experienced a basic study of the fundamentals of chemistry, rarely do they have the opportunity to see themselves a part of this chemical system. This unit will foster their understanding of chemistry by having them express their understanding of a chemical concept by writing a poem about this idea. Furthermore, students will examine the relationships among science, society, and literature, as well as the inner connective relationship that exists between man and nature. It consists of a selection of ten poems written by various poets, which will be read by students over three different class sessions. During the initial session the students will read four short poems. For the other two sessions they will read three poems. After each session they will participate in a discussion of what they find interesting about any of the poems read. The content of these poems is not intended to be a sequential unit of study addressing one major concept, but a collection of readings to stimulate the imagination of the students toward creating a poem of their own that is both reflective and in some way related to a concept studied during the first year of chemistry. To allow students an adequate depth of content exposure, the readings and poem creation will take place during the final grade report period of the year. In writing a poem concerning a chemical concept this exercise will serve to enhance the core curriculum.

Rationale

This curriculum will fit into the existing curriculum as a supplementary curriculum unit, encompassing information learned in the existing curriculum for chemistry as prescribed by the Pittsburgh Board of Education.

Students often consider first year chemistry to be challenging and not very entertaining. I see this curriculum project as an extension of something that has already proven successfully entertaining in the past. An annual event that has taken place in my classroom for many years involves students participating in a holiday sing-along session. It happens just before the winter break, sometime on or about the final week of December. After issuing each student a booklet that contains

pages of chemistry sing-along songs, I then inform them that they are required to participate in a chorus of musical merriment. I make them aware that by doing this they will be given a bonus lab credit that will be averaged with their present grade. By making the offer attractive enough they usually jump at the chance to earn some easy credit towards their grade. On each page of the song-packet is a tune that is somehow related to the study of chemistry, set to the melody of a well-known holiday carol. Each song is poetic by design, having a rhythm established in the melody of the tune. The content is often silly nonsense, or pertains to a genuine serious concept that they have already learned in class. The sing-along usually starts out kid of slow with me leading the chorus, but then picks up momentum as students begin to lower their guard and join in the growing noise. The poems in these songs tend to share a pattern of being simple end-rhymes, with final words kissing together to delight the ear of the beholder. The sing-along is always unannounced, but most students already anticipate that this is going to happen because they hear about it from friends who were former students of mine.

If asked ahead of time about the singing, I never admit that it's going to happen, but they're rarely surprised when it does. This day is always a pleasant day for me, and I attribute this to the fun that students have while singing these songs. The atmosphere of the sing-along is jovial and light-hearted, often ending with a competition between students to see who can sing in the loudest voice. The class often splits into gender competitions, girls grouping against the boys. It's comical to watch the students, especially those that are members of the high school chorus, or an extroverted boy, gleefully singing with a deeply rich, post-pubescent voice, and the aggressive girl trying to trump the boy with her elevated alto-soprano. I marvel that there have been times when students from previously graduated classes show up on this day to join in the song. They are usually brothers or sisters of my present class members, and were former students of mine from previous years. It gives me great pleasure to see these familiar faces, and pause to think that they've returned to their alma mater to partake in something that they remember as a pleasant experience.

Recently I revisited several of these holiday songs, and while reading the silly rhymes of the lyrics, it dawned on me that there was a lot of comedy in the words of the tunes. One such song was a childish ditty about the name of the element Cesium, and was entitled; "The Song of Cesium." This poem is sung to the melody of the tune, "Oh Christmas Tree." It begins with the verse: "Oh Cesium, oh Cesium, Thy spectrum doth us please-ium." This is really entertaining stuff, don't you think? There are many other songs for the other elements of the periodic table.

I see this curriculum unit as an extension of something that has already proven successful. My idea is to get students to write poems, either with or without the accompaniment of melodies to familiar songs, and then have them read their poem or sing their creations to the class. The other members of the class will be

encouraged to join their classmate authors in a sing-along of any musical poetic verses.

In teaching the subject of chemistry over two decades, I've come to recognize the magnitude of importance that this discipline provides when an individual pursues a better understanding of the natural world. Chemistry allows the user to make connections between the properties of materials making up the world, and the uses of these materials. Concepts embodied in this study allow the user a better grasp of why things work the way they do, and serve as tools when designing new technologies. Each concept is one small thread from the tapestry of the natural world, and has its place in the interconnectedness of natural processes. It will help students to better understand various aspects of their lives. One such aspect is that they are made of atoms, which react with the atoms around them, for instance. Life is one large chemical system, a series of interactions. Students can see that they are part of this tapestry, and write poetry about it. I liken a concept to the analogy of a bridge, which serves as means when connecting opposite sides of a river, or a model that serves as a method of describing something unseen. A model can paint a proverbial picture, enabling a learner to identify macroscopic observations concerning the nature of our physical world, by explaining the microscopic patterns of composition responsible for these properties. I believe that poetry has a place in this means of understanding the interconnected tapestry between man and nature. Just as the secrets of nature are unlocked by the examination of reoccurring natural patterns, I think that a well-written poem has the power to enlighten the mind of a careful observer.

