Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2009

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Preface

In April 2009 the Yale National Initiative to strengthen teaching in public schools® accepted seventy-two public school teachers from fourteen school districts in eleven communities in ten states to participate in seven national seminars held at Yale. The Initiative is a long-term endeavor to establish exemplary Teachers Institutes in under-served school districts in states throughout the country. Following the approach developed in New Haven and demonstrated in other cities, it builds upon the success of a four-year National Demonstration Project. The League of Teachers Institutes® is an alliance that advances their work locally and nationally.

Teachers Institutes are educational partnerships between universities and school districts designed to strengthen teaching and learning in a community's public schools. Evaluations have shown that the Institute approach enhances teacher quality in the ways known to improve student achievement and encourages participants to remain in teaching in urban schools.

About two thirds of the teachers, named Yale National Fellows, were from seven communities that are planning or exploring the establishment of a new Teachers Institute: Charlotte, NC; Chicago, IL; DeKalb County, GA; New Castle County, DE; Richmond, VA; San Francisco, CA; and Santa Fe, NM. Other National Fellows were from existing Institutes in Houston, Philadelphia, Pittsburgh, and New Haven that are members of the League of Teachers Institutes. The Fellows attended an Organizational Session of the seminars held in New Haven on May 1-2. The seminars reconvened during a ten-day Intensive Session from July 6-17.

The seminars, which concluded in mid-August when the Fellows submitted their completed curriculum units, included "Storytelling around the Globe," led by Dudley Andrew, R. Selden Rose Professor of Film Studies and Comparative Literature; "Green Chemistry," led by Gary W. Brudvig, Eugene Higgins Professor of Chemistry and Professor of Molecular Biophysics and Biochemistry; "The Rise, Fall, and Rise Again of the Civil Rights Movement," led by Robert A. Burt, Alexander M. Bickel Professor of Law; "Shakespeare and Human Character," led by Paul H. Fry, William Lampson Professor of English; "The Sound of Words: An Introduction to Poetry," led by Langdon L. Hammer, Professor of English and of American Studies; "The Brain in Health and Disease," led by W. Mark Saltzman, Goizueta Foundation Professor of Chemical and Biomedical Engineering; and "Energy, Climate, Environment," led by John P. Wargo, Professor of Environmental Risk Analysis and Policy.

The twin purposes of the program were to acquaint public school teachers with the Teachers Institute approach to high-quality professional development, and to cultivate

their leadership in either creating or sustaining such an Institute. Each participating teacher wrote a curriculum unit to teach his or her students what they had learned, to share with teachers in their school district, and to disseminate to other teachers internationally over the Internet. The units contain five elements: objectives, teaching strategies, sample lessons and classroom activities, lists of resources for teachers and students, and an appendix on the district standards the unit implements. The curriculum units National Fellows wrote are their own; they are presented in seven volumes, one for each seminar.

The Yale-New Haven Teachers Institute is a permanently endowed unit of Yale University, which undertook the National Initiative in 2004. The material presented here does not necessarily reflect the views of the funding agencies.

James R. Vivian

New Haven

September 2009

I. Storytelling around the Globe

Introduction

For many, perhaps most, children, public education begins before they can talk, when they are taken to the local library for "story hour." Many experiences adults look back on nostalgically no longer attract young people, but stories and story-telling seem to be holding up just fine. We tell children stories at bedtime; later they will pride themselves on being good storytellers. Storytelling grabs and holds the attention of those who come in earshot. No wonder it is often used to carry a message (as in allegory, homily, or parable) and it always carries a point of view. For every story may concern characters in a sequence of events (what is narrated) but only as organized and related, presumably by someone (the narrator). All of us in the Yale seminar agreed on the value of getting students to recognize, and begin to control narrative. Such understanding makes for active participation in listening to or viewing stories, and it surely helps anyone trying to tell a story just right. Unlike many other school topics, it shouldn't be so difficult to cajole students into putting effort into acquiring a sense of how stories work. Identifying the elements of a story must be more gratifying than analyzing other kinds of structures, because stories are so common. Students may not leap at the chance to learn, for instance, to speak correctly (ask anyone who teaches syntax or diction), but most would love to be skilled storytellers. And this counts for students of all ages and abilities. Teachers can get them to look for stories everywhere: in family histories told at the table, in playground bragging, in newspaper accounts of events, as well as tucked inside sermons they are forced to hear when delivered by parents or preachers. Discovering stories all around them, students can be taught to identify their prominent features: characters, settings, a sequence of related events that rises to a climax and concludes consequentially. We customarily categorize stories that have similar styles or subject matter. In our seminar we enjoyed cataloguing such types as myth, legend, epic, satire, folktale, short story, novel, and so on. Each of these can be further broken down, each category implying a different function that stories serve in a culture.

In fact it was those "different functions" that took up most of our attention, as we went looking for types of stories in cultures far-flung from the urban USA. Our students need to know that their neighborhood is not the only world on the globe. What kinds of stories are told in Ireland, West Africa, Japan, France, China, or Iran? Learning this does more than help decenter the USA; it encourages looking at the world from very different perspectives. For stories populate worlds and do so from perspectives. What are the concerns of children in Iran, for instance, and how are those concerns treated and valued? Stories open up different worlds as well as different ways of valuing the world. What we found, of course, was that these differences are often not so far-reaching after all. There are plenty of universals in the way stories are told because so much of human experience is common to us all. The interplay between similarities and differences in the stories we encountered makes for powerful teaching material.

Most of the stories we took up came to us through foreign films. It's not always an easy matter to locate appropriate stories in prose from other cultures; but the industry of foreign film distribution through film festivals and DVDs makes for a fantastic reservoir of stories that are available and about which one can learn a great deal. So our seminar became a forum for film analysis and criticism. In the units written for the seminar, most Fellows took up the challenge of incorporating films into their strategies and often into their objectives. Even those whose units focus on written or spoken tales were able to clarify their ideas about narratives and narration in our discussion of the films. It seems that films can be both attractive to students and can serve as terrific tools in helping them locate elements of stories. Even better, they provide images of those "worlds" that are laid out in filmed stories coming from elsewhere. We chose films that involved the lives of children, distinguishing those that seem told from a child's viewpoint, from others that were told by an adult narrator. And we looked into the special status of certain kinds of storytellers that some of our films either depicted literally or imitated. The African griot served as the example we spent most time on, in part because griots still tell (or sing) stories in contemporary Africa, and in part because their attitude toward the entire function of storytelling differs so markedly from the novelist we are used to in American culture, and in the West generally.

The units written for this seminar all combined questions about the nature of narrative with questions about the nature of other cultures. It's a great way to pair social inquiry and language arts making students travel to a world beyond their neighborhood and doing so in a vehicle (stories) that they live with all the time. This can only expand them. The cinema is a wonderful metaphor for this entire process for it projects stories for us while projecting us into the stories and the lives of the characters who make them up. It also lets us glimpse the source of light that makes this possible, the narrator or storyteller behind what we see. Language arts, as a subject, expands in the process. As happened in our seminar, everyone gains from attention to foreign stories. The results can be seen in units dealing not just with novels but also with art and social studies as subjects. More important the Fellows of this seminar were able to find new ways to engage their students in what counts more than subjects: the "expression" of language arts, the "creativity and freedom" of art, and the issues of "equality and respect" of social studies.

Dudley Andrew

Synopses of the Curriculum Units

2009.01.01
Using Stories and Film in the English Language Learner Classroom to Teach Immigration History, by Darlene Anaya

Immigration is a hotly debated topic in the United States, the"melting pot." It is reported in the media and discussed in legislatures and on street corners. In classrooms teachers fret about how to teach the newest immigrants. English Language Learners are a major component in the American classroom.

There is a developing area of pedagogy that makes content and language accessible to English Language Learners. This curriculum unit includes five lesson plans that are interdisciplinary and that include hands on, visual activities. Cinema and stories are powerful tools with which students can identify and learn. Along with mapping exercises and graphic organizers, they can be transferred to other content topics.

The curriculum unit also addresses equity, social justice, and accountability, for all children have the right to a rewarding education that prepares them for college and/or career. It addresses the achievement gap that leaves many students behind. A well educated populace is critical to the progress of our nation. Equity should be the third prong of content and pedagogy, though it is beyond the standards.

(Developed for History and Social Studies, grades 10-11, and Spanish Primary Language Arts, grade 9; recommended for History and Social Studies and Spanish Primary Language Arts, Middle and High School grades)

2009.01.02
Lo “real maravilloso” y el cine, by Maria Cardalliaguet Gómez-Málaga

As a result of the Lo "real maravilloso" y el cine curriculum unit, designed for high school Spanish 4 classes, students will learn about Latin American literature, so as to be able to appreciate and ultimately to read, understand, analyze, and interpret short stories or novel excerpts written by authors such as Gabriel García Márquez, Juan Rulfo, Isabel Allende and Laura Esquivel. They will also learn to compare them to some of their adaptations on the screen. They will learn basic notions of film studies, as well as how to watch, interpret and analyze movies by making connections and comparisons with the original text, involving questions of point of view, who the narrator is, what tone is taken, etc.

Most of the class activities for this unit will be conducted in Spanish, but English will be used when necessary. With proper modifications, the unit could also be taught in Spanish

3, Spanish 5 or in Advanced Placement Spanish Language and/or Advance Placement Spanish Literature.

(Developed for Spanish IV, grades 11-12; recommended for Spanish IV, AP Spanish Language and Literature, grades 9-12)

2009.01.03
A.VOID: Who Are the Poor People? How Environment Impacts the Development of Character, by Jill Spaulding

This unit is designed to engage students in a study of characters living in poverty in the United States, Latin America, and the Middle East. This unit focuses on building reading comprehension and inferencing skills through the use of film in direct teacher modeling and Literature Circles which incorporate all three cultures. Students will have the opportunity to learn about the designated culture, its manifestation of poverty, and watch a film from that culture illustrating characters living in those conditions. Students will then analyze characters for tone, mood, actions, and thoughts in a novel of at their appropriate Lexile level for growth and challenge. The end assessment of this unit is a choice by the student of a 1) Character Diary, 2) Podcast Interview, or 3) Character Board Game.

(Developed for Language Arts, grade 6; recommended for Language Arts and English, grades 6-8)

2009.01.04
Cinderella: A Cross-cultural Story, by Patricia Kite

What makes a good story, especially one that has been adapted by almost every culture in the world? I developed this unit for my third grade language arts class to teach the concept of story using story elements, the attributes of a fairy tale, and the cultural influence on a story. It is designed to last four weeks, 75 minutes each day. The unit could also be used in lower or upper elementary grades. My overall strategy in designing this curriculum unit is to use three Cinderella stories from three different cultures (Iran, China, and Africa) as a basis for cooperative learning, partner learning, individual learning, and teacher-directed learning. There will be five activities for each story: 1) compare and contrast the three different cultures, 2) map each story's elements, 3) identify the attributes of a fairy tale in each story, 4) journal writing response to a guest visit, 5) examine a different point of view in each story. As a culminating activity, my students will apply the three concepts of the unit in writing a Cinderella version of their own set in modern America.

(Developed for English and Social Sciences, grade 3; recommended for English and Social Sciences, grades 2-4)

2009.01.05
SHAZAM! Exploring Superhero Comics to Study Character Origin and Creative Writing, by Karlene McGowen

When we look at the word "superhero" our minds go to supernatural powers and larger-than-life characters. We instantly think of Superman, Batman, or Spider-Man, to name a few. These are characters that are universally known by young and old, foreign and domestic. Hollywood has recently had an influx of films based on comic book heroes. These movies are generating millions in revenue both domestically and in the foreign markets. In addition to Superman, Batman, and Spider-Man other comic superheroes have taken to the big screen. Characters such as Iron Man, Wolverine, and Incredible Hulk have gained wide popularity with movie audiences. Whatever the reason may be, the comic book superhero is someone that we are all familiar with. It is this notion that is explored in this curriculum unit.

This unit is designed for an eighth grade language arts classroom. The key objectives for this unit include sequencing, origin studies, character development, and creative writing. Although this unit is designed to work within the reading/writing workshop format it certainly can be tailored for standard instruction classrooms as well.

(Developed for Literacy, grade 8; recommended for Language Arts and English, grades 6-8)

2009.01.06
Interpreting Vietnam: War Stories and Film, by Kate Reber

This is a unit on Vietnam War stories and films. The unit will be taught in the English half of an integrated American Literature and American History class for 11th grade students. Our literary study will focus on Tim O'Brien's *The Things They Carried* and will be complemented by a more in-depth historical study of the Vietnam War and America in the 1960s and 1970s. In addition to clips from documentaries, studies of war photography, and examples of oral histories, this unit's other central pieces are films. I have chosen to focus on four films (*The Green Berets, Platoon, The Abandoned Field,* and *White Badge*) that view the war from a variety of perspectives to both broaden my students' understanding of the war's context and deepen their empathy for others' experiences of these events. The films, texts and activities included in this unit will coincide with our reading of the book. It is my intention that this unit could be adapted to use in a traditional English or American History course.

