Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2011

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Preface

In April 2011 the Yale National Initiative to strengthen teaching in public schools® accepted eighty-four public school teachers from twenty-two school districts in eleven states to participate in seven national seminars held at Yale. The Initiative is a long-term endeavor to influence public policy toward teacher professional development, in part by establishing exemplary Teachers Institutes in high-need school districts in states throughout the country. Following the approach developed in New Haven and implemented in other cities, Teachers Institutes are educational partnerships between universities and school districts designed to strengthen teaching and learning in a community's public schools. The League of Teachers Institutes® is an alliance that advances their work locally and nationally. Evaluations have shown that the Institute approach exemplifies the characteristics of the highest-quality teacher professional development, enhances teacher quality in the ways known to improve student achievement, and encourages participants to remain in teaching in their schools.

Forty of the teachers, named Yale National Fellows, were from school districts that have been exploring the establishment of a new Teachers Institute for Chicago, IL; DeKalb County, GA; Emeryville, CA; Richmond, VA and San Mateo County, CA. Superintendents of school districts that are participating in the Yale Initiative for the first time this year nominated teachers to become National Fellows from the Diné Nation; San José, CA; Tulsa, OK; and Washington, PA. Other National Fellows came from Teachers Institutes that are members of the League of Teachers Institutes® located in Charlotte, NC; New Castle County, DE; New Haven, CT; Philadelphia, PA; and Pittsburgh, PA.

The National Fellows attended an Organizational Session of the seminars held in New Haven on May 6-7. The seminars reconvened during a ten-day Intensive Session from July 11-22 and concluded in mid-August when the Fellows submitted their completed curriculum units. The seven seminars were on "Chemistry of Everyday Things," led by Gary W. Brudvig, Professor of Chemistry and of Molecular Biophysics and Biochemistry; "The Art of Reading People: Character, Expression, Interpretation," led by Jill Campbell, Professor of English; "Love and Politics in the Sonnet," led by Paul H. Fry, Professor of English; "The Idea of America," led by Bryan Garsten, Professor of Political Science; "Great Ideas of Primary Mathematics," led by Roger E. Howe, Professor of Mathematics, and assisted by Amanda Folsom, Assistant Professor of Mathematics; "The Big Easy: Literary New Orleans and Intangible Heritage," led by Joseph R. Roach, Professor of Theater, of English, of African American Studies, and of American Studies; and "Organs and Artificial Organs," led by W. Mark Saltzman, Professor of Chemical and Biomedical Engineering.

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 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 academic 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 its funding agencies.

James R. Vivian

New Haven

August 2011

I. The Art of Reading People: Character, Expression, Interpretation

Introduction

- Man is a social animal. The soul yearns with inexpressible longings for the society of its like. . . .
- William Godwin, *Enquiry Concerning Political Justice*, 1793

Writing more than two hundred years ago, the visionary political philosopher William Godwin could not have anticipated the rapidly-proliferating array of media and consumer products that would, in our own time, bear out his statements about humans' deep longing for contact and communication with other human beings: the cellphone as a prosthetic extension of many bodies, BlackBerries and iPhones, email, Twitter, text-messaging, Skype, Facebook and My Space, blogs, chat rooms, the nearly limitless capacities of the Internet to transmit communications across space and time. What extraordinary technological advances have been made in a short historical period to provide us with more and more means with which to make contact with "society" of our "like"; how eager individuals have been to invest funds, time, and energy to make use of the astonishing series of new devices and media that industries offer us at every turn. Surely our souls' "inexpressible longings" for companionship and society – our yearnings to know others intimately, and to be known by them – have been answered in our time.

"A quarter of Americans report having no close confidantes, double the number who reported such a degree of isolation in 1985. Today, most say they have just two people they can turn to for social support, compared with three in the mid-eighties," reports Maggie Jackson in *Distracted: The Erosion of Attention and the Coming Dark Age* (2009). "When we do come together," she asks, "especially with those we love, do we turn away? . . . Do we yearn for such voracious virtual connectivity that others become optional and conversation fades into a lost art?" Without holding our increasing reliance on "virtual connectivity" responsible for whatever erosion of true intimacy and communication may be occurring, as teachers devoted to promoting *literacy* in every sense, we must remark that no technology of transmission can replace or perform the work of human intelligence in receiving and interpreting the overt content and implicit cues contained in every act of communication.