Objective

This unit will be used to supplement the curricular information on various concepts covered during the school year. Pittsburgh Public School standards that will be addressed for secondary science students are many. For instance, students will need to demonstrate knowledge of basic principles of chemistry. They will construct poetic verses to validate proficient use of communication skills, using proper grammar and punctuation. Students will develop and apply skills of pattern recognition, and scientific reasoning. And finally, they will explain relationships between science, society, and literature.

The intended outcome of this unit is that students will grasp key concepts written in the student syllabus of chemistry-one and achieve higher marks on standardized semester examinations and PSSA testing. They will internalize concepts in chemistry to write poems. It will help attract students more interested in the liberal arts to consider the sciences, and not to write off the subject of chemistry as something

inaccessible. Use of this multi-disciplinary approach will allow the students to really, actively collaborate with the material taught in chemistry. They must synthesize ideas about chemistry to write the poems.

Strategies

Many techniques will be utilized to help students achieve the objectives and attain the goal of higher achievement on standardized testing. Each student will first write and submit a brief summary that describes a specific concept concerning chemistry, covered sometime during the school year, that they intend to develop into a poem. They will then examine ten poems and participate in three class discussions concerning what ideas the authors of these poems were trying to convey to the reader. These poems are written by people who have incorporated an understanding of concepts of the natural world into their poetry and their way of viewing the world in which they live. After this they will then write a first rough draft, which will be read aloud to the rest of the class for input concerning the concept being expressed in the poem. For instance, they might be writing a poem about the concept of gases, liquids, and the solid state. To better internalize the distinction between these states, they would be encouraged to consider the connection that exists between kinetic energy and particle movement. They could relate this to people moving, or the emotional intensity of people and their human conditions. This would hearten them to see chemistry in all aspects of their lives by the use of allegory and metaphors. To write the poem they would truly internalize the concept, making them take their understanding of chemistry to a new level. Depending on the recommendations and suggestions made by members of the class and myself, the student will then proceed to write the final version of their poem for submission as eighty percent of the grade. Each poem will be read before the class by the author, with twenty percent of the grade dependant upon the averaged scoring of all evaluators, excluding myself. The evaluators will score the presentation on a special evaluation form, with scores based on a scale ranging from one to five, with five points being the highest possible score. Students that have written poems to a musical score will be encouraged to conduct a sing-along, or perform the song as a solo using a karaoke musical system that is available onsite.

Classroom Activities

First Set of Readings (To be read and discussed during one class period.)

Poem #1: High Flight by John Gillespie McGee Jr.

Oh! I have slipped the surly bonds of earth
And danced the skies on laughter-silvered wings;
Sunward I've climbed, and joined the tumbling mirth
Of sun-split clouds – and done a hundred things
You have not dreamed of – wheeled and soared and swung
High in the sunlit silence. Hov'ring there,
I've chased the shouting wind along, and flung
My eager craft through footless halls of air.
Up, up, and the long delirious, burning blue
I've topped the wind-swept heights with easy grace
Where never lark, or even eagle flew –
And, while with silent lifting mind I've trod
The high untrespassed sancity of space,
Put out my hand and touched the face of God.

I begin with this poem because I think students will be able to connect with it without having someone else telling them what it means. I believe that students will feel the emotion in these words that were written by the nineteen-year-old American volunteer that sot to fight against the oncoming threat of the Hitlerian Third Reich. This is the poem read by President Ronald Reagan in a eulogy to the crew members of the Challenger disaster in 1986. The author of this poem died in late December of 1941 when his Royal Canadian Airforce Spitfire collided with another plane while fighting in The Battle Over Britain. I don't think that a student has to be an expert in poetry to understand these verses, to sense the awesome dynamics of flying a fighter plane, and the amazement of the author upon experiencing these sensations. After reading this poem I intend to share the background of the author with the students to get the discussion rolling. This poem joins together the application of technology with the marvels of human experience in the natural splendor of the earth's atmosphere. The witness of an aviator dancing across the sky to touch the face of God is both inspirational and reflective, and should inspire some sort of reaction from the students. I will also point out the author's use of rhyming ends that have been used in this poem.