(Developed for English III and American Literature, grade 11; recommended for English and American History, grades 10-12)

2009.01.07
A Study of Oral Tradition: Storytelling in Ireland, West Africa and Japan, by Nicole Schubert

This unit is a study of the tradition of oral storytelling in West Africa, Ireland and Japan, and will focus on legends and epic tales. Instead of reading two legends, we will study two films, *The Secret of Roan Inish* and *Into the West*, both examples of Irish legends. These films beautifully illustrate how a legend is passed down from one generation to the next and introduces the mysterious people and places of which legends are made. The study of epic tales will come next, with a lot of time spent examining the role of the storytellers, the *griot* of West Africa, the *fili* of Ireland, and the Biwa recitations of Japan. These storytellers communicated these stories for hundreds oft years and in West Africa and Japan, the practice of oral storytelling has not shifted much over time. I have chosen the theme of "Origins" for this unit because my overarching goal is for students to understand how the culturally significance oral tradition is in these three regions of the world and to study the elements of legends and epics. The epic tales we will study are Sundiata (West Africa), *Tain Bo Cualnge* (Ireland), and *The Heike Monogatari* (Japan).

(Developed for Language Arts, grade 8, recommended for Language Arts, grades 6-8)

2009.01.08
Keeping the Tradition of African Storytelling Alive, by Octavia Utley

This curriculum unit will be implemented in a 3rd-5th grade classroom with students who have diverse learning needs and ways of learning. I intend to enhance students' knowledge and appreciation of African storytelling through West African folktales and film. The literary focus will be on animal trickster tales, which include animal tricksters with human habits, beliefs, and weaknesses. Students will be prompted to further their knowledge of African storytelling by viewing three African films, *Abouna, Keita: The Heritage of the Griot*, and *Wend Kuuni*. The three-part lesson framework will be used to teach this unit during the reading period. The three-part lesson framework consists of a mini-lesson, student work period, and sharing. This unit will begin with a series of mini lessons on traditional African storytelling, storytelling in film, and the role of the African storyteller. By analyzing and examining a variety of animal trickster tales, students will recognize the distinctive narrative elements of African folktales. Students will be challenged to think about how to begin a story, how to create powerful characters, and how to quickly move incidents to a satisfying ending. This unit will offer students an opportunity to continue the tradition of African storytelling in the classroom.

(Developed for Reading, grades 3-5; recommended for Reading, grades 3-5)

2009.01.09
The Global Bildungsroman: A Film Study of Individual Identity and Integration into Society, by Elouise White-Beck

This four-week unit will address three short stories in the tenth grade English classroom whose themes will be extended through the additional study of three films from different cultures. The stories and corresponding films are: Kurt Vonnegut's "Harrison Bergeron" and Michael Cuesta's *12 and Holding* (USA), Doris Lessing's "No Witchcraft for Sale" and Mike Newell's *Into the West* (Ireland), and Sylvia Plath's "Initiation" and Fredi M. Murer's *Vitus* (Switzerland). The stories are all under the heading of The Individual and Society in the Pittsburgh Public Schools tenth grade curriculum and each story and film pair represents one of three prongs of that theme: identity, fidelity, or conformity. Methodology and activities can be adapted to other stories and films. Filmography including other choices is included for extended study or application to other grade levels and literature choices. All films are readily available through Netflix or online at very reasonable prices.

(Developed for English II, grade 10; recommended for English, grade 10)

2009.01.10
Movie Posters: Capturing the Essence of a Story, by Karen Yarnall

After participating in the "Storytelling around the World" seminar with Dudley Andrew, the R. Seldon Rose Professor of Film Studies and Comparative Literature at Yale, I have created a cross-curricular unit that combines the study of storytelling in films and literature with the art of movie poster illustration.

Students will analyze and evaluate trailers (film previews that are snippets or tiny narratives) and movie posters using the narratology, filmmaking and art knowledge that they will be learning as we progress through the unit. Trailers and movie posters both share the goal of enticing viewers to see the films they represent. Thanks to the internet, these can be easily viewed in the classroom. To produce a greater sensitivity and understanding of storytelling traditions and cultures that differ from their own, students will explore foreign films along with more traditional Hollywood fare. After students have experimented with different art media and techniques, they will each create an effective movie poster from a film of their choice. These will be displayed in an art show for the community at the end of the unit.

(Developed for Advanced Drawing, grades 10-12; recommended for 2D Art Courses, Drawing, and Painting, grades 9-12 and can be adapted to Middle School)

II. The Rise, Fall, and Rise Again of the Civil Rights Movement

Introduction

The election of Barack Obama as our first African-American president signified some considerable success for the goals of the Second Reconstruction just as the election of Rutherford B. Hayes in 1877 signified the abandonment of the First Reconstruction. The goal of this seminar was to understand the interactions between legal institutions (both national and state) and popular movements (both among whites and blacks) that led to failure and the effective re-enslavement of African-Americans in the first instance and success (in the sense of the end of legally enforced segregation and the empowerment of African-Americans in the political process) in the second instance. We repeatedly asked ourselves, what were the differences that led to failure of the First Reconstruction and success, such as it has been, in the Second? Our primary focus was on the African-American Civil Rights Movement — a focus reflected in the curriculum units prepared by Kyle Beckham, Marlene Cabiness, Mary Ann Caruso, Artnelson Concordia, Lynn Pleveich, and Adam Kubey.

We also more briefly explored three other contexts: the modern claims for equal rights of women, gays and lesbians, and Hispanic and Asian ethnic minorities. In two of these contexts — women and gays/lesbians — the claims followed the same pattern of the Second Reconstruction: that is, reliance on the courts in enunciating constitutional rights and political mobilization through popular protest movements. In the third context — the status of Hispanic and Asian minorities — there has been, relatively speaking, much less reform-minded effort directed at courts or popular protests. Our consideration of these three contexts helped us distill lessons about the general effectiveness for advancing minority rights of the strategy laid down in the civil rights struggles by and on behalf of African-Americans. The curriculum units prepared by Joseph Corsetti on the rights of gays and lesbians, by Deborah Fetzer on the campaign for women's suffrage, and by Meredith Tilp on Hispanic identify reflected this aspect of our seminar.

The ambitious agenda for our seminar sessions inevitably meant that we skimmed only over the surface of extraordinarily complex events in attempting to distill comparative lessons from different historical eras regarding different minority groups. The curriculum units prepared by the seminar Fellows gave much more detailed attention to specific topics related to the broad themes that we discussed together.

Robert A. Burt

Synopses of the Curriculum Units

2009.02.01
Competing Paths of Struggle: African American Resistance to White Oppression, 1863-1896, by Kyle Beckham

This unit deals with African American history during Reconstruction. Using a model of oppression and resistance, it explores the wide array of obstacles African Americans faced, and the specific strategies of resistance that they used, to challenge those obstacles. Though it covers a very short time period, this unit should provide students with a firm understanding of historical agency, American legal structure and history as well as a new set of vocabulary and analytical frameworks that they can apply the examination of other groups. Ideally it will challenge them to look at the struggles of African Americans in a new light, one that will empower them to examine and change their own communities.

(Developed for U.S. Humanities, grades 10-12; recommended for U.S. History and American Government, grades 10-12)

2009.02.02
The Audacity of Hope for a Hopeless Generation, by Marlene Cabiness

Today's students appear to lack vision, motivation and aspiration. Society has given labels to those who fail to maintain a certain quality of life and families may have succumbed to these labels. Such labels include, but are not limited to, single-parent homes, male students with learning disabilities, teenage pregnancy, violence, inner city living, etc. Many of these diagnoses are not really disabilities, but a result of the lack of resources necessary to educate the whole child.

With regards to this unit, its primary focus is to build life skills and identify self-esteem issues in students. Although the core is on low achieving African American boys, in many special education classrooms girls, too, face similar challenges. Therefore, the lessons apply to both sexes. Once their skill deficits are identified, students will be able to focus on rebuilding their needs and trust. Students will begin with several questions. 1) What do you see your life like in ten years? 2) What do you want your life to be like in ten years? 3) What is getting in the way? The need to explore concrete steps to turn their wishes into reality is the focal point of the lesson.

(Developed for U.S. History, grade 11; recommended for History and Language Arts, grades 9-12)

2009.02.03
Turning Hope into Reality, by Mary Caruso

Although my students are very excited about the election of President Obama, they have very little awareness of the Civil Rights struggle, the political process, and what they can do to make a difference. I plan to use my students' current interest and excitement surrounding Barack Obama to spark curiosity about the history of Civil Rights and motivate students to become involved in their communities.

My students are tenth through twelfth graders in an urban, non-traditional setting of 500-800 students. The students transfer to the school from the nineteen other high schools throughout the county-wide school district. This unit will be incorporated throughout the nine week course.

I plan to move students through a discussion of due process and equal protection rights, to a brief history of the Civil Rights Movement and the individuals involved, to general discussion about how citizens can and should participate in a democracy, and finally, to the actual planning and/or participating in a community activity. I will use Barack Obama's story and the stories of 1960's Civil Rights leaders to show continuity of the movement and to inspire and motivate the students to become involved in their communities.

(Developed for American Government and Civics, grades 9-12; recommended for American Government, Civics, and U.S. History, grades 9-12)

2009.02.04
The Great African/African-American Intellectual Tradition for Liberation: Resistance Past, Present and Beyond, by Artnelson Concordia

I see in teaching the history of Civil Rights, the opportunity to inspire my students to take the lessons from this period for their benefit by helping them uncover the symptomatic nature of their immediate problems as part of a larger system. Historical, structural and cultural reasons underlie many of the problems faced by my students. This provides an opportunity to free them from the burden of the narrative that their lack of performance is somehow intrinsic to their race.

In their exploration of Civil Rights history, they will see that the positive values of self-determination, sacrifice, responsibility to self and community, intellectual discipline, creativity, faith in humanity, resistance to oppression, love of life and commitment to justice, run deep and permeate the fight for civil rights. And as a result of this fight, all people are the beneficiaries of this rich legacy. As they enter broader society, I wish for these lessons to provide concrete, relevant and convincing arguments to move them to

reverse the tragic irony of self-destructive behavior and motivate them to excel academically.

(Developed for U.S. History, grade 11; recommended for U.S. History, grade 11)

2009.02.05
Analysis of the Obama Election: Will It Bring Rights and Representation for Minorities?, by Adam Kubey

Barack Obama is the 44th President of the United States. Now what? This unit, "Analysis of the Obama Election: Will it Bring Rights and Representation for Minorities?" is designed to analyze the state of our nation, society and government and address how Obama's election is a sign of our changing society's view of minorities. The unit will also look at the progress made since the 2008 election, and will ask students to predict how this administration might leave a lasting mark on minority populations.

This unit reflects the needs of my student body, as 99% of Kenwood Academy's students are classified as minorities. Kenwood Academy students were highly engaged in the 2008 election on many different levels. I was pleasantly surprised at the level of my students' interest and involvement, but I want them to delve deeper; analyzing the election's genesis and its role as a catalyst for "change."

This unit will create a thread that will be woven throughout other units taught this year. To introduce the class, I will have a "tapas" unit, or small units that will be expanded to full units. This small units share a common theme, minority rights and representation. The goal of the unit is to allow students to view the election from the perspective of those from different races, religions, gender, sexual orientations, geography, and languages. Looking at the election from alternate angles will allow students to gain a better understanding of the factors that formulate America's diverse electorate.

(Developed for AP U.S. Government, grades 10-12, and World Studies, grades 8-9; recommended for AP Government, U.S. Government, and U.S. History, grades 9-12, and Social Studies, grades 7-9)

2009.02.06
Civil Rights: Massive Assistance Resuscitated, by Lynn Pleveich

The unit is designed to teach fourth and fifth grade accelerated and gifted students in Richmond, Virginia the struggle that African Americans endured to gain equality. I plan to teach this unit over the course of the year with the intent of having students invest in their own learning, allowing them to understand how truly fortunate they are to be the recipients of a free public education. It is essential that the students can connect to the material covered and not as distant spectators. This is why I have decided to start with a

case close to home, Davis v. Prince Edward County Board of Education; one of the five cases consolidated in the Supreme Court's Brown verdict of 1954. The students will investigate what led to the student protest at Robert Russa Moton High School and the decision the Prince Edward Board of Supervisors made in response to the Brown verdict vowing to close the schools rather than integrate them, from 1959-1964.

The students will study the laws and major Supreme Court decisions that emerged from the Reconstruction Era through the 1960's. Students will use the constructivist approach to learning by using cognitive terminology such as analyze, predict, classify, reflect, synthesize. Differentiated instruction will provide avenues for the visual, auditory, and kinesthetic learners thus engaging all students in meaningful hands-on activities. The unit could certainly be modified and adapted for use in the upper grades.

(Developed for Gifted and Talented, grades 4-5; recommended for Virginia Studies, grade 4, Language Arts, grades 4-6, and U.S. History, grades 6-7)

2009.02.07
That's My Right, too: Punishment for Being Different, by Joseph Corsetti

Genuine legal equality: a simple phrase, but tied up in these three words is the impetus for the Gay Rights Movement for this is the very basis of democracy in the United States. Of course, the ultimate goal of any liberation movement would be social acceptance; but, ultimately, the Constitution can only protect the legal rights of the citizenry. However, the United States Government does not protect the rights of gays and lesbian, and in many ways, punishes and prevents this population form enjoying full equality. This unit will explore the five particular moments in the Gay Rights Crusade: the Stonewall Riots; Anita Bryant's Crusade; Decriminalization of Homosexuality; Don't Ask Don't Tell; and the battle for same-sex marriage. These moments have been chosen not because the represent the entire story of the Gay Rights campaign, but because the gay population was punished for their sexual orientation by an official government agency. In some cases, the government agency has made redress and this redress will be explored. In the end the overarching goal will be to have students explore the tension between government and the individual. This unit is primarily designed for 11th and 12th graders.