Recently, cognitive scientists have demonstrated just how fundamental and extraordinary is the capacity of the human brain to register and "read" clues about other people's inner thoughts and feelings through facial expressions, physical attitudes, indirect implications, tone of voice or written stylistic cues, as well as through the semantic content of words. For most individuals, at a very early age, human faces prompt dramatic cognitive activity in a way no other visual object does; as a child grows, the ability to attribute states of inner feeling and thought to other people through what is observed is one of the most

complex and demanding areas of cognitive development. In the 2011 National Initiative seminar on "The Art of Reading People," eleven of us came together to explore the familiar but mysterious process by which people interpret others' characters, emotions, and experiences, and to identify the range of ways that we can encourage our students' self-aware engagement in that key process.

Our exploration of this subject took place simultaneously on several levels. The readings we prepared and discussed in depth and detail in seminar meetings particularly emphasized the ways that character is constructed and inner experience is represented in literary works; we honed our methods for drawing inferences and reaching conclusions about characters through literary analysis, and we considered how skills of inferential and interpretive reading can be cultivated in our students. Talking about our classrooms and our students, we often found our inquiry moving onto a pedagogical plane: again and again we observed that the challenge of grasping other people's ways of thinking and honoring the great range of individual human difference requires special self-awareness and resourcefulness in our work as teachers. First and last, at the most fundamental level, we experienced the mystery of other selves and the rewards of paying close, respectful attention in our encounters with each other: we came together as a group of strangers, our initial responses to each characterized by hopeful interest, wariness, curiosity, and a variety of preconceptions; we ended our intensive two-week session as respectful collaborators, fellow travelers, and friends – with new knowledge of our commonalities and of our important, and enriching, differences.

The group of outstanding units produced by seminar members, with its range of different emphases and aims, represents the several main dimensions of our work together. Several units focus strongly on developing the skills of literary analysis that will allow students to become more probing readers and thereby more able and confident critical thinkers. Stacia D. Parker's unit, devoted to studying characters from Kathryn Stockett's *The Help* and William Shakespeare's *Romeo and Juliet*, requires high-school students to move beyond routine methods for identifying character traits they may have mastered in earlier grades to pursue the subtle features that distinguish those remarkable literary characters whom we experience as "real," unique people – whether they appear in a novel published in 2009 or in a play performed more than four hundred years ago. Nancy Ventresca's unit, designed for fifth-grade Reading Enrichment students, moves them from fluency about a literary work's superficial features to deeper questions about characters' internal processes of change, awakening students to the mystery of how we interpret people's thoughts and feelings in literature and in life. Marsha Liberatore takes on the underlying, seemingly intractable problem of how to encourage students to read on their own rather than solely when they must do so to fulfill assignments. Cleverly, she approaches her paradoxical aim of creating required activities that will promote voluntary, independent reading through the attractions of a popular series for young adult readers: immersing students in the *Bluford Series* through shared reading and discussion of the series' first book, she will then offer them access to the many other volumes in the series for free-reading. An art

teacher, Elizabeth R. Lasure has woven together lessons in the study of literary character and exercises in the creation of visual portraits, leveraging the well-developed methods of literary character analysis to inspire a deeper, more creative appreciation of how visual portraits may reveal subtle inner qualities in their subjects.

In the units they have designed, Lori Hiura and Stephanie Murphy both seek primarily to build personal character in students through strategic encounters with literary works. As Lori Hiura observes, despite the availability of a number of well-designed character education programs for schools, a gap often exists between instruction in content curriculum and in character education. She aims to bridge that gap through a unit that combines a model for ethical decision-making with analysis of characters' choices and their consequences in songs, picture books, and a novel. A teacher of special day classes for students with moderate learning needs, Stephanie Murphy concentrates on developing a capacity for pride in her students, who often struggle with navigating social situations; her carefully-chosen sequence of readings introduces students to characters who are able to draw on pride and on the courage of their convictions amidst adversity or inner confusion.