Poem #2: Why Wait for Science by Robert Frost

Sarcastic Science, she would like to know,
In her complacent ministry of fear,
How we propose to get away from here
When she has made things so we have to go
Or be wiped out.

In this poem the author addresses an issue concerning the underlying nature of science. Science is portrayed as a cold and impersonal entity, necessitating humankind to evolve or perish. I want the students to inspect this poem to see how they perceive the character of science, and its influence on mankind. Do they see science as something that controls their life, an entity requiring them to understand its principles or be left behind, and in a sense become redundant? I liken this to a technology change that I've experienced over the past twenty years. After my students have read this poem I intend to share my experience with having to adapt to the new age of communication technology that relies heavily on the use of computers. Twenty years ago, who would have thought about using a mouse, or doing word processing, or searching the internet? Are these communication skills essential to the way that we live? Will this new technology be a requirement to those who wish to be functional in the future? These are questions that I will have the students address after reading this poem.

Poem #3: An Everywhere of Silver by Emily Dickinson

AN EVERYWHERE of silver,
With ropes of sand
To keep it from effacing
The track called land.

The main reason for use of this poem is that it contains the name of a highly recognizable chemical element, silver. It is a short poem starting with an emphasis on the words AN EVERYWHERE, which jumps out from the page at the reader, thus focusing on a destination or condition. This poem requires the student to interpret the meaning of the author, and should allow for an open-ended discussion of its meaning. Will sand be strong enough to hold fast when challenged by a specific force of nature? What part of nature is being held back? If silver is everywhere, and we interpret land as earth, then silver must represent a reflection from the surface of the oceans that cover the majority of planet earth?

Another avenue of thought that will be explored in this poem is whether the author is addressing a concern about the human interaction between the male and female genders. Does silver symbolize something mythically feminine as opposed to the alchemical masculinity of the element gold? Is the author identifying the male to have a greater worth in her society? Might sand represent the controlling norms of a patriarchal social structure, limiting a female's ability to influence the culture at the time of Dickinson's life? Did the author use this poem as a voice to address concerns over a social condition that she resented? Will the silver eventually breach the sand to overcome the land?

Poem #4: On Grafting by Thomas Randolph

If the fresh trunk has sap enough to give
That each inserted branch may live;
The gardener grafts not only apples there,
But adds the warden and the pear.

The peach and apricot together grow,
The cherry and the damson too,
Till be both made by skillful husbandry
An entire orchard of one tree.

As lest our paradise perfection want,
He may as well inoculate as plant.

This poem begins with a condition that there must be a reliable source of nourishment if a branch is to be successfully grafted to a trunk. The unifying source of life is the sap, which provides life for whatever type of branch is used in the graft. The energy of the sap is a unifying force that joins together all living things. One tree can then produce many different types of fruit, but only with the skillful talent of the gardener. All living things are connected to each other by a shared energy that runs throughout the natural world. The trunk produces the sap. The sap gives life to the grafted branches, the branches produce the various fruits, the fruit is consumed by the gardener, and the man cares for the trunk.

Second Set of Readings

*Poem #5: The Pleasure of Finding Things Out and the Meaning of It All
by Richard P. Feynman*

There are the rushing waves
mountains of molecules
each stupidly minding its own business
trillions apart
yet forming white surf in unison

Ages on ages
before any eyes could see
year after year
thunderously pounding the shore as now.

For whom, for what?
on a dead planet
with no life to entertain

Never at rest, tortured by energy
wasted prodigiously by the sun
poured into space

A mite makes the sea roar,

Deep in the sea
all molecules repeat
the patterns of one another
till complex new ones are formed

They make others like themselves
and a new dance starts,

Growing in size and complexity
living things,
masses of atoms,
DNA, protein,
dancing a pattern even more intricate,
out of the cradle,
onto dry land,
here It is standing::

Atoms with consciousness;
matter with curiosity,

Stands at the sea,
wonders at wondering:

I, a universe of atoms,
an atom in the universe.

I chose this poem as a second reading because it differs from those previously read by being a longer poem without rhymes, and conveys to the young reader the value of science. Science has produced numerous accomplishments, with some achievements proving to be far greater than projections of the dreamers and poets of the past. Discoveries from scientific development and technology have opened new windows of enlightenment into the building blocks of nature.