(Developed for Crime, Punishment, and Justice, grades 11-12; recommended for Civics and U.S. History, grades 11-12)

2009.02.08
Setbacks to Suffrage: Inquiry into the Process, by Deborah Fetzer

This unit focuses on the women's movement from 1848 to 1920. The foundation for this unit of study includes three major events: the First Women's Rights Convention, the 14th and 15th Amendments, and the 19th Amendment.

The constitutional history of the women's rights movement is a lost chapter in our history. Students will realize that while there is little reference to the struggle leading to the 19th Amendment, and women clearly have the right to vote, there remain issues around equality for women. Students will understand the consequences of perseverance in the face of adversity or oppression and they will come to understand what it means to have the courage of your convictions. It is by studying the past that we can clarify and better understand issues that face us today. Issues facing women today are some of the same issues that faced women in the 19th century; issues such as violence, job discrimination, pay difference, right to privacy, and connections to family. This unit provides direction for teachers as they help their students understand the women's movement from the 1840s to the 1920s and how this history impacts women today.

(Developed for U.S. History, grade 9; recommended for U.S. History, grades 8-12)

2009.02.09
Hispanic Identity: From Dreams to Civic Participation, by Meredith Tilp

The 2008 election of President Barack Obama provides the opportunity to look deeply at evolving civil rights in the United States, and to address the question: "Why Hispanics in the US have not achieved the same degree of success in the US as African-Americans?"

Phase one of this unit will explore the questions: "Who am I? Where did I come from and what is my cultural background?" We will read Dreams from My Father by Barack Obama. Using Dreams from My Father, we will decode his father's heritage and mother and grandparents' influence, and study his education and values.

In phase two, students will examine the topic of discrimination. Students will explore how change has come about slowly in the southwest for New Mexico citizens and Mexican immigrants. The cases of Hernandez v. Texas, the Lemon Grove incident "Tierra Amarilla" and the record of Senator David Chavez will be examined.

Phase three explores the resources, rationale and practice of community development and civic participation. Each student will research, evaluate and volunteer for 8 weeks in a community organization in Santa Fe. Students will do a project including writing a resume, seeking recommendations and writing a diary on their work.

(Developed for Government, Economics, and U.S, History, grades 11-12; recommended for Social Studies, Government, Economics, and U.S. History, grades 10-12)

III. Shakespeare and Human Character

Introduction

The Fellows in my 2008 seminar, "Race and Gender in Shakespeare," took a particular interest in Harold Bloom's *Shakespeare and the Invention of the Human*, especially in the way that Shakespeare according to Bloom makes consciousness in certain characters (Hamlet, Falstaff, Rosalind, Cleopatra, Edmund) register the capacity to change. On hearing for example that Goneril and Regan have gone to their deaths competing for his favors, the dying Edmund reflects, "Yet Edmund was beloved," and orders — too late — a reprieve from death for Cordelia. Bloom argues that this sort of discovery through introspection is something crucial and new in the history of human self-understanding. The Fellows' interest in this claim prompted the topic of the 2009 seminar. With this emphasis in mind, this summer's Fellows studied *Hamlet, Henry IV Part I, Henry V, Julius Caesar, Antony and Cleopatra*, and *King Lear*. It proved a worthwhile guiding thread, as whatever other kinds of focus their classroom situations required, their presentation of Shakespeare necessarily passed through considerations of character (you can't get around character because Shakespeare does not follow Aristotle's subordination of character to plot), and all their curriculum units very naturally focused on this issue.

Three Fellows teaching at the high school level directly address aspects of characterization. Amanda Stefanski's unit is premised on the fact that theatre, unlike narrative fiction, is obliged to use the devices of "indirect characterization," especially the revelation of character through speech: what do certain speeches in *Macbeth* tell us about the characters who utter them, and what — as a cautionary note — do our own speeches reveal about ourselves? Aleco Julius draws on the sociology of Erving Goffman to consider character, also in *Macbeth*, as a matter of "performance" at three levels: the characters' self-presentation to self and others; the actor's interpretive presentation of the character; and the actualization of the performance in the minds of readers or audience members. Janelle Price, preparing her students to compose brief sequels to *King Lear*, emphasizes what one might call "inference from character": How can we imagine Cordelia (in the "happy ending" of Nahum Tate, or if we imagine Lear to have correctly seen her breath on the mirror), Albany, Edgar, Kent, France, the Fool, or any other survivor to behave if we put them in a new setting, given what we know about them already?

Two Fellows work with students for whom learning English as a second language is the ultimate goal: Spanish-speaking middle school students and Chinese-speaking fifth and sixth graders, respectively. Both of these teachers necessarily "scaffold" their approach to Shakespeare, starting with graphic versions, continuing through parts of the No Fear editions, and arriving finally at certain speeches or passages in the original. Barbara Prillaman is eager to return to Shakespeare, having been gratified to see how well her

students, with whom she works for two years, took to such seemingly remote material. She has distinguished nine aspects of characterization that she wishes her students to recognize and discuss, especially in relation to *Hamlet* and *Julius Caesar*. Lisa Ernst asks her students to imagine what *Romeo and Juliet* and *A Midsummer Night's Dream* would be like with text messaging (suppose Juliet had texted Romeo, "Fak'n death"?), and develops an across-the-curriculum unit in which the organizing idea is "communication."

Three Fellows consider character in relation to historical and social issues. Terri Blackman is actually teaching social studies to middle school students, and wishes to focus on "leadership" in the Roman plays *Julius Caesar* and *Antony and Cleopatra*, comparing the main characters in those plays with the personages described in her students' history textbooks. Through this strategy she identifies aspects of leadership that are suitable or risky for various forms of government, including the social dynamic affecting the students themselves. Jane Hall wants her high school-level unit to appeal to students from broken or dysfunctional families, so she will focus on mistakes made by single parents and on sibling hostility in *King Lear* — an approach that will effectively organize all the pivotal events and characterizations in the play. Barbara Dowdall finally honors the namesake of her high school, Asa Philip Randolph, an amateur actor as well as social activist, by teaching a unit encouraging research projects on the history of acting Shakespeare by African Americans. Her unit combines this historical work with reflections on race and racial attitudes in *Othello* and *The Merchant of Venice*.

Paul H. Fry

Synopses of the Curriculum Units

2009.03.01
That Lady is Loca! or Speech as the Main Method of Characterization in Shakespeare's Plays, by Amanda Stefanski

The 2008 election of President Barack Obama provides the opportunity to look deeply at evolving civil rights in the United States, and to address the question: "Why Hispanics in the US have not achieved the same degree of success in the US as African-Americans?"

Phase one of this unit will explore the questions: "Who am I? Where did I come from and what is my cultural background?" We will read Dreams from My Father by Barack Obama. Using Dreams from My Father, we will decode his father's heritage and mother and grandparents' influence, and study his education and values.

In phase two, students will examine the topic of discrimination. Students will explore how change has come about slowly in the southwest for New Mexico citizens and Mexican immigrants. The cases of Hernandez v. Texas, the Lemon Grove incident "Tierra Amarilla" and the record of Senator David Chavez will be examined.

Phase three explores the resources, rationale and practice of community development and civic participation. Each student will research, evaluate and volunteer for 8 weeks in a community organization in Santa Fe. Students will do a project including writing a resume, seeking recommendations and writing a diary on their work.

(Developed for Government, Economics, and U.S, History, grades 11-12; recommended for Social Studies, Government, Economics, and U.S. History, grades 10-12)

2009.03.02
"Life's But a Poor Player:" Macbeth and Performing Ourselves, by Aleco Julius

Shakespeare's great tragedy *Macbeth* is a very appealing work for young people to study. It involves ambition, deceit, violence, and elements of the supernatural, while posing questions and problems that young people will be eager to discuss and connect to. This curriculum unit presents a framework for which to study this remarkable play, called the Performance Triangle. This threefold paradigm is a graphic representation of what Shakespeare makes us aware of in his work: the complex concept of performance. First, there is the everyday performance of the self that each reader/audience member engages in. Secondly, there is the performance of the actor, who must take on a role while interpreting the text. Lastly, there are the performances of the characters within the play, who present their own multiple selves to the other characters.

Through close reading strategies such as staged readings, annotation, and guided discussion, students will use this performance triangle to come to an understanding of how Shakespeare comments on the multifaceted concept of performance— in the play and in our own lives. The unit also includes intensive writing, culminating in an essay that draws upon the entire unit's study of *Macbeth*.

(Developed for AP Literature and Composition, grade 12; recommended for AP Literature and Composition, grade 12, and World Literature and British Literature, grade 11)

2009.03.03
King Lear, Part II--It's All About the Play, by Janelle Price

In this unit, middle school students will use a myriad of scaffolding activities to read Shakespeare's *The Tragedy of King Lear* and write a one-act sequel using plausible plot threads from the play. To aid in teaching this unit, numerous strategies and methods are included such as: basic understanding of the play, its history of being rewritten and Shakespeare's original work not being seen by audiences for almost 150 years, comparisons between Shakespeare's and the rewritten version, Freytag pyramid analysis, discussion of themes, motifs, and symbols, Aristotle's definition of tragedy from the Poetics as it applies to the play, the influence of the Great Chain of Being, rhetorical and blocking exercises, playwriting tips, differentiation cues, and suggested activities to further aid in student comprehension and playwriting.

(Developed for Communications, grades 6-8; recommended for Creative Writing, grades 6-12, Communications, grades 6-8, and English I-IV, grades 9-12)

2009.03.04
Getting to Know Shakespeare's Characters, by Barbara Prillaman

In this unit, students will focus on what we have learned in the past about a character's identity and apply it to the new information that we will acquire in the proposed unit, giving them a strong foundation for comprehending Shakespeare's works as well as the art of characterization. The focus will be on developing the important ability to analyze characters in literature. Students will be required to analyze some of the most famous and complex characters in three of Shakespeare's plays - *Hamlet, Julius Caesar,* and *King Lear*. Analyzing characters and the role they play in developing a plot helps to provide insight in to and better understand the stories one reads. An analysis should involve a detailed examination of all aspects of the character, including but not limited to: traits, features, and, motivation. This analysis will be aided by a special graphic organizer that was created for this unit.

(Developed for English Language Learners, English Language Arts, grades 6-8 combined class; recommended for English Language Learners and Struggling Readings, Middle and High School grades)

2009.03.05
Shakespeare on the Cell Phone: Texting Romance, by Lisa Ernst

2BONT2B? That is the question. This message is better known as," To be or not to be"; from William Shakespeare's *Hamlet*, written around 1600. It is considered to be one of the most famous quotations in world literature and the best known of this play. The form of language, 2BONT2B is better known as text messaging, or instant messaging. On any given day, or place, one can see children with their cell phones sending messages. The messages could be, Can you meet me? What day is our math test? As we witness this transformation, we know that there are and have been many types of communication: talking on the phone, writing a letter, talking one on one, twittering, signing, blogging or emailing on a computer.

But what does that have to do with Shakespeare? Presently, text messaging has become a worldwide form of communication for our students. Teachers need to embrace this new form of technology. In what better way can a teacher bring the words of Shakespeare and the tech-language of 21st century learners together than through an aspect of life that begins to preoccupy many students by the sixth grade—romance in the lives of young people? This unit is called "Shakespeare on the Cell Phone: Texting Romance".

When reading and discussing *Romeo and Juliet* and *A Midsummer's Night Dream*, the sixth grade students have the opportunity to be introduced to Shakespeare. At Alice Fong Yu, the students learn Chinese as a first language. The language that is used is Cantonese with eight tones. As the students are educated in reading, writing and the speaking of Cantonese, they are also at the same time learning English. This unit also gives the students the opportunity to use the visual arts to apply their understanding and comprehension of the plays. The main purpose of the unit is to strengthen student's comfort level reading Shakespeare as well as to enhance their skills and confidence in writing essays with good sentence structure, learning the elements of a story, word usage, and reading comprehension through text messaging.

(Developed for Language Arts, grade 6; recommended for Language Arts, grades 5-8)

2009.03.06
"A Tide in the Affairs of Men": Looking at Leadership in Shakespeare's Roman Plays, by Terri Blackman

A leader needs to know what to do and when. It is essential that today's students, who will become the productive citizens of tomorrow, learn to evaluate public figures,

policymakers, and leaders. History provides examples, but we find more engaging lessons from a discerning master of human character: William Shakespeare. We find a wide range of leadership models in many of his plays, notably in the Roman Plays: *Julius Caesar* and *Antony and Cleopatra*.

This unit, embedded in a larger study of ancient Rome, was designed primarily for sixth grade as part of a yearlong theme of leadership. While there are research and writing components to the unit, the core elements are discussion and debate through Socratic seminar. *Julius Caesar* and *Antony and Cleopatra* present leaders who exhibit characteristics affecting the outcomes of their projects. Students identify these characteristics, determine how they affect the results of the action, and theorize the results of a different outcome. They pinpoint passages that reveal good or bad leadership and perform those scenes, along with scenes rewritten to show an alternate outcome. Peripheral goals include health and wellness. Identifying the traits that constitute a positive leader can affect the personal choices that children make.