Through their units, Audra Bull and Joy Beatty both hope to increase their students' capacities for self-knowledge. Drawing on evidence from the burgeoning field of neuroscience, Audra Bull contends that many students' apparent inability to learn derives not from the limits of their intelligence but from the effects of emotional trauma, which impairs their cognitive development and often sets in motion a cascading chain of effects, as they fall further and further behind and suffer academic and social marginalization. Proposing a "bibliotherapeutic" approach to intervene in this downward spiral, Audra Bull introduces the reluctant readers she teaches to characters who have suffered personal traumas and offers them a range of activities for reflecting on and sharing their own life stories. A geography teacher, Joy Beatty has designed a unit that aims at once to honor her students' distinctive home cultures (often rooted in neighborhoods or even specific streets); to make students more aware of the specificity of the values and customs they have adopted as members of those cultures; and to encourage them to become more open to other cultures – cultures that coexist within the bounds of Richmond as well as in the country and world beyond – by recognizing more consciously the features of their own "cultural geographies," which potentially both enrich and limit their lives.

All of the units developed by seminar members strive in some way to develop students' capacities for empathy and their skills for observing and comprehending the experience of others. Gretchen Wolfe's and Sarah Hall Kiesler's units focus particularly strongly on this aspect of our shared aims. Gretchen Wolfe cites evidence that well-developed reading skills and powers of empathy are strongly correlated in young people, and her unit simultaneously advances the development of both kinds of power in her first-graders, as they read biographies and approach historical characters as complex characters who made a difference in the world. A teacher of first- and second-graders, Sarah Hall Kiesler

addresses the same question of empathy but brings it closer to home for her students – that is, an elbow's length away – to the joys and frustrations of interacting with the child sitting in the next seat or converging on the same set of blocks. In a carefully designed sequence of picture books depicting friendships, Sarah Kiesler moves forward incrementally from direct to more inferential forms of observation of others' feelings and from simpler to more complex kinds of relationships. Drawing on her students' own experiences and evolving conceptions of friendships as well as cultivating their skills at observing facial and verbal expressions of feeling, Sarah Kiesler – like her colleagues in the seminar – seeks to prepare young people to make intimacy, communication, companionship, and a rich experience of giving and receiving social support real and present parts of their lives.

Jill Campbell

Synopses of the Curriculum Units

Year.01.01
The Other Side: Experiencing Cultures through the Eyes of My Students, by Joy Beatty

The essential questions for this unit are: How can I expose my learners to other cultures within their communities and within the United States? How can I awaken my student's subconscious prejudices in order to make them conscious and how can they confront them to overcome those prejudices, if possible? And finally, are sheltered learners more susceptible to accepting messages received from different media sources without questioning the integrity of the source?

By analyzing fictional and non-fictional readings, poems, and short films, students will address the nature of their prejudices as it may question their own cultural geographies and the cultural geographies of others. This unit will attempt to debunk misconceptions about what they perceive as different and will address how those "differences" can be seen as similar cultural traits that they share within their cultures. I will mainly focus on regions within the United States and by the end of this unit, students will be able to be aware of their prejudices and will be able to confront the origin of their prejudices. This unit also forces teachers to become more aware of how they teach sensitive topics, as it questions whether teachers are providing enough information to allow learners to form their own opinions.