Poem #6: $p^+ = e^+ + \nu_e$ by James R. Villiesse

They tell me a proton
Long considered to be eternal

May have a life of 1033 years
Not much cause to worry
But we may have to redefine
Eternity, slightly downward

This short poem is another example of a poem without rhyming sentences. I've chosen this to reinforce the idea that a poem need not rhyme to be considered as poetry. It also addresses an issue that I often stress while introducing students to various exceptions to the general rules that apply to the more common patterns of chemical behavior when studying chemistry. I tell my students at the beginning of the year that there are recognizable trends when studying the patterns of the periodic table, or in the bond structures of various molecules, but I also inform them that there will occasionally be exceptions to these general guidelines. I let them know ahead of time that there will be instances during their studies where they will become frustrated by contradiction to the general patterns, and that they will be perturbed by these exceptions because it required them to memorize the details concerning these irregularities. I always sympathize and reinforce them when we get to an exception of the general pattern, and assure them that I know how confusing it can be to have to remember the contrary bonding structure or unusual trend. This poem is a perfect example of one such exception. The structure of the atom is studied early in the year, and students get the impression that subatomic particles are stable and unchanging entities. Nothing is mentioned of nuclear chemistry and the changes that are possible with the nucleus and its subatomic particles. Reading this poem will introduce students to a concept that will further their understanding of the nature of the proton.

Poem #7: Blue Planet by Author Unknown

I live on a planet
The blue planet
My feet patter it everyday
So do others'
We stir the dust and clay
And make our marks upon it

I live on a planet
The blue planet
My lungs breathe its air
So do others'
The creatures also share
But our breath can explain it

I live on a planet

The blue planet
I gulp its cycled rain
And so do others'
We make fountains, lakes and drains
Our blueprints plan it

I live on a planet
The blue planet
My feet patter it everyday
So do others'
We stir the dust and clay
And make our marks upon it.

This final reading reverts back to the more familiar sort of poem that uses rhyming words. It is a poem that is reflective when read at the end of the school year, because it addresses the previously covered subject material concerning water and its unique role of being the stable compound responsible for the existence of life on earth. In the month of March, students learn the chemistry of this unique substance, and how it influences every substance on the earth, both living and nonliving. It's appropriate to read this poem in the early spring to commemorate "Earth Day" because it can be used both as a springboard to identify the significance of the day, and also to discuss the style and meaning of the poem.

Third Set of Readings

Poem # 8: Experiment by Wistawa Szymborska

As a short subject before the main feature –
in which the actors did their best
to make me cry and even laugh-
we were shown an interesting experiment
involving a head.
The head
a minute earlier was still attached to...
but now it was cut off.
Everyone could see that it didn't have a body.
The tubes dangling from the neck hooked it up to a machine
that kept its blood circulating.
The head
was doing just fine.

Without showing pain or even surprise,
it followed a moving flashlight with its eyes.

It pricked up its ears at the sound of a bell.
Its moist nose could tell
the smell of bacon from odorless oblivion,
and licking its chops with evident relish
it salivated its salute to physiology.

A dog's faithful head,
a dog's friendly head
squinted its eyes when stroked,
convinced that it was still part of a whole
that crooks its back if patted
and wags its tail.

I thought about happiness and was frightened.
For if that's all life is about,
the head
was happy.

Experiment is an amusing poem that makes the reader address the issue; what is real? In the subject of chemistry students test the materials that reality is comprised of by the employing a technique known as scientific method. Like the observer of the dog head, the student must interpret the meaning of the results of what they see after doing a lab. They need to apply the senses of smell, sight, and sound to first collect data, and then formulate conclusions based upon this data. When their results prove that a concept being tested is accurate, then the satisfaction experienced by the student warrants justification for having done the experiment, and reinforces their understanding of a given theory being studied.

Poem # 9: Alter by Octavio Paz

	A name	
	Its shadow	
	He She	
	An i	An o
A mallet		A gong
A tower		A pool
A hand		A clock
A bone		A rose
A mist		A tomb
A spring		A flame
A brand		A night
A river		A city
A keel		An anchor

She male
He
Body of names
Your name in my name in your name my name
One to another one against the other one around another
One in the other
Unnamed

I love this poem because of the geometric design and related terms. It is creative in its unorthodox appearance and shape, and will inspire students to experiment with new ideas about how they are permitted to design a poem without being restricted by conventional limits.

Poem # 10: The Bridge by Octavio Paz

Between now and now,
Between I am and you are, the word *bridge*.

Entering it
you enter yourself:
the world connects
and closes like a ring.