(Developed for Social Studies, grade 6; recommended for Social Studies, World History, Language Arts, Reading Comprehension, and Expository Writing, grade 6, and can be adapted higher)

2009.03.07
Single Parenting and Family Dynamics Then and Now: King Lear, by Jane Hall

The three thousand students who attend Westside High School in Houston, Texas study a work attributed to William Shakespeare for three years of their four-year tenure. As AP senior students, they will be responsible for three Shakespearean tragedies: *Macbeth, Hamlet*, and *King Lear*. This unit will use elements of Lear's and Gloucester's filial relationships in what we today call a single parent environment, so students can identify with specific issues they confront in their daily lives. By recognizing Lear's and Gloucester's familial situations as single fathers, students can easily compare how, in our current environment, the many students who reside within a single parent household live in conditions that are not much different those in Shakespeare's day that are depicted in King Lear. The interactions siblings experience among each other and their extended families will also be visited in this unit by studying Lear's and Gloucester's families and comparing/ contrasting students' family dynamics.

All of the three thousand students attending Westside — or any high school in the state of Texas — are exposed to various works of the Bard during their tenure: freshmen romance their way through *Romeo and Juliet*, sophomores clash with *Julius Caesar*, prep/grade level seniors muddle through Macbeth, and Advanced Placement seniors are immersed in *Macbeth*, *Hamlet* and *King Lear*. Westside's demographic includes approximately 30% African American, 30% Caucasian, 30% Hispanic, and 10% Asian/ Pacific Islander/Middle Eastern students. The school's classes consist of full inclusion for Special

Education and 504-designated students; lessons and assessments for these students must have appropriate modifications or accommodations. Although this unit will be directed toward Advanced Placement English Literature and Composition students, it can certainly be adapted to address students in regular grade level classes, including those who are classified as Special Education or 504.

(Developed for AP English Literature, grade 12; recommended for English IV and AP English Literature, grade 12)

2009.03.08
African Americans and Shakespeare: Partners in Search of Humanity, by Barbara Dowdall

Unbeknownst to the vast majority of average Americans — and certainly to average high school students — is the fact that a long and distinguished roster of African American actors, professional and amateur, embraced the language and characters of William Shakespeare, audaciously challenging a society that denied both their humanity and intellectual abilities. The wealth of material, both printed and electronic, that is available for research in these lives, dating back to the early 19th century career of the black actor Ira Aldridge, can stimulate student interest both in American social and literary history and in the Bard of Avon himself. High school students will study the narratives of *Othello* and *The Merchant of Venice* — plays presciently modern in depicting individuals cast as 'other' — analyze speeches that bring these characters to life and evaluate how these roles evolved through the ages. Student performance of key scenes and soliloquies, the display of timelines exhibiting the interplay between actors' lives and African American history, and published poster or mini-book biographies of the actors will serve as assessment.

(Developed for English II, grade 10, English IV and AP English Literature, grade 12; recommended for English, grades 10-12)

IV. The Sound of Words: An Introduction to Poetry

Introduction

Our seminar used a focus on sound as a way to approach poetry. In poetry, sound is a primary organizational principle: rhythm, rhyme, alliteration - these and a host of other "sound effects" structure poetry, and set it apart from other kinds of language use. Poetry can be a daunting subject in the classroom, because it is difficult to say what it means, and students shy away from it under the pressure to unlock its meaning. But a focus on sound postpones the question of meaning. It presents poetry as a medium of expression. It makes poetry available to anyone who can learn to listen, or to memorize and recite; and these skills can provide a basis for students to develop skills of writing and speaking — as well as interpretation.

To focus on sound is to focus on something essential about poetry, then. But we can turn this around and see poetry as a way to learn something about sound and the essential role it plays in communication generally. We de-materialize language when we look to it for a message. But language is always a material form. We apprehend it through our senses. Sound reminds us of the primacy of the material, of the sensory, in language. In poetry it is impossible to isolate content from form, or message from medium. This is true of communication generally, but poetry foregrounds it as a principle; and studying poetry helps students at every level of school to integrate these different dimensions of language.

Poetry is an archaic form, the most ancient of literary kinds; its patterns of sound, its structures of repetition, refer us to the earliest literary forms in culture, and to the basis of the literary and of literacy itself in orality. The primacy of sound in poetry also returns to the early history of the individual: to the experience of language acquisition, when we struggle out of infancy into speech, learning to form meaningful sounds with the muscles of our mouths, and to our first experiences of patterned language in nursery rhymes, schoolyard chants, song, or readings of scripture.

Our seminar explored these aspects of sound in poetry. We began by reading and discussing modern and contemporary poems written in Anglo-Saxon alliterative meter in order to learn to hear accent and alliteration. To the accentual scheme of Anglo-Saxon poetry, we added nursery rhymes — a prosody based on accent and rhyme — and some popular song forms. We explored basic principles of lineation and rhythm — in free verse poems by Whitman and Elizabeth Bishop — and moved from there to accentual-syllabic meter, with Robert Frost's "Mending Wall" as a model.

With Frost as a guide, but now as a theorist as much as a poet, we explored the concept of "tone" in poetry. We discussed Frost's notions of the "Vocal Imagination" and the "Imaginary Ear," and his definition of "the sound of sense." These topics lead us toward a

working definition of "voice" in poetry, which we brought to the interpretation of contemporary dramatic monologues by Suzi Kwock-Kim and Louise GlÃƒÂ¼ck.

We studied the patterning of blues poems by Langston Hughes, and the use of rhyme — and ideas about rhyme — in Alexander Pope's "An Essay on Criticism" and Thom Gunn's "The Man with Night Sweats." Pope and Gunn both play with notions of "imitative form": rhymes — and more generally sounds — that imitate the sense of what is being said. We turned this idea on its head with poems by Sylvia Plath and Frederick Seidel and the lyrics of contemporary rappers like Microphone Rakim, in which we saw how sound sometimes takes the lead and generates sense. This lead us to children's poetry and the pleasures of nonsense, with May Swenson's inventive poems as a model, including her poem made out of spoonerisms, "A Nosty Fright," and Wallace Stevens's "The Man on the Dump."

Throughout the seminar, we mixed discussion of these texts and concepts with reflection on classroom teaching. We also had time for reading aloud, individually and collectively, and hands-on, practical play with words. For example, we practiced turning prose into poetry by taking a passage of prose and introducing line breaks. We composed poems collectively. We got the hang of hearing metrical patterns by analyzing the patterns of stressed and unstressed syllables in our names.

In response, the Fellows produced the remarkable curriculum units that follow. They demonstrated the usefulness and interest of sound in poetry by bringing the ideas and exercises of our seminar to bear on a notably wide range of classroom subjects and situations: the teaching of reading in first grade, Spanish as a second language for high school students, English as a second language for Spanish-speaking students, a course on public speaking in business at a vocational-technical high school, inner-city high school English classes, a class for gifted eighth-graders, and AP English in several different settings.

Holly Banning was our first-grade teacher. Her unit draws on the oral roots of poetry as a way to help students move from an oral experience of language, focused on speaking and listening, to basic reading and writing skills, in the process heightening young children's sensitivity to sound and pattern in all verbal communication. Working with AP English students, Marva Hutchinson identifies a new, crucial problem in her classroom: the difficulty students have defining and describing tone in writing. She has designed a curriculum unit meant to redress this lack by helping students develop their auditory imagination through the study of poetry.

Bonnee Breese uses poetry's oral roots in another way: to draw her largely African-American student body into the study of literature and the refinement of verbal expression by focusing on oral traditions in African diaspora performance and writing,

both in the United States and the Caribbean, emphasizing recitation and choral reading in the classroom. In her AP English classroom in Chicago, Andrea Kulas accomplishes something related: her unit uses the sounds of rap and new forms of hip-hop, such as the "mash-up," to develop students' sensitivity to sound in language, and to introduce them to sophisticated literary concepts such as tone and allusion, as well as questions of intellectual property, originality, and literary value.

Thelma Uzeta, who remembers first encountering poetry through the Spanish verses and songs of her mother, teaches Spanish as a second language in high school; she has designed a unit which uses memorization and recitation of poetry and song to help teach students Spanish pronunciation, something of the history of Spanish poetry, and with it, important lessons in cultural style and tradition. Martha Margarita Tamez, who is herself a poet, teaches English to Spanish-speaking middle-school students in a low-income urban environment. Her unit invites students to experience the excitement and pleasures of verbal expression, in literature and in the everyday life around them, and seeks to instill in them an interest in the literary devices through which writers create their effects.

Business students do not ordinarily encounter poetry in their studies, but Nicole Dobbs has designed an exciting curriculum unit intended to enhance the confidence and verbal sophistication of her students by introducing them to poetry and poetic pattern through memorization and recitation, as a basis for effective public speaking. Cheree Charmello, working with gifted eighth-graders with a wide range of backgrounds, uses poetry as a bridge "from familiar sounds — such as those created in nursery rhymes — to the often inconspicuous pattern of sounds in free verse," drawing on students' "prior, and possibly untapped knowledge" of verbal pattern, to create a foundation for higher-level reading and interpretation of literature.

Jeanette Gibson foregrounds poetry in her teaching of American literature to high school students as a way to strengthen students' listening, speaking, reading, and writing skills in all literary students, helping them, in particular, "to find the joy of language through poetry." Her concentration on Walt Whitman, Claude McKay, and Robert Frost gives focus to her curriculum, as well as exciting cultural and aesthetic diversity. Melissa Dailey makes the most of a special classroom setting at the Sound School, a high school on Long Island Sound, by introducing her AP students to the long tradition of the poetry of the sea, reaching back to Homer, including sea shanties and other forms of song, and contemporary poems. But the example of her unit invites all teachers to be attentative to the sounds in and outside their particular classrooms, and to integrate them in their teaching of language arts.

Langdon L. Hammer

Synopses of the Curriculum Units

2009.04.01
Embracing the Frumious Bandersnatch: Sound, Rhyme, and Nonsense in Poetry for Young Children, by Holly Banning

I developed this unit, "Embracing the Frumious Bandersnatch: Sound, Rhyme, and Nonsense in Poetry for Young Children," for my first grade class as an adjunct to the language arts program. This introduction to poetry foregrounds the elements of sound, rhyme, and nonsense while appealing to the lively, spontaneous, and creative nature of children. It may be implemented as either enrichment to, or a component of, first grade language arts instruction.

The unit is intended to be cross-cultural and inclusive; having the potential to be used in virtually any socio-economic demographic. It is yearlong in its scope, with two pairs of lessons to be taught twice a month. The pairs of lessons are thematic, based on seasons, holidays, and special topics. Although the unit was conceived and designed for first grade, with a little creative differentiation, it could easily be adapted in full or in part for any grade level. I have included teacher resource books in the bibliography that would be useful for adapting concepts for middle and high school age students. With minor adjustments, many of the lessons could be successfully utilized in Kindergarten and Pre-K classes as well.

(Developed for Language Arts, grade 1; recommended for Language Arts, grades PreK-1, and adaptable to Language Arts, grades 2-5, and English, grades 6-12)

2009.04.02
Change Moans and Groans to a Love of Tone: Teaching Students to Listen to Text, by Marva Hutchinson

The mere mention of the word tone elicits moans and groans in my classroom. Students can hear the tone of the spoken word-the question is: how do we help them make the transition to hearing the sound of the written text and identifying that tone? This unit will promote the idea that the study of poetry, with a particular emphasis on sound, can actually serve as the impetus for improving student facility in discussing the tone of any *prose* text, fiction or nonfiction. The unit will begin with a more substantive discussion of the definition of tone, accompanied by activities that build student confidence in the ability to recognize audible tones in their day-to-day lives. When we actually hear what someone is saying, we can easily recognize how it is being said-we hear the tone. Firmly rooted in an historically oral tradition, poetry serves as a natural bridge from the study of spoken words to written texts. The final transition in the unit will involve students taking the same approaches they have learned in the study of the sound of poetry and applying them to their study of prose. These techniques should be used in conjunction with other

analytical techniques as an organic discussion of the meaning of the text-not isolated as arbitrary exercises. The ultimate goal is to improve, not replace, an already substantive analysis of text.

(Developed for AP English Language and Composition, grade 11; recommended for English, grades 10-12)

2009.04.03
Poetic Sounds: Symphonic Synchronization of the Word, by Bonnee Breese Bentum

This unit uses devices to strengthen critical analysis of poetry. Students are also given the opportunity to create new works as they become engaged in the message, sounds, and meanings of words in the context of lines of verse. More importantly, students will be guided in writing symphonic selections of poetry citing specific voices for particular verses and stanzas, this strategy will be explored to give way for students to express their feelings, make known their opinions, and tell their points of view in a more effective mode of communication in a public forum. The unit will activate a foreground for choral reading of poetry and other literary texts. This unit's goal is to invite students to become a community that harbors less conflict and more bonding through poetic writing and sound. We will study the depth of lyrical poetry of rap masters who have been given acclaim for their writing skills, sense of sound, and attention to current and past cultural dilemmas, social issues, and world/community events. This unit can be used in a high school English Language Arts setting on all academic levels. It can be altered to suit a framework for an after school poets' club, too.

(Developed for English Language Arts, grades 9 and 12; recommended for High School grades)

2009.04.04
Discovering Voice, by Andrea Kulas

The most ancient of literary genres, poetry uniquely lends itself to the primacy of sound through conveying a sense of thoughts, feelings, and meaning. Poetry foregrounds sound as an organizational principle. Students often struggle with detangling form from function, which is surprising in that patterns of sound are primary in our acquisition of language. Students need to have a stake in their work in order to have bought in. For many of our students that is a connection to self.

Students already have a fundamental relationship to poetry in the form of music. This has only been furthered by the advent of the iPod and the variety of MP3 players available allowing students to readily access, store, share, and collect music. Because of this emergent technology, students seem to be even more enamored with sound than ever. However, we must not forget that sounds awaken us. The natural poetics of rhythm and

meter helps us connect with poetry in the very organic sense of sound. Students cannot see poetry without hearing poetry.