(Developed for World Geography, grade 9; recommended for U.S . History /Social Science, grade 11; World History II/Social Science, grade 10; and World Geography/Social Science, grade 9)

Year.01.02
Are You Talkin' to Me? A Bibliotherapeutic Realization of Intelligence and Self-efficacy in Traumatized Adolescents, by Audra Bull

The year two-thousand fourteen quickly approaches, the year all public school students are to be performing at grade level as measured on state assessments. Yet, according to the 2009 NAEP (National Assessment of Educational Progress) report the reading level of fourth and eighth graders has only risen 4 points (on a 500 point scale) since 1992. Millions of dollars have been spent in an attempt to alleviate skill deficiencies, yet very little comparative time or money has been spent understanding the source of the deficiency and thus designing a strategy to address the deficiency at its origin. The background research of this unit seeks to explain what the deficiency is not, an inherent lack of intelligence, but rather explore what, for an alarming percentage of students, the deficiency is, a product of an emotional trauma which has left the mind in a stasis, incapable of measurable emotional or academic growth. This unit seeks to address the

emotional trauma of students using journal writing, collaborative grouping, and non-linguistic representation in a bibliotherapeutic approach. The goal is to begin an external and internal dialogue aimed at helping the child move forward emotionally and therefore clear a path for addressing the skill deficiency.

(Developed for Reading, grades 6-8; recommended for Language Arts and Reading, grades 4-12)

Year.01.03
You'll Stumble in My Footsteps: Character Traits, Choices, and Outcomes in Literature, by Lori Hiura

My unit focuses on bridging the gap between content curriculum and character education through various types of texts. This unit allows students to use both canonical and contemporary literature to recognize conflict characters face when presented with ethical dilemmas that have harsh moral, physical, emotional, and social consequences. Through lessons, discussions, and activities students will be able to apply what they have learned to decisions they have made in the past, and note the impact that decision had on their own personal character. This unit also covers the levels of judgment that people face when confronted with moral choices. Students will analyze where that judgment comes from and discuss why people judge others' decisions when they often don't know the real reasons for why someone made the choice he/she did. By the end of the unit, students will develop skills that will help them make choices that will better strengthen their personal character and give them the confidence to make and defend their decisions.

(Developed for English, Middle School grade 7; recommended for English, Middle School grades 6-8)

Year.01.04
Making Friends with Characters: Exploring Friendship through Literature, by Sarah Kiesler

Using a carefully selected progression of read-aloud texts, this unit is intended to cultivate in first and second grade students an ability to take another person's perspective – to consider what a person's actions, words, and reactions tell us. We will practice reading characters' facial expressions and words for clues as to how they feel. The texts included in this unit were selected because they offer students the opportunities to explore friendships between characters while at the same time considering implications for their own relationships. My hope is that the included activities will help them gain critical skills necessary to manage and repair their friendships when conflicts and misunderstandings arise. This unit will allow young students to not only to build empathy for the other people in their lives but also for the characters they encounter in literature.

(Developed for Language Arts, grade 1; recommended for Language Arts and Civics, grades 1-2)

Year.01.05
Approaching Portraiture: The Character on the Page and on the Canvas, by Elizabeth Lasure

In this unit we will focus on the mystery of trying to understand characters in literature and apply some of the methods we develop to create portraits in the visual arts. I believe there are some intrinsically natural and subtle ways we respond to characters in literature and that we recreate some of those same instincts when we look portraits. This unit is intended to help weave together these two kinds of study and ultimately produce the kind of portrait that allows for that mystery to be revealed with the subtlety that the written word so often creates. We will be exploring characters in our world, both real and imaginary, in an attempt to deepen our understanding of language and in some cases, bring us literally face to face with those who have lived, loved and died. It is my hope that this unit also brings into question for my students other concepts for understanding the function of art in our world. Is it *l'art pour l'art*, or must art serve a more severe moral or didactic purpose? Where does portraiture fit within this quandary?

Analyzing metaphors, tone, identity, place, and point of view is common practice in beginning to think about how we approach character studies in literature. When we read literature we often identify characters that are 'like us' in any number of ways. This can take us on a broad path of understanding ourselves and others if we consider closely the various devices the author may have (very cleverly) used to set this up.

Visual artists creating portraits must be able to move back and forth cognitively from the obvious physical characteristics to more abstract conclusions about what is observed (strength, intelligence, insecurity); and back again to the detailed observations that yield the abstraction (strained muscles, furrowed brow, slouching posture). It will be the goal of each assignment within this unit to capture (and communicate) the essences of a character students have met in a literary work through a drawing or painting.