From one bank to another,
there is always
a body stretched:
a rainbow.

I'll sleep beneath its arches.

I end the readings with a poem that unites human experience with the world. It is the connecting theme that joins matter to human experience and is reflected in the workings of literature. We are all joined together by the common chemistry that is shared by every unit of matter that exists. Each individual is a microcosm of the larger macrocosm of the universe, sharing those atoms that allow us to exist, and that we experience as a part of our reality. We all sleep beneath the arches of a rainbow that is constructed from the building blocks of the natural world, the atoms that make up all things.

Works Cited

Dickinson, Emily. "An Everywhere of Silver." Complete Poems-1924. Bartleby. Website.

April 20 2003 < <http://www.bartleby.com/113/2022.html>

This website provides a collection of poems written by Emily Dickinson. Many of the poems deal with mans relationship to the natural world. A rich resource for teachers and students who want to explore the poems of Emily Dickinson.

Feynman, Richard P. "Observations of the Sea." Discussion on Feynman's Science.

February 1 2003 < <http://www.cheesebikini.com/mt/mt-tb>

Nobel laureate, Richard P. Feynman, leads readers on an exploration of the accomplishments of mankind.

Frost, Robert. "Why Want for Science." Bartleby. Website

April 20 2003 < <http://www.bartleby.com/66/8/24108.html>

A database with poems that are related in some manner to the sciences. Students can find science related topics from many different authors at this website.

McGee, John Gillespie Jr. "High Flight." The Wall Street Journal

Tuesday, February 4 2003 The Wall Street Journal Newspaper

This was a poem found in the book reviews section of the Wall Street Journal. Students will be able to find poems in this section of the Journal.

Paz, Octavio. "Alter." and "The Bridge." The Collected Poems of Octavio Paz 1957-1987. New York:

New Directions Publishing Corporation, 1987.

This book contains virtually all of the poems written by Octavio Paz from 1957-1987. These poems were written in many countries, and translated into many languages. Students fluent in Spanish can read poetry in both English and Spanish by reading this book.

Randolph, Thomas. "On Grafting." Garden Poems: Everyman's Library Pocket Poems. New York. David Campbell Publishing Ltd., 1996.

This is a wonderful collection of poems from various authors about the art of gardening. It will serve teachers and students as a good source of poetry that deals with plant life and gardening.

Villiesse, James R. " $p^+ \rightarrow e^- + \nu_e$." Science News Online 75th Anniversary Essay.

April 20 2003 < http://www.sciencenews.org/sn_arc97/75th/poetry.html

Poems concerning science are available on this website. Many of the poems are quite interesting and different because of their technical nature.

Wistawa, Szymborska. "Experiment." Poems New and Collected. New York, San Diego, London. Harcourt Brace and Company. 1998.

This collection of poems covers many different areas of interest, some related to science.

Author Unknown. "I Live On a Planet." E-poems/Earth/Blue Planet

April 20 2003 < <http://www.e-poems.org/blueplanet.html>

This website contains poems that were written by students. It is a cool site for finding samples of poems that have been written by high school students.

Reading List for Students

Paz, Octavio. The Collected Poems of Octavio Paz 1957-1987. New York: New Directions Publishing Corporation, 1987.

This collection of poems is written by the 1990 Nobel Laureate, Octavio Paz. It is a translation of all of the poems written over a three-decade period of time, and each poem in this book is written in both Spanish and English.

Randolph, Thomas. Garden Poems: Everyman's Library Pocket Poems. New York. David Campbell Publishing Ltd., 1996.

Students will enjoy the poems in this book. There is a good selection of poems about plant life and gardening.

Wistawa, Szymborska. Poems New and Collected. New York, San Diego, London. Harcourt Brace and Company. 1998.

There is a good mix of poems in this collection. The poems in this book are easy to read and understand for students with limited exposure to poetry. Many of the poems are about the natural world.

Appendix-Content Standards

The Pittsburgh Public Schools standards that will be addressed for secondary science students include:

- (1) Students demonstrate knowledge of basic concepts and principles of chemistry.
- (2) Students explain the relationships among science, technology, and society.
- (3) All students read and use a variety of methods to make sense of various kinds of complex texts.
- (4) All students write for a variety of purposes, including to narrate, inform and Persuade, in all subjects.
- (5) All students exchange information orally, including understanding and giving spoken instructions, answering questions appropriately, and promoting effective group communication.
- (6) All students listen to and understand complex oral messages and identify their purpose, structure and use.
- (7) All students demonstrate that they can work effectively with others.