By the end of this unit, students will write and discuss the issue of intellectual property in popular music basing their arguments in examples from the canon of authentic poetic literature.

(Developed for AP English Literature and Composition, grade 12; recommended for AP English Literature, Composition, and World Literature, grades 11-12)

2009.04.05
?Que Bello es el Sonido de la Poes?a! Teaching Sounds and Culture through Poetry, by Thelma Uzeta

With this unit I intend to help my students develop a larger vocabulary in their second language class, as well as learn the right intonation and pronunciation through the use of poetry. The students use the target language for the specific purpose of communication. They experiment with non-verbal, communicative aspects of language (body language, gestures, and facial expressions) as well as verbal aspects (intonation, rhythm, stress, slang, and idiomatic expressions), while interpreting a poem. Poetry is one of the best techniques to help teachers combine phonics and reading instruction in a way that is fun and engaging for students.

Second language acquisition becomes part of our students' lives when they begin to feel the language, and gain confidence to interact outside of the classroom in the target language. When the students learn and master the use of vocabulary, they become engaged in free flowing conversations as they interact with one another. Poems that express strong emotions, feelings, opinions or ideas can be an exciting language learning experience, through which students are able to develop vocabulary and cultural awareness.

With this unit I intend to accomplish the following goals:

- Students would have read a variety of literature from different periods in different styles that would help them understand many dimensions of human experience.
- Students would apply knowledge of language structure, conventions, figurative language and literary styles.
- Students would learn intonation, pronunciation, rhythm, rhyme and stress in a poem.
- Students would use spoken, written, and visual language to accomplish their learning purpose.

Poetry is a literary genre that makes people fall in love with sounds and words, but perhaps it is also the literary form most difficult to teach. Our children nowadays are not

exposed enough to poetry and they perceive it as a complicated way of writing. The main focus for teachers should be to teach the genre in a way that is meaningful and engaging to students.

(Developed for Spanish I Reading and Writing, grades 9-10, and Spanish II Speaking, grades 11-12; recommended for Spanish I, II, III, Reading, Writing, and Speaking, grades 10-12)

2009.04.06
The Unknown Voice of My Students, by Martha Tamez

The myth about students that in poor conditions cannot learn has been dismissed by the generosity of the curriculum unit named The Unknown Voice of My Students. It shows the grace of learning with teenagers, without losing respect and purpose. With the help of games and discussions the teacher immerses in class, not only poetry theory but literary terms used by writers provoking specific reactions by the listener or reader.

Forty-four are the literary terms taught during the first six months of the scholar year. It is an accumulative process that refers to literary terms learned throughout those months.

The Unknown Voice of My Students is intended to expand the daily expressions of students, vocabulary and written forms, taking advance of technological devices that students enjoy at every time.

(Developed for English as a Second Language, grades 6-8; recommended for English as a Second Language, grades 6-8)

2009.04.07
Speak Up and Sound Off! Vocal and Rhythmic Patterns in Public Speaking, by Nicole Dobbs

This curriculum unit's focus is to highlight voice and sound in my students' oratory skills. My goal is to teach students how to be confident speakers through preparation, practice, memorization, and recitation. In addition, I want to teach students to be creative, interesting, and engaging speakers through the use of poetry elements as well as sensitize them to language in general—its elements and its expressive potential. This unit also addresses the fear of public speaking and provides ways of overcoming it.

Public Speaking is not only an integral part of the Business Technology Curriculum that I teach but it is an invaluable personal skill. Students will be using this skill to interview for jobs and communicate with co-workers and clients. Additionally, this unit is extremely important because it sets a foundation for the future courses my students will be taking over the next three years, all of which require them to give oral presentations.

(Developed for Business Technology, grade 10; recommended for Business Education, English, and Career Development, grades 9-12)

2009.04.08
The Sound Within: An Exploration of Prosodic Elements in Poetry, by Cheree Charmello

This stand-alone introductory poetry course was designed for seventh and eighth grade students in the Humanities Department of the Pittsburgh Public Schools gifted education program.

The focus of this unit is the exploration of *auditory imagery*. The unit was developed to help students make a connection between what words mean, how the words sound, and how the two support one another within poetry. Can you still hear the upbeat rhythmic pattern of childhood nursery rhymes playing in your memory? In this unit, students will study prosody in order to uncover how patterns of words create such an effect.

The poems chosen for use in this unit contain specific prosodic elements and will be used in a sequence that allows the students to move from familiar sounds — such as those created in nursery rhymes — to the often inconspicuous pattern of sounds in free verse. Each poem was also chosen for the over-arching theme of perseverance that each supports — either because the poet has overcome adversity, the poem's content implies such, or because of the consistent pattern of sound that ripples through the poem.

(Developed for Middle-Level Humanities, grades 7-8; recommended for Middle-Level Humanities, grades 7-8)

2009.04.09
Listen to the Sound of My Voice: Teaching Poetry to Make Language Whole, by Jeanette Gibson

I will teach this unit over a three-week period as part of my American Literature curriculum. I will focus on the experience of sound in poetry to stimulate listening in students. In doing so, I will strengthen their listening skills to "make language whole." I have tried to show how listening underpins all the activities in my English classroom. It is an eleventh-grade class but my students are tenth graders on an accelerated curriculum.

I have selected four poets: Langston Hughes, Claude McKay, Robert Frost and Walt Whitman. Each of these poets is gifted and models a different style of poetry. Hughes wrote many poems that echoed blues rhythms. McKay wrote an emotional sonnet, "If We Must Die," that encouraged African-Americans during a dark time in their history. Robert Frost was a master of blank verse, and Walt Whitman was an ingenious trendsetter with his free verse. The selected poems are engaging and age-appropriate for my students.

I will also use audio recordings, reading aloud, discussion, thinking-aloud, and listening to music as basic activities in interacting with each poem. These primary activities will stimulate other activities such as classroom discussions, writing, research, collaborative group work, analysis, evaluation and feedback.

(Developed for American Literature 03, 05, and 07, grade 10; recommended for Language Arts, grade 9, World Literature, grade 10, American Literature, grade 11, and British Literature, grade 12)

2009.04.10
The Sound of Poetry, by Melissa Dailey

The Sound of Poetry explores songs of the sea, sounds of poetry and sounds of the sea. Through sea shanties and sea poetry, students study the elements of poetry with sound as the guiding force. In twelfth grade AP Literature, poetry constitutes a significant portion of the curriculum. The challenge of the unit is to guide students in prosodic analysis as well as evaluating the meaning, diction and syntax of the poetry. In addition to a variety of engaging exercises, students write a final essay analyzing a poem of their choice. As an aquaculture vocational magnet school, the Sound School is a prime choice for such a unit. Nevertheless, the unit is accessible to anyone with a love for the sea.

(Developed for AP English Literature, grade 12; recommended for AP English Literature, grade 12)

V. Green Chemistry

Introduction

Our consumer-driven society generates a tremendous amount of waste that is threatening the carrying capacity of Planet Earth. The enormous challenge facing us can be summarized in one word: sustainability. "Green chemistry" is a growing field that aims to develop and apply new methods that are more environmentally friendly for the manufacture of products and for recycling of products after they have been used. Important goals of green chemistry are to minimize the waste generated during manufacture of a product and to develop products that are biodegradable or are easy to recycle. There are many common household products for which green chemistry can make an impact, including fuels, plastics, electronics, pharmaceuticals, cleaning products and cosmetics. The aim of this seminar was to illustrate how the principles of green chemistry relate to products that we use every day and how they may lead to a more sustainable society.

My own interest in science stems from my hands-on experiences as a child. Therefore, many demonstrations were included in this seminar — at least one demonstration during each seminar meeting. These demonstrations were chosen so that they could actively involve the participants and at the same time illustrate the scientific principles related to green chemistry.

The book by Paul Anastas and John Warner, entitled *Green Chemistry: Theory and Practice*, was used as the primary text for the seminar. The seminar was greatly enriched during the first meeting in May when Paul Anastas joined our group. Paul is widely regarded as the father of green chemistry and he coined the name "green chemistry." During this first seminar meeting, Paul articulated the need for "green chemistry" and outlined the 12 principles of green chemistry. Several of the Fellows in the seminar took advantage of Dr. Anastas' offer to sign his book. During the Intensive Session in July, a focus of the seminar was on case studies of green chemistry. These were taken from "Real World Cases in Green Chemistry" published by the American Chemical Society, which was used as a supplemental text for the seminar. All of the case studies are examples of projects that have received the prestigious Presidential Green Chemistry Challenge Award. We discussed the principle of atom economy as it was applied to improving the synthesis of ibuprofen (Motrin, Advil, Medipren) so that less waste and fewer byproducts are generated in its production. The different types of plastics, and their recycling, were discussed both from the point of view of consumers and the chemistry for their production and recycling. A demonstration on the synthesis of nylon added to these discussions. We also discussed greener methods for dry cleaning, washing clothes and dishes, and bleaching. Renewable energy is a key aspect of sustainability. With this in mind, the seminar included a discussion of sustainable energy use in the future that included progress in the development of biofuels and processes for solar energy

conversion using artificial photosynthesis. A highlight of the seminar was the production of biodiesel fuel from cooking oil that culminated in the combustion of biodiesel fuel in an oil furnace burner.

The curriculum units developed from this seminar are suitable for elementary to middle school to high school students. In all of the units, the science content is integrated with language arts, mathematics and social studies to provide a balanced program that meets the literacy requirements of the school system. The Fellows have prepared extensive lists of materials that can be used in the classroom or as resources. These materials include books that the children can read, textbooks that the teachers can use, demonstration sourcebooks, suppliers of equipment, useful computer software, and addresses of sites on the World Wide Web. Several of the Fellows developed units around a theme or activity related to green chemistry, including an innovative "murder mystery" activity that illustrates the improved "green" method for synthesis of ibuprofen. Other units are related to the impact of our consumer society on our Planet Earth and include topics such as recycling, water use, environmental justice, ecosystems, and use of pesticides and herbicides. The units include a number of excellent activities that will engage the students' interest and teach them about green chemistry and sustainability.

I would encourage all teachers of elementary through high school students to review these curriculum units. These materials provide a valuable resource for incorporating topics of science and society related to "Green Chemistry" into the classroom.

Gary W. Brudvig

Synopses of the Curriculum Units

2009.05.01
"How Much Is Too Much"? Teaching Measurement and Solution Concentration through Bioaccumulation and Levels of Toxicity, by Myrna Alvarez

We use multitudes of harmful chemicals that pollute the air, the lands, and the waters. Pesticides are one of them. These pesticides have numerous wonderful uses; but they also have damaging effects. They contain hazardous agents that have the ability to leave behind residues that linger, and become more potent as they magnify and extend beyond limits of contamination.

My curriculum unit focuses on the harmful and bioaccumulative effects of heavy metals in pesticides. I developed lessons and hands-on activities that built a strong link between photosynthesis and bioaccumulation. The culminating project is a power point presentation that will be evaluated based on how well my students have studied and analyzed EPA-released cases of bioaccumulation from Chicago and some parts of the Midwest. I believe, using these teaching tools of social significance, I can ease the teaching of measurement, and going further, the concept of solution concentration.

The lab activities and lessons address the goals of the Illinois State Standards. They are designed to develop scientific inquiry, and enrich their knowledge and skills on life, physical, and technological aspects of science as a core high school course.

My curriculum unit is intended for honors level biology and chemistry classes.

(Developed for Honors Biology, grade 9, and Honors Chemistry, grade 10; recommended for Honors Biology, grade 9, and Honors Chemistry, grade 10)

2009.05.02
Reducing the Environmental Impact of the Green Industry with Green Chemistry, by Justin Benz

This two week unit is designed to empower high school students enrolled in any horticulture related Agriscience pathway with the skills to protect the environment during chemical applications. Through this unit, students explore the different classes of landscape chemicals and how these chemicals should be managed. Students gain insight into the deleterious effects the different classes of chemicals possess due to their mode of action. Students also gain an appreciation for how powerful landscape management chemicals are and the need for proper application procedures and personal protection use. Understanding how to determine all the pertinent information about a chemical from its label is critical to make informed decisions on chemical usage. Students utilize their knowledge gained from the labels to scientifically determine the best pesticide to use for

a particular pest on particular sites in order to reduce the environmental impact every time they apply a pesticide to the landscape. Students will come away from this unit with a much better understanding of the impact these chemicals can have on humans and the environment and how they, as green industry professionals, can do their part to lessen the environmental impact of managing the landscape.

(Developed for Environmental Landscape Technology, grade 12; recommended for Plant Science, Horticulture, Landscaping, and Vocational Agriculture, grade 12)

2009.05.03
It's Not Waste: Teaching Recycling through Density, Phase Change and Solubility, by Victoria Deschere

Conservation. Sustainability. Renewable resources. These immense concepts overwhelm my students; even I have difficulty wrapping my mind around them. With such multifaceted ideas, the students find it complicated to act in an earth-friendly manner. The aim of this unit is three fold: to create questioners and lifelong learners, to make an impact on the environment and to influence businesses in our area to act more responsibly. In this unit, the students will explore local and simple actions to aid the planet while developing problem-solving skills. Additionally, students will apply the concepts of density, phase change, and solubility while experimenting with methods of recycling in a single stream system. They will determine how to sort comingled recyclables to prevent contamination and how to reclaim the various materials for reuse. In this unit, students will explore the application of scientific concepts and techniques of investigation, problem-solving strategies, as well as behaviors that will help sustain the environment.