(Developed for Studio Art III, IV AP, grades 11-12; recommended for Studio Art II, III and IV AP, grades 10-12)

Year.01.06
Reading Independently with the Bluford Series, by Marsha Liberatore

Independent reading is a struggle for students across many boundaries, regardless of age, sex, race or socioeconomic status. The purpose of this unit is to engage intermediate age readers as active listeners and encourage independent reading. The Bluford Series by Townsend Press is the selected series chosen for this unit. Using this particular series is

advantageous because it has the qualities to connect to various types of readers. Focusing on the lives of male and female protagonists is a way to entice male and female readers. The setting throughout the series is an urban inner city school. Many of the conflicts that are resolved are common situations that students deal with today. For these reasons, I felt that this series was appropriate for a sixth grade Response to Instruction and Intervention (RtiI) class. In ten days, the first book in the series will be read outloud to the class. Details of the main characters shall be developed with the use of informal discussions and activities. At the conclusion of reading and discussing the first book, other books in the series are available in the class for students to read.

(Developed for Response to Instruction and Intervention, grade 6; recommended for Academic Support and Response to Instruction and Intervention, grades 4-6)

Year.01.07
Taking Pride in Our Character, by Stephanie Murphy

Social issues arise with bullying, peers, family members, and authority during the middle school years. I want my students to have a voice and demonstrate integrity when faced with adolescent social challenges. In this unit, my students will read a variety of literary works with prideful and courageous characters that my students will both relate to and learn from.

This curriculum is created for a middle school special day class for students with moderate learning needs. The underlying theme of developing a sense of pride and self-respect is applicable, however, to all grade levels and abilities. Students will take an in-depth look at three literary pieces: "Little Things Are Big" by Jesus Colon, *Life Doesn't Frighten Me* by Maya Angelou, and *The Absolutely True Diary of a Part-Time Indian* by Sherman Alexie. The characters portrayed in each piece experience and overcome what my students experience often—a lack of social competence. The readings of these works, combined with reflective classroom activities, will show my students that they can rise above the most challenging social situations.

(Developed for Special Day Class, Language Arts, and Social Skills, grades 5-8; recommended for Language Arts, Social Skills, Character Building, grades 5-9)

Year.01.08
An Unforgettable Snapshot of Reading Character in The Help and Romeo and Juliet, by Stacia Parker

This unit will be taught in my 9th and 10th grade English courses. The goals of this unit are to teach students about characterization and character analysis in fictional and nonfictional texts and to discuss and dissect characters from the Deep South in the early 1960's and Elizabethan England. My English I course is an introduction to fiction and the

author's craft. Specific attention during the first half of the year is devoted to plot and setting, character, narrator and voice, and comparing themes. Of the aforementioned literary elements students in both 9th and 10th grade struggle the most with analyzing the methods a writer uses to reveal character. Therefore, this unit seeks to introduce various authors' techniques for developing characters via film clips, text excerpts, and audio presentations. Additionally, students need to build mental stamina for reading and deepen their comprehension skills, so short stories, primary sources, prequels, and translated versions of text are studied to accommodate struggling and proficient readers.

While character analysis is the specific focus of this unit our studies will also focus on critical thinking skills of evaluation and synthesis. To accomplish this task students will perform a series of writings that require them to research, interview, and adapt text to demonstrate their in-depth knowledge of multi-dimensional characters that they encounter before reading a complete novel or drama.

(Developed for English I/II, grades 9-10; recommended for Middle School Literacy, grades 7-8, and English I-IV, grades 9-12)

Year.01.09
Reading Between the Lines: The Secret Lives of Characters, by Nancy Ventresca

This unit was created for use with fifth-grade Reading Enrichment Students. These are students who are in the top 10 per cent of the grade level, based on a standardized reading test. My purpose for writing the unit was to encourage these students to be consistently critical in their reading, particularly in the area of character analysis. I chose a variety of literature pieces, including a short novel, a short story, video and a poem. The activities are individual and collaborative in nature, with a variety of choices for student products. Technology has also been incorporated for those who have access to it. The culminating activity requires students to synthesize all they have learned about character analysis and reading body language in a written piece.

Although I developed this unit with a particular group of students in mind, it can easily be adapted to other grade levels and readings. Appendices include suggestions for further research and alternative sources for literature.

(Developed for ELA Enrichment, grade 5; recommended for English/Language Arts, grade 5 Enrichment and grades 6-7)

Year.01.10
Taking a Role in History: Reading Biography with Empathy, by Gretchen Wolfe

Primary students frequently identify characters and their traits in the fiction they read. This unit is designed to expand students' understandings of character beyond the stories

they read to include a better understanding of others and themselves. The primary focus of this unit will be analyzing character while reading about four significant American historical figures using biographies. Character analysis enhances the reader's understanding of a character's actions and the events that occur in a story. By analyzing the character of a historical figure in a biography, the reader can construct a deeper understanding of the actions and motivations of the person as well as the significance of those actions on the events of that time in history.

The secondary focus of this unit is developing empathy in our students. One must empathize in order to achieve a deeper understanding of a person. While reading the biographies the children will participate in role-taking activities to develop their understandings of others. The children will read, write, draw, use graphic organizers, and role play to "become" the characters in history!

(Developed for English Language Arts, grade 1; recommended for English Language Arts, grades 1-3)

II. Seminar Title

Introduction

The topic for the Summer 2011 seminar was "Love and Politics in the Sonnet." This was one of a number of seminars I have offered in hopes that poetry-challenged teachers, and of course those too who love poetry, will become more comfortable with forms and literary terms that many if not all English teachers have to teach, if only to prepare their students for standardized tests.

The Fellows fully understood this objective and entered into it wholeheartedly. Almost from the beginning, they took an interest mainly in questions of form, especially the differences between the Petrarchan and Shakespearean forms and the way in which the structure of each determines where the turn of thought in the argument, or *volta*, can be expected. As we read more and more sonnets from the 19th and 20th centuries they came to realize that more often than not poets actually glide over the traditional points of transition (between the octave and the sestet of a Petrarchan, for example) often by enjambing lines, and introduce their turns of thought, if there is one at all, in an unexpected place. That was of great interest to those teachers who were interested in the ways poets revise, innovate against, or subvert traditional forms. They were especially alert also to the difference between the author and the speaker of sonnets, and the parallel difference between readers such as ourselves and the implied reader frequently addressed or hinted at within the poem.

These sorts of focus somewhat deflected us from the path I had envisioned, which was to trace something like a history of sonnet themes, love and politics (and the curious ways in which they stand proxy for each other) foremost among them. These issues came in and out of our discussions, but somewhat at hazard, and always in the context of formal poetic choices. This emphasis continued unaltered as we discussed more and more sonnets by under-represented and recent poets during the second week of the seminar.

Karen Kennedy fits the sonnet into her standard course in the history of African American literature by stressing that from the beginning (Lucy Terry, Phillis Wheatley), poets of color have written subversively under cover of using traditional, "white" forms and writing styles. Using Henry Louis Gates Jr.'s concept of "signifyin'," Kennedy traces a strategy that's as clear in Claude McKay as it was in Terry or Wheatley. Andrea Kulas too is concerned with the violation of conventions, and puts together a unit accordingly in which the sonnet is taught as a formal default that can then be contrasted with the departures from form in modern free verse. Kulas wants to bring out the ways in which form and its subversion almost demand each other and are engaged in constructive historical dialogue.