(Developed for General Science, Properties of Matter Unit , Beginning Chemistry, grade 7; recommended for Chemistry, Environmental Science, and General Science, grades 6-9)

2009.05.04
Green Chemistry: The Future Is in Your Hands, by Stephen Griffith

Green Chemistry brings about a fundamental difference in how the chemical process is treated. It is the cutting edge of the chemical industry today and can fundamentally change our lives for the better in the future by assessing environmental concerns today. Once one understands the twelve principles of Green Chemistry that have been established it becomes painfully obvious how this form of chemical synthesis should have been established for many years. It is due to the nature of what Green Chemistry has to offer that it becomes vital for students of this day and age to know, understand, and practice the principles of Green Chemistry in their daily lives. The following unit is designed to take the existing form of chemistry education and expand upon it by

including this revolutionary new approach to chemistry. The target audience for this is an 8th grade science classroom. It is intended to be used during the instruction of basic chemistry as an extension to the curriculum guidelines already established. This is not designed to make them future chemists; it is designed with the dogmatic approach to teach them these new concepts so they may be aware of better use and practice of chemistry in the real world so they may become outspoken advocates of the movement in their own future.

(Developed for Science, Grade 8)

2009.05.05
Effects of Rates of Change and Accumulated Change in a Throw-Away Society, by Joseph Irizarry

This unit integrates calculus techniques with green chemistry content. Calculus deals with the derivative and the integral. Many examples in the typical course come from physics, economics, and biology. This unit expands the applications to include green chemistry. The unit's activities are relevant to residents of an urban center challenged by municipal waste disposal and exposure to persistent bioaccumulative toxins. This unit should take one to two weeks, depending on contact hours and the depth of research. It should be taught after applications of the derivative, at the point of the introduction of the integral.

Green chemistry is environmentally benign chemistry that considers the life-cycle cost of products. A core principle is that products should be designed to degrade harmlessly rather than persist or produce toxins in the environment. In contrast, our society encourages planned obsolescence and repeated purchase and disposal of single-use plastic items.

This unit follows two strands. First, students will learn about the production of municipal solid waste and use historical data to compute the derivative, or rate of change, and consider the effects. Second, students will research environmental toxins and use the integral as a Riemann sum to calculate cumulative exposure to one toxin, lead.

(Developed for AP Calculus AB, grade 12; recommended for Pre-Calculus, grades 10-11, and Calculus, grades 11-12)

2009.05.06
Using Green to Catalyze the Changing of The World, by Rajendra Jaini

This four week High School Chemistry unit is designed to teach first semester Chemistry fundamentals in an innovative way that will catalyze students to become impassioned scientists or scientific-related participants in the Green Chemistry revolution. Green Chemistry is about inventing, designing, and creating products and systems that will be

sustainable into the future; after all, why fix problems later that we can engineer solutions for today? To help students visualize possibilities, the four lesson unit will scaffold students' knowledge and culminate with an interactive investigative science game in which the students are the participants in helping convict drug kingpin Ibu Profen Brufen (a.k.a. 'The Headache') using quantitative and qualitative evidence. Concepts reviewed and introduced include, Reactants, Products, Reactions, Reaction Types, Gram Formula Mass, Stoichiometric Dimensional Analysis, Atom Economy, and E-Factor; these concepts are 'hidden' in a case study of Ibuprofen, which is just one example of how innovative Green Chemistry processes are changing the world. Through these innovative lessons, I hope to reactivate the curiosity and passion for science and learning that has been so often lost amongst the urban youth we serve; from these reactivated curiosities, I hope to create active future participants that will Change the World.

(Developed for Chemistry and Biochemistry, grades 10-12, and AP Chemistry, grades 11-12; recommended for Chemistry and Biochemistry, grades 10-12, and AP Chemistry, grades 11-12)

2009.05.07
Experiencing Positive Relationships with Managing the Environment, by Stephanie Johnson

This unit will explore the natural function of trees and simulate what they do through chemical experimentation. There will be several ways to accomplish this. First, we will look at how we contribute to waste. This will be through using the Ecological Foot printing tool. This concept is a resource tool that measures the usage of natural products and resources by an individual. This tool will assist with giving my students ownership for their responsibility to the environment. Secondly, we will look at trees and how they help the environment. Then we will explore composting through a family involvement activity.

The concept of Green Chemistry was created to assist chemists with being mindful of their environment when creating different elements or solutions. We will model as a chemist would do by creating and preventing waste. The subject green chemistry has twelve principles. In this unit, we will focus on three. The first one is it is better to prevent waste than to clean up after it is formed. The second one is chemical products should be designed to preserve efficacy of function while reducing toxicity. The third one is design chemicals and products to degrade after use: Design chemical products to break down to innocuous substances after use so that they do not accumulate in the environment. One of the laws that have assisted with this is the Clean Air Act. This act also would like to prevent waste at its source. To assist with preventing waste at its source, I will be teaching my students about pollution through the topic of trees. Pollution first of all comes in many forms and has assisted in hurting the environment by causing problems such as the green house effect. Pollution will be discussed and ways to help

prevent it. There are several strategies to reduce air pollution. Trees help trap these pollutants and planting trees is a way of combating air pollution. Some countries have it so that you may donate a tree in a person's honor such as Trees for Israel. This unit has interactive activities and field trips. It has a literature component with several informational texts. The texts help make this unit a very lively study.

(Developed for Science, grade K; recommended for Science, grades K-3)

2009.05.08
What's Your Green Bottom Line? The Truth About What We Leave Behind, by Kathryn Kinsman

There are so many campaigns right now advertising for us to live a greener lifestyle, but thanks to television, I think most people are suffering from a little green fatigue. I've found that many people, especially my high school students, don't even know what living greener means. Maybe they don't take interest because they can't really see it or they don't feel any personal connection to it. I'd like to change that. The main objective of this unit is to transform the way students think about their everyday actions and how they effect the local environment. In order to do this, first they will be empowered. They will explore the concepts of environmental racism as they are introduced to several people around the nation who have been affected by toxic waste in their neighborhoods. They will even watch a music video by popular musician, will.i.am. A second emphasis will be placed on 2 of the 12 principles of green chemistry and a case study of plastics. Once students realize the importance of individual action, they will be more likely to make necessary daily changes.

(Developed for Environmental Science, grade 9; recommended for Environmental Science and Earth Science, grades 8-12, and Green Chemistry, grades 7-8)

2009.05.09
Green Chemistry: Is Water, Water?, by Francisca Rebullida

This curriculum unit is designed for fourth and fifth grade students in English as a Second Language but could be modified for students in the mainstreamed classes. The students are about nine to ten years old. The water curriculum unit is aligned with the state standards objectives. Teachers can teach this unit from two to three weeks. One of the most important features of this curriculum unit is teaching science across the curriculum. Teachers will find the unit integration in the content areas of reading, science and math. Also, it includes teaching the four areas of listening, speaking, reading and writing for second language learners. The focus of the curriculum unit is water. The goal of this unit is to make second language learners understand the importance of water in science and apply their reading skills to read in the science content. There are three main ideas in this curriculum unit: the history of water; how water is purified in simple ways;

and how do we conserve our water. The first principle of Green Chemistry, that it is better to prevent waste than to treat or clean up waste after it is formed, will be integrated in the unit's topics. Using children's literature science is one way of getting the students engaged in learning. These fascinating and colorful illustrated books for children are namely: "The Lorax" written by Dr. Seuss; "S is for Save the Planet" written by Bradherzog; and "The Drop in My Drink" by Hooper. Using literature to teach science will make learning meaningful for the students in the science content area. At the end of the curriculum unit is celebrating water with different activities assigned to each group of students in class. Find out more when you use this unit with your fourth and fifth grade students.

(Developed for ELA Reading and Science, grade 4; recommended for ESL, Reading, and Science, grades 4-5)

2009.05.10
The Science of Environmental Justice: Can Green Chemistry Change Our World?, by Catherine Salvin

Fundamentally, environmental justice can be defined as the right of all people-regardless of race or class-to live, work, play, and learn in healthy, safe environments. The Southeast corner of San Francisco, where our school is located and almost all of my students live, is a case study in environmental injustice, carrying a hugely inequitable toxic burden compared to the rest of the city. This unit utilizes chemistry as a means of better understanding the toxicity our community faces, and draws upon green chemistry for its potential to address environmental injustice.

Through studying the fundamentals of chemistry-atomic structure, chemical bonds, polarity, ions and isotopes-students will understand four categories of toxicity present around them: reactivity, solubility, radioactivity, and volatility. Examining the atomic and molecular structures shared within these families of toxins will allow students to identify what makes a toxin toxic, and how each type of toxin can affect human health and the environment. Students will then turn to the field of green chemistry, analyzing its principles and practice to determine its potential and limitations in offering solutions that will help achieve environmental justice.

(Developed for Environmental Science, grades 9-12; recommended for Environmental Science, Social Studies, Social Justice, Chemistry, Environmental Justice, and Urban Studies, grades 9-12)

VI. The Brain in Health and Disease

Introduction

The human brain is a remarkable contraption, capable of decoding complex information about the world around us and organizing that information into plans and dreams. This seminar reviewed the overall structure of the brain and its subdivision into regions that are responsible for different tasks, such as vision, hearing, control of movement, and decision-making. The function of the brain was related to the activity of cells within the brain, particularly neurons, which are capable of collecting, integrating, and relaying information. The seminar also described common diseases of the brain, such as Parkinson's disease, Alzheimer's disease, epilepsy, and stroke, and related the causes and consequences of these diseases to properties of cells and groups of cells in the brain. Because the biology of the brain has many levels of complexity, it is a suitable substrate for lesson plans at a variety of grade levels, encompassing aspects of mathematics, biology, chemistry, philosophy, and social studies.

Specifically, the seminar covered the following topics:

1. Cellular structure of the brain
2. Organization of the brain
3. Neurotransmission and the synapse
4. The body manager (major senses and body regulation)
5. Nutrition and the brain
6. Parkinson's disease and other neurodegenerative disorders
7. Positron Emission Tomography (PET) imaging of the brain
8. Emotions and social function
9. Learning, thinking, remembering
10. Epilepsy

The discussions were enhanced by our reading from three books: The Dana Guide to Brain Health: A Practical Family Reference from Medical Experts, Bloom, Beal, and Kupfer (eds.), Dana Press (2006); Think Smart, Richard Restak, Riverhead Books (2009); and The Brain that Changes Itself, Norman Doidge, Penguin (2007).

The Fellows prepared curriculum units that covered a breadth of information on the brain and the senses. The material presented in the units assembled in this volume span an impressive range and are designed for use in classrooms from first grade through high school.

Two of the units focused on material that is most appropriate for high school students. Eric Laurensen prepared a unit called "The Brain Desynchronized," which is designed for

use in high school physics classrooms. In this unit, students are asked to use their knowledge of electrical circuits to understand signal transmission in the brain and to develop mathematical models of electrical activity. These concepts are illustrated by describing the changes that occur in seizures. Connie Scercy Wood prepared a unit called "Neurobiology Using Both Sides of the Brain," which was designed for International Baccalaureate or Advanced Placement classes. Her unit uses information on the cellular mechanisms of neurobiology to give students practice with the scientific method and testing of hypotheses.

Several of the units were addressed to middle school classrooms. Chanh Quach prepared a unit called "Brain Structure and Function," which relates function of the brain to its organization into distinct anatomical regions. The function of each region is further explored by looking at differences in organization among species. Shelley Freedman-Bailey prepared a unit called "Memory Boot Camp," which uses classroom activities to explore mechanisms of memory and to provide students with tools to enhance memory. Kimberly K. Turner prepared a unit titled "Art Is Not Just in the Eye of the Beholder but in the Brain," which explores the function of the visual system and relates the way that the brain processes images to illustrate how artists achieve effects - such as perspective and optical illusions - in their work. Sharon M. Mott prepared a unit called "Our Brain's Fat and Carbohydrate Connection," which discusses the important role of diet in the function of the healthy brain, focusing on the impact of carbohydrate and fat composition of the diet on brain health. Karen L. Brinkley prepared a unit called "Mathematics and the Brain: Easy as 1-2-3, Simple as A-B-C," which describes differences in learning styles for mathematics, and provides teachers with approaches to enhance their students' ability to solve multistep word problems.

Many of the units were addressed to elementary school classrooms. Vivienne Bartman prepared a unit called "An Investigative Approach to the Brain: the 5 Senses and the 5 W's and an H," which introduces students to the techniques of investigative journalism and applies these techniques to study of the special senses. Kathleen Gormley wrote a unit called "An Investigation into Learning Using the Regions of the Brain," which encourages students to find connections between the way their brains work and the ways that they learn. Sharyn F. Gray prepared a unit titled "This Is Your Brain. This Is Your Brain on Fire…Any Questions?" In this unit, students are introduced to the learning styles and new research on brain function, in order to provide them with personal strategies to enhance their learning potential. Carol Boynton prepared a unit called "Sensing Our Five Senses," which provides a collection of hands-on activities to introduce young students to the power of observation through the five senses.