Two teachers will teach the sonnet as a form of expression to be mastered but also as it reflects topics in history and social studies. In his high school, Paul Landshof has the opportunity to teach both American history and American literature in depth, and proposes to use the sonnet, from Royall Tyler to Robert Lowell, as a means of reflecting historical change, not without attending too to divergences in particular periods such as that between Whitman and the Fireside Poets. Anjali Kamat, teaching a middle-school course in world cultures, will use the sonnet both to gain insight into the western European Renaissance, especially the rise of Humanism, and also to help show how the Renaissance differs from the Middle Ages. This focus will carry her very naturally from Petrarch to Shakespeare. She will acclimatize her students to poems by beginning with work by poets like Maya Angelou.

Razan Almiladi's unit I place here as a point of transition between units concerned with history and units concerned with the conduct and betterment of students' lives. Almiladi has a lively interest in Shakespeare's sonnets, and will begin her unit in fact by teaching the "sonnet" embedded in *Romeo and Juliet* as a dialogue between the star-crossed lovers. Her theme, however (in keeping with the seminar title) is love, and the ways in which that topic not only captures the attention of adolescents but can serve as a springboard for teaching decency in interpersonal behavior.

Intisar Hamidullah, our seminar Coordinator, teaches students of middle school age with learning and behavioral disabilities, students for whom attention must be paid in equal measure to learning the skill of reading and writing and learning the skill of getting along with others. She will teach the sonnet as a reading lesson, using before, during, and after reading strategies and emphasizing throughout the social and interpersonal lessons that can be learned from studying such poems. For her second-graders, Torrieann Dooley will use poetry as a topic in itself but also to teach topics such as science across the curriculum in a memorable way. Poetry has always been used as a mnemotechnical device, and will serve Dooley well in this regard. She teaches her students as much as she can about poetry and its forms but will confine herself for the most part to age-suitable poems that have conveying information as their purpose. Denise Hall wants students to find an authentic voice through reading and writing poetry. She is struck by the dullness of student prose, written according to formula as a rote exercise, and hopes that listening to and imitating to the liveliness of poets' voices, and attending in particular to the ways in which poets speak through speakers as though they were dramatic characters, will allow students to realize that writing prose as well as poetry can be an expressive medium.

Like Hall and Kamat in particular (but other teachers too hope to get this point across), Lori Wiley wants to emphasize the "concealed message" in sonnets, recognizing that part of poets' indirectness in this form results from their introduction of speakers and implied readers. Wiley's unit is organized to scaffold her middle-school students' understanding

of poetry, from simple and age-suited forms upward in difficulty to the traditional sonnet, with care devoted to the learning of formal features and their purposes.

Paul H. Fry

Synopses of the Curriculum Units

Year.02.01
Unfettered Genius: The African American Sonnet, by Karen Kennedy

This unit is designed for high-school students. It provides some history about formalist poetry in African American Literature, and focuses on the African American sonnet. The technique of "signifying," in which the author conveys two different messages to two different audiences using the same words, is the primary lens used in this unit. This technique is based on the trickster tradition, which was brought from Africa to America.

Two of the sonnet cycles discussed in this unit are Natasha Trethewey's "Native Guard," found in her collection of the same title, and Marilyn Nelson's *A Wreath for Emmet Till*. These sonnets take full advantage of the sonnet's history as a political forum, and use the sonnet's "cultural capital" to garner the interest and respect of a broad audience.

The first lesson will explore early African American poets' use of double-voicing, and introduce students to Shakespeare's sonnets through Maya Angelou. The second lesson will have students research African American soldiers in the Civil War and compare "classroom history" to Trethewey's poetic interpretation. The third lesson will begin with Nelson's sonnets about the lynching of Emmet Till, and will lead students to write original sonnets based on important historical events.

(Developed for African American Literature, grade 12; recommended for African American Literature and African American History, grade 12, and American Literature and American History, grade 11)

Year.02.02
Lyric Poetry: The Sonnet, by Andrea Kulas

In the 1947 article "Those Who Make Poems," Chicago poet Carl Sandburg challenged the status quo of poetry: "recently a poet was quoted as saying he would as soon play tennis without a net as to write free verse…The poet without imagination or folly enough to play tennis by serving and returning the ball over an invisible net may see himself as highly disciplined." The poet he referred to was Robert Frost, a serial practitioner of iambic pentameter. Like a highly skilled tennis player, Frost adhered to the conventions of traditional line and meter, proving his game on the international court by winning four Pulitzer Prizes for Poetry in his lifetime. Frost makes a good point, there is something to be said for those who adhere to the rules, but I would argue there is also something to be said about the deliberate choice to selectively challenge the convention. That is what this unit sets out to do — challenge conventional poetic form while taking it seriously before turning away from it. Most of the present unit is actually concerned with taking form seriously, but the turn to free verse will still be the point of the exercise.