W. Mark Saltzman

Synopses of the Curriculum Units

2009.06.01
An Investigative Approach to the Brain: The 5 Senses, the 5W's and an H, by Vivienne Bartman-McClellan

This unit is prepared for the second grade classroom but can be easily adapted for any grade level. An ideal time for the unit to be presented is during National Brain Awareness week which is scheduled for the week of March 15, 2010. Using the journalistic approach to research the students will understand how to use one of the best ways to research a subject. The journalist approach is to do the research by answering questions using who, what, when, where, why and how. In this unit the students will research the brain and the five senses. In this unit teachers are provide with background information and step-by-step procedures to teach your students how to do independent research.

(Developed for Science, grade 2; recommended for Science, grade 2)

2009.06.02
Sensing Our Five Senses, by Carol Boynton

We rely on our five senses to provide information about the world around us. The thought of a holiday dinner brings to mind the delight of many senses - the smell of dinner cooking, the sound of holiday music, the taste of fresh baked sweets, and more. Experiences like this engage our combined senses. In fact, at every moment of our day, at least one of our senses is hard at work, supplying our brain with needed information to make decisions, be safe, enjoy ourselves, and become smarter.

This unit is designed to get first grade students involved in hands-on sensorial experiments. My hypothesis is that young students need to actively participate as scientists, not just observe demonstrations by the teacher or look at examples in books. Too many young children today are exposed to "information" from the world of computers, television, video games, and other synthesized media. Their knowledge is based on limited sensorial experiences, or even experiences with the wrong sense, for example seeing food being cooked on television or watching someone petting a dog. This curriculum unit will provide learning through true sensorial experiences. By giving students a chance to have these experiences, their brains will truly "grow smarter" as a result.

(Developed for Science, grade 1; recommended for Science, grades K-2)

2009.06.03
Mathematics and the Brain: Easy as 1-2-3 Simple Like A-B-C, by Karen Brinkley

> *The goal of learning is not just to acquire knowledge, but to be able* to use that knowledge in a variety of different settings that **students** see as relevant.
>
> David A. Sousa

Students are often successful with computational problems, whereas they experience significant difficulty when required to solve and analyze multi-step word problems. Why does this occur? What brain functions are vital for students' successful comprehension of math concepts? What parts of the brain produce student achievement in mathematics? These are essential questions that were researched, evaluated, and presented within this curriculum unit intended for grades fifth through eighth.

The foundation to achieve these objectives is through student exploration of meta-cognition activities to help them critically reflect on their learning. Also, the unit incorporates multiple intelligences and brain-based learning theories, because according to research it is imperative that we create classrooms that engage the whole brain. Therefore, my goal is to offer students an in-depth explanation and strategies regarding how the brain works in processing mathematical concepts.

(Developed for Math, grades 5-8; recommended for Math, Literacy, and Science, grades 5-8)

2009.06.04
Memory Boot Camp, by Shelley Freedman-Bailey

Your students are about to be drafted into Memory Boot Camp. This intense program will use physical activity and a simulation of being in the military service to help them improve their memory. At the conclusion of this unit, students will understand that their long-term memory is unlimited. To remember something, they have to want to remember it, to value the information. Students will be able to quantify how their short term memory has improves with practice, practice, practice. Students will be able to describe how memory works in the brain. They will be able to answer: What is memory? How does the brain store memories? Where is memory located? What are the types or pathways of memory? What are the stages of memory? Why do we remember certain events and not others? After completion of this unit, students will be able to determine, when given a memory task, whether they need this information short-term or long-term, and incorporate one or more of the strategies included in this unit. All the information and activities they participate in will be recorded in a portfolio. This portfolio will be the evaluation tool indicating if they have improved their memory.

(Developed for Gifted and Talented, grade 7; recommended for Biology, Science, Psychology, and Gifted and Talented, grade 7)

2009.06.05
An Investigation into Learning Using the Regions of the Brain, by Kathleen Gormley

If you teach it, they will learn. Teaching students about how their brains work is a direct way to enable them to take charge of their learning. When a student connects with the information in a personal way, an opportunity to open their eyes and minds to a new world is created.

This unit was developed for a third grade classroom and focuses on three topic areas. The first topic to be covered will investigate brain anatomy and functions. Students will participate in cooperative groups to complete research and develop a power point project about the regions of the brain and the responsibilities of these regions. The next topic will unravel how the brain receives messages as the students take memory quizzes and learn about how memories develop and help them learn. The final topic will make a connection between the regions of the brain and learning. Students will uncover their learning styles and discover ways to use this information to enhance their learning. Students will participate in literature circles and complete choice boards that will empower them to take charge of their learning and link this learning to their brains.

(Developed for Science, ELA, and Math, grade 3; recommended for Science and English Language Arts, grades 3-5)

2009.06.06
This Is Your Brain…This is Your Brain on Fire…Any Questions?, by Sharyn Gray

Today the idea that the brain is the central component of human function is generally understood, yet many mysteries remain, particularly for children. Fortunately, recent advances in technology are allowing us to study the brain as never before; through digital imaging techniques, scientists are able to watch the brain as it works. These techniques provide tremendous opportunities for scientists, whose discoveries in turn create implications for medical doctors, business leaders, educators, and parents - anyone, in fact, with any interest in the human condition and all of our beautiful eccentricities. Many educators and researchers are looking at how this new information can assist us in the classroom to be both better educators and learners. In reading the work of these researchers, one quickly becomes aware of a recurring theme; that is, that current US education paradigms are not providing opportunities for our young people to properly develop the minds, intelligences, and habits they will rely upon to be successful in the 21st century. Consequently, this unit was developed to help students improve their

understanding of how the brain works and use "brain-compatible" learning strategies with the self-knowledge necessary to become better learners.

(Developed for Science, grade 4; recommended for Science, grades 3-6)

2009.06.07
The Brain Desynchronized, by Eric Laurenson

Ode to the brain, the most magnificent of organs! In humans, these few pounds of "gray matter" somehow manifest in cognition, self-awareness and consciousness, enabling the brain to study itself.

The means by which the brain achieves this feat is not well understood, which stimulates student's imagination, emphasizes the continual scientific pursuit of knowledge and motivates them to learn the physics and chemistry of the electrical propagation of signals. Having grasped the nature of electrical signal transmission conceptually and to a limited extent mathematically, students will explore the macroscopic functioning of the brain in this unit. They will investigate the necessity of brain signals not being synchronized, because such a state of synchronization results in seizures and, if chronic, the debilitating condition called epilepsy. The current theories of the cause of epileptic seizures will be explored and one treatment device, for which I received a patent, will be presented. Appreciating the proper functioning of the brain will provide relevance to the remarkable advances made in neuroscience over the past few decades. This unit is intended for advanced physics students studying current electricity but it could also be adapted for chemistry students.

(Developed for CAS Gifted Physics, grades 11-12, and AP Physics II B, grade 12; recommended for Physics, High School grades, and AP Physics, grade 12)

2009.06.08
Our Brain's Fat and Carbohydrate Connection, by Sharon Mott

This unit is designed to integrate student's knowledge about atoms, elements, and compounds into their daily lives. Students will have an opportunity to learn how the brain utilizes specific compounds to develop and function. The goal of the unit is for students to recognize how specific foods in their diet, when they are broken down into chemicals, can enhance or harm the brain. Two food compounds will be the central focus, fats and carbohydrates. These two compounds play a significant role in the brain's function and structural development. Students consume large quantities of these two substances daily; thus the unit will attempt to educate them about which types of fats and carbohydrates can enhance their brain function. Students will have an opportunity to learn how certain fats and carbohydrates affect them personally by participating in a food choice program.

The unit will also allow students to organize and present an educational pep rally to the school to share what they have learned.

(Developed for Physical Science, grade 8; recommended for Physical Science, grade 8)

2009.06.09
Brain Structure and Function and Disease, by Chanh Quach

This unit on brain structure and function covers brain anatomy and its relation to brain function. The unit is written with the intention of introducing brain science to middle school students. The brain is divided into three regions known as the forebrain, midbrain, and hindbrain. Each region individually or collectively corresponds to a specific function. Several concepts are introduced by explaining the role of the cerebral cortex, the role of the cerebellum, and the brain stem. After a thorough understanding of brain gross anatomy, this unit covers the anatomy of the neuron and neurotransmission. The unit further describes the cause and mechanism of the brain disease Parkinson's Disease. Additionally, the effects of alcohol on the brain are discussed. Both the Parkinson's Disease and the alcohol sections are intended to synthesize prior learning from the earlier sections presented. This unit concludes by providing creative and hands-on lessons and labs. Each lesson is written to encourage student participation and discussion with an open dialogic approach, so that all students, at all levels of language skills, feel comfortable learning the material. Teachers will also find that each lesson was written with the option of using various techniques that foster learning such as having students assist in generating a list of vocabulary words.

(Developed for Biology, grade 7; recommended for Biology and Life Science, grades 7-8)

2009.06.10
Art is Not Just in the Eye of the Beholder But in the Brain, by Kimberly Towne

This curriculum unit is designed for middle school students but could easily be adapted to upper elementary and high school students. During a period of about eight weeks, students will complete three studio projects that connect directly to how the brain works. The unit is designed to introduce students to the link between art and the brain. Specifically, the brain is the driving force on how the world is seen AND how art is created and viewed. The unit explores the rules and assumptions that the brain makes and how they effect our perception of the visual world, art and how we perceive both. By exploring the two visual pathways, the "what" and "where" systems, students will create three studio projects: one focusing on depth, one on color, and one on the illusion of movement. Fine art examples and optical illusions will be used to teach the ways that the brain perceived what is seen. The unit focuses both on how the brain perceives the world,

how artists have used this information throughout the centuries, and how students can create an artwork using these principles.

(Developed for Art, grade 7; recommended for Art, upper Elementary through High School grades)

2009.06.11
Neurobiology Using BOTH Sides of the Brain, by Connie Wood

This is a unit on neurobiology developed for high school International Baccalaureate or Advanced Placement Biology classes. It is also a unit on the scientific method; using neurobiology to help students gain a better understanding of how science is done. The activities included in this unit include building a model of the brain from MRI images and doing "the wave" to demonstrate how action potentials are propagated. Students will "dissect" a journal article on brain hemisphere specialization in toads for different kinds of behaviors. The "dissection" will allow students to discover how the experiment was designed to control for variables, to test for the hypothesis, and to collect sufficient data. Afterwards, they will replicate the experiment and compare their results to the published data. I encourage you to read the background information, if, like me, you have always had questions about the nervous system, such as: why does acetylcholine stimulate skeletal muscles but inhibits heart muscles? Where and how does an action potential really begin? What exactly happens when neurotransmitters bind to receptors? There is still much to learn about the brain, but it is my hope that one of my students will help discover the answers.

(Developed for IB Biology, grade 12; recommended for IB Biology and AP Biology, grades 11-12)

VII. Energy, Climate, Environment

Introduction

There is little scientific doubt that climate warming is occurring globally at rates unprecedented in human history. It is also clear that human-caused CO2 release to the atmosphere is a predominant cause. Society's use of fossil fuels that release CO2 to the atmosphere is the primary source of CO2 and other gases that contribution to the warming effects. These are well understood to include polar icecap melting, sea level rise, more intense storms, desertification in some areas and increased rainfall in others, rapid loss of biological diversity on land and at sea, foul and unhealthy air quality, and a resurgence of vector borne diseases such as malaria and dengue fever.

Within this Yale National Initiative seminar we focused on what I believe to be the underlying human behavioral causes of climate change, predominantly our choices as consumers in a global economy. Economic growth and associated lifestyle changes have radically increased the average energy consumed by individuals. For example, we have long been encouraged to buy larger cars that are less fuel efficient. Our society has fled urban centers and sprawled into suburbs increasing both the number of vehicles per household, and the miles driven each year. Nearly 240 million vehicles exist in the U.S. today, one for everyone eligible to drive. We are burning more fuel, moving more miles, but driving in greater comfort than any previous society in human history.

Our homes are also larger on average than ever before. In the 1980s the typical home included approximately 1,700 square feet of floor space. Today average home size has grown by nearly one-third to 2,400 square feet. This means there is more space to heat and cool, more electronic gadgets, bigger refrigerators, freezers, ovens, and increased water consumption. Why be concerned about water consumption? It takes energy to pump it from its source to its point-of-use, and to both heat and cool it for cooking and washing.

By 1970 many far-sighted scholars — including Donella and Dennis Meadows at Dartmouth College, Paul and Anne Ehrlich at Stanford University, René Dubos and Ian McHarg at the University of Pennsylvania, and Barry Commoner at City University in New York — all understood that the underlying driver behind loss of global environmental quality is individual consumer behavior. We react quite predictably to advertising, rushing to buy the latest cell phones, Ipods, laptops, and much more. All have exceptionally short lifespans - often only two years - and all are produced abroad, many in Asia. It takes energy to produce the chemicals, formulate the products, move them to their point of sale, and to dispose of them. Few products are labeled to indicate their energy use during a year, but no labels tell the story of energy costs associated with their creation, delivery, and ultimate disposal. This form of "product lifecycle

assessment" has led to the concept of producer lifecycle responsibility, now required in a number of European nations.

Our seminar also considered the energy associated with food production and consumption. For breakfast this morning I had a cup of coffee from Brazil, a glass of apple juice from concentrate produced in eight different European nations, a bagel produced from wheat grown in the U.S. Midwest, and a mango from Costa Rica. I don't have any idea how much energy was used to grow these foods, process them, and move them to the store where I bought them, or what energy I consumed to prepare them at home. In short, the energy consequences of our daily diets are almost impossible to know. Surprisingly without this knowledge, we could still adjust our diets to consume far less energy by buying food that is grown locally, unprocessed, and low on the predatory food chain. Although I enjoy a well-cooked steak occasionally, the energy used to produce a calorie of beef is nearly 30 times higher than the energy used to produce a calorie from locally grown vegetables (not even accounting for transportation or processing costs). And the average American consumes nearly 70 pounds of beef each year.