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

Year.02.03
The American Sonnet: Barometer of Change in American History, by Paul Landshof

The American Sonnet stands as a uniquely resilient and chameleon-like form that has matured, endured, and morphed over two-and-a-half centuries of our existence as a nation. At every juncture, the sonnet has served uniquely through its requirement of compression. Whatever trends or crosscurrents of political conflicts, views, and repercussions may have been in the air, the sonnet crystalizes the state of American culture as few other forms can.

This unit covers the development of the American sonnet as a reflection of the American historical narrative, tracing it from its neo-classical roots in 18th century culture and its imitative character then to its blossoming during the American Renaissance as yet another indication of the growth of a distinct American culture (warts and all) that takes on the challenge of adapting an ostensibly anti-poetical, commercial population to a poetic form. Sonnets in the unit follow the subsequent path through the anxiety and tension of the second Industrial revolution and the compromises and leveling effects of modernity.

The sonnet's reflection of the changing voice of America (as well as its changing face), interjecting minority, immigrant, and feminine tones, topics, and nuance, provides students with an opportunity to determine which significant facts have changed and which remained constant in their contemporary American reality.

(Developed for English III, grade 11; recommended for English Language Arts, grades 11-12)

Year.02.04
Teaching History through Poetry, by Anjali Kamat

In this unit, students will become familiar with how to read poetry and learn how to make inferences about the historical circumstance of the poems they read. The unit, designed for seventh-grade students in a Humanities class that addresses both English and Social Studies standards, will help students gain a deeper understanding of the Renaissance through the study of the Shakespearean sonnet. The skills students will acquire during this unit will also help them understand how to make inferences about the speaker, reader, and historical circumstance when reading forms of poetry other than the sonnet. Students will begin with familiar forms of poetry before moving on to closely examine a selection of Shakespeare's sonnets and discover what is revealed through the speaker and

intended reader about the poems' cultural and historical circumstances. Students will develop the skill of making inferences from poems and then use those inferences to construct historical context, which they will compare with their readings from the history textbook. Finally, students will write a sonnet series of their own which will be discussed by their classmates.

(Developed for English Language Arts and History, grade 7; recommended for English Language Arts and History, grades 7-9)

Year.02.05
From Inquiry to Interpretation: A Passage through the Sonnet, by Razan Almiladi

This unit aims to explain how sonnets work and consider why students should read them. Among the many reasons why sonnets are so popular, their brevity and compactness of form is predominant. Sonnets are only 14 lines long and follow a regular iambic pattern. Owing to its powers of compression, the sonnet conveys an argument that seems to be resolved by the end of the poem. This is significant for my students because, as explained in the unit, they are very poor readers, writers, and without these basic skills—even thinkers! I want students to understand that they can actually read poetry, and hence chose the study of sonnets. One of this unit's objectives is to teach students life skills, which include the ability not just to think, but to think critically, which is a higher level of thinking. Students will develop strategies such as questioning the text. Through reading, writing, and inquiry, students will negotiate the challenges of the sonnet and acquire decisive, logical powers of thought.

(Developed for Survey of Literature, grade 9, and American Literature, grade 10; recommended for Survey of Literature, grade 9, American Literature, grade 10, and British Literature, grade 11)

Year.02.06
Teaching Reading Strategies through Lyric Forms: Politics and Love in American Sonnets, by Intisar Hamidullah

I want this unit to equip my students with strategies, skills and knowledge that they can apply across all content areas. I want my students to read challenging sonnets