Buildings provide another example. They account for nearly 70% of the electricity consumed in the U.S., and electricity used to operate them is created predominantly by burning coal, oil, or natural gas, all important sources of greenhouse gases. We examined energy efficient building technologies, and toured one of the newest buildings at Yale University that will be soon certified under the U.S. LEED Green Building Program, designed to encourage and recognize buildings that are energy efficient and protective of indoor air quality. The seminar discovered that the LEED program depends upon a scoring system within which points can be earned in different categories. When we analyzed the LEED standards with care, we found that indeed a building could receive the highest "platinum rating" while paying no attention to indoor air quality and this is a concern because tighter buildings that trap airborne chemicals indoors can harm human health. Indeed, one of the more convincing explanations of the rise in asthma prevalence during the 1980s and 1990s is that indoor air quality declined as buildings became more energy efficient. Similarly, by gaining points for landscaping, reuse of formerly developed sites, among other categories, the highest rating could be achieved with little attention paid to energy conservation. Then we found that these LEED standards are being codified into federal, state and local laws, conferring an undeserved impression of energy-conserving legitimacy — all while enhancing property value.

We also considered what we called "the quiet revolution in plastics," well predicted by the 1968 film *The Graduate*, starring Dustin Hoffman. Plastic molecules are now found in the human tissues of most people tested in industrialized nations. Disturbingly, several plastic ingredients are recognized to be estrogen or androgen mimics, and they are capable of producing hormonal responses in many species of animals tested, even when exceptionally low doses are administered. The average individual in the U.S. purchases

nearly 200 pounds of plastic each year, with little understanding of its chemical composition or ultimate fate when disposed. Many assume it will simply be recycled, however on average only 5% of plastics are recycled and the remainder is discarded in landfills or is incinerated. Since nearly all plastics are derived from petroleum, and nearly 600 billion pounds are produced each year in the world, we are creating an enormous chemical burden on the environment and our bodies, one that will persist for centuries given the slow rate of plastic decay.

Each of the seminar Fellows prepared a unit that addresses these issues in a way that is tailored to the grade level and subject areas they are responsible to teach. The units are exceptionally creative, well organized, and will certainly engage school children to understand the complexity of the energy and climate change challenge we all face. Even more important, the units will also empower the students to reflect on their own behavior, and that of their families and schools, to see opportunities to reduce their energy demands. I am deeply indebted to my Fellows, as they have inspired me to examine how complex and often technical knowledge may be reframed and taught far earlier in our school systems that anyone had imagined. For their passion, patience, humor and intelligence, I am deeply thankful!

John P. Wargo

Synopses of the Curriculum Units

2009.07.01
Flexible Enthusiasm: Consumption and Awareness of Plastics in Our Lives, by Stephanie Brown-Bryant

The production and consumption of plastics have infiltrated our lives at an alarming rate. From our homes to the water we drink, it is almost inconceivable to have a world without plastics. As plastics technologies grow, so do environmental and health concerns. Consumer awareness and the importance to protect our natural resources are of great importance to our environmental future. Landfills and toxic air are reminders of how our habits formed by marketing trends have created lifestyles filled with waste. While most consumers are not aware how predominant a role plastics play in our lives, concern has shifted to the health implications that we must confront. Considerable attention is given to the history of plastics, the role advertising plays in consumption, societal and legal controversies and the need to be agents of change. Students will use background information to evaluate opinions and use hands-on methods to exhibit a concrete need to reduce plastic consumption. Students will evaluate the concerns surrounding the production, use, and recycling of plastic. In addition, students will become more aware of their personal actions as consumers and how a shift in thinking may actually make a difference in our future. Students will interactively share knowledge and are encouraged to take action to fight the growing problem.

(Developed for Science and Technology, grades 6-8; recommended for Science, grade 6-8)

2009.07.02
Energy Quest: Exploring Sun, Wind, and Water, by Ann-Marie Chiyeni

This curriculum unit is designed to target 4th and 5th grade learners, although the activities and material are appropriate and adaptable for 3rd grade through high school. The rationale behind the unit is that it is vital to our global future to educate students on making informed energy choices and that this learning should be an active and dynamic process for students. The first part of the unit will begin with the most basic concepts of what energy is. The learning will then transition into exploring different energy sources and an investigation of how use of renewable and non-renewable resources impact climate and the environment. In the next part of the unit, the two grade levels will diverge and begin a focused study of their particular energy source(s). 4th grade students will examine solar energy through using the process of scientific inquiry and experimentation. The 5th grade students will look at the energy sources of wind and water through the lens of technological design. The overall goal of the "Energy Quest" unit is to engage students in exciting and authentic hands-on learning in science and to make them more knowledgeable consumers of energy in the future.

(Developed for Science Resource Lab, grades 4-5; recommended for Science, grades 3-8)

2009.07.03
EFP&W: Energy Food-Production & Waste, by Kelly Clark

2009.07.04
Toxic, Persistent Chemicals in Human Environments: Case Studies of Agent Orange Use in Vietnam, 1965-1970 and Methyl Mercury in Minamata Bay, Japan, 1932-1968, by Jeffrey Davis

Allied bombs destroyed much of the manufacturing capabilities in post war Japan. Industries without war applications were spared. So the importance of those industries was critical to the rebuilding of the Japanese economy. This importance exaggerated the value of the companies and caused the government to overlook dubious practices and, in effect, side with the companies when issues pitted them against the citizenry.

The deep jungles of Vietnam helped the North Vietnamese Army conceal their actions during the Vietnam-American War. The American strategy of defoliating the forests was considered an effective way to overcome that problem. The U.S. military's need to help their troops blurred their understanding of the consequences of their tactics.

Teaching this unit will accomplish three elements in students' education. First, students will complete lessons directly related to specific state standards. Second, they will conduct and present research on environmental contamination about how citizens are affected by the contamination and how they cope, or deal, with the contamination incident. Finally, students will learn how to look at situations that are frequently considered in only emotional terms, in more objective fashion - considering specific risk analysis issues in historical and cultural contexts and from the principals' political and moral perspectives.

Key activities include: Research for debate, creating a faux news program informing the audience about relevant issues, and experimenting with models of bioaccumulation and chemical persistence.

(Recommended for Elementary Science and Social Studies, grade 5)

2009.07.05
Math and Consequences: Environmental Context in Math Instruction, by Jonathan Fantazier

I believe that teachers of mathematics must prepare students for the social and political conditions that they will adopt it in their adulthood. Because climate change issues are certain to be a serious part of their world, we should therefore be adapting mathematics

instruction with the context of environmental issues. Math is a primary tool for solving the problems of human health, habitat, and economics that our students will live with.

My argument is that students will be more competent in their use of math skills, in both future math courses and real life experiences, if they have had some degree of environmental context with their instruction. Teachers have many issues to consider, some that have been popularized in the media, others which are less widely recognized. The primary decision about teaching math through the lens of climate change should be based on the immediate, valid issues of the school's environment, because students who learn from concrete example will have higher math proficiency.

(Developed for Algebra I, grades 8-9, and Geometry, grade 8; recommended for Algebra I, grades 8-9, Geometry, grades 8-10, and Algebra II, grades 10-11)

2009.07.06
Unconventional Transportation, by Laura Kessinger

Students will be introduced to the effects of human choices on the local environment through an analysis of data. We will look at methods of transportation, and their pollution outputs (air, liquid, and solid). They will use current data to analyze and predict future pollution.

With these predictions in mind we will begin exploring the atmosphere past, present, and future. Students will perform experiments regarding current energy resources. They will measure pollution outputs, and test effectiveness. Students will examine the most utilized nonrenewable resources and generate reports of benefits and costs of each.

After which they will research renewable energy sources. Students will examine these sources and debate potential challenges to each source. They will measure the pollution outputs of each. Finally in small groups students will use their knowledge of energy resources to create a low to non polluting transportation prototype to revolutionize the way in which we transport people, goods, and information. They will design, organize, and create a model of their prototype. They will calculate the pollution output of their vehicles, and predict the impact their machinery will have on air, water, and congestion pollution. Each group will also be responsible for creating a marketing campaign to sell their product.

The final results will be presented in an energy which will highlight our data findings, prototypes, and outputs.

(Developed for Math and Science, grade 6; recommended for Math and Science, grades 6-8)

2009.07.07
Energy, Climate, Environment: What's Plastic Got To Do with It?, by Doriel Moorman

This unit will have students take a look at the Earth from the perspective of before and after the Industrial Revolution that is said to be the onset of the global warming cycle. During the course of the unit the distinction between weather and climate will be established, students will gain an understanding of the climate system and its component subsystems, and take an in-depth look at weather, climate, and the natural cycles that impact them. Students will examine how a balanced system works and methods used for detecting an imbalance. Students will heighten their awareness of observable impacts of climate change including sea level rise, extreme events, and temperature and precipitation level changes. They will identify some of the contributing factors causing these changes. Finally they will consider plastic as a source of some of the contributing factors to climate change, as a pollutant of the environment, and as a cause of health related issues. Five environmental problems linked to climate change that will be explored include quality and availability of water resources, depletion of natural resources, degradation of land resources, reduction of marine ecosystems, and damage to food crops due to flooding and other extreme events.

(Developed for Enrichment Math and Enrichment Language Arts, grade 3-5; recommended for Elementary Language Arts, Math, and Science, grade 5, and adaptable for grades 3-4)

2009.07.08
Teaching Ecology Principles through the Study of an Ecosystem, by Valerie Schwarz

This unit is designed to teach principles of ecology and ecosystems by examining the Chesapeake Bay Watershed. This bay is the largest estuary in North America and is an amazing resource. Even if you do not live near the Chesapeake Bay, you can still use this unit in your class. The foundation in ecology is the strength of the unit. Some of the focal points are watersheds, food webs, pollutants, global warming, land use, invasive species and endangered species. It is important for students to learn to classify threats to the environment as physical, biological or chemical. However, the ultimate goal is to empower children to connect with nature, to care about their environment and to become stewards in their communities. The target audience is a fourth grade science class, but it could be adapted for use with middle school science students. The activities could easily be altered to teach an ecosystem anywhere in the world.

(Developed for Science and Social Studies, grade 4; recommended for Science, grades 4-5)

2009.07.09
Social and Cultural Shifts in the Wake of Climate Change, by Francisca Sorensen

This unit analyses four relatively strong civilizations both in the New World and the Old over the past two thousand years that weakened so much that their civilizations ended, became memory and eventually legend. There is ample evidence that their populations' use of the natural resources so stressed their fragile ecosystems that when the climate changed they were unable to continue with their lifestyles. We also make a comparison with the climatic shift that we humans have caused in our pursuit of progress' and the unwillingness of our industrialists and political leaders to recognize its magnitude. Therefore we analyze some of the evidence that global warming is already having on Houston and the Texas Gulf Coast wondering if the excessive modifications to the landscape in order to accommodate to the intensive demands of industry, agriculture, construction and urban demands will hold firm.

The lesson plans are designed to awaken in fifth graders and older curiosity about the planet Earth and its physical morphology, the different causes of climate changes, human's proper usage of natural resources. Woven into all of this is the effort to rouse in the students, an acceptance that we are part of the natural world and as such should strive to find sustainable ways to satisfy our real needs.

(Developed for Science, Physics, Biology, Earth Science, Social Studies, Geography, and Populations, grade 5; recommended for Science, Physics, Biology, Earth Science, Social Studies, and Geography, grades 4-12)

2009.07.10
Reduce, Reuse, Recycle, Oh My!, by Huwerl Thornton, Jr.

Do you know where your garbage goes? Do you know how much garbage the average person generates every day? Most people don't give these questions a single thought, but it is an important question if there is a concern about global warming and climate change. This unit focuses on the three R's: Reduce, Reuse, and Recycle. It looks at how this ideology can make a difference in what is happening on the planet. Students generally don't know or realize how the things that they throw away have an impact on the world they live in. Landfills are filling up and they create toxins called leachate that can potentially contaminate the soil and groundwater around them. Trash that is incinerated creates greenhouse gases that contribute to global warming and climate change. This unit will focus on having students reduce the amount of trash they generate by learning about where the trash goes and how it is dealt with. Students will also do experiments to simulate what happens in a landfill. This unit will work to educate students so that they change their habits of waste disposal so that they can in turn institute those changes at home.

(Developed for Science, grade 3)

2009.07.11
Learning Ecology through Endangered Species, by Cynthia Woolery

This unit is written to help students build an understanding of the effect that human population growth and human activities play in threatening the earth's habitat and capacity to sustain life. As students come to understand threatened and endangered animals and the causes behind why they are dying out, they will build an understanding of the interdependence of plants and animals and how humans change the often times delicate balance in ecosystems. In this unit students will go beyond basic knowledge to personal responsibility and action. I want to empower the students to become part of the solution to help save animals from extinction through doing something. It is not enough that students become acquainted with what happens when the environment becomes overpopulated and the use of resources increases. The goal is to have students see solutions and the part they can play in bringing about needed change! I want to raise student's awareness of how climate change affects all living things, ways that they can personally reduce global warming and become change agents for a healthier world!

(Developed for Elementary Science, grade 5; recommended for Elementary Science, grade 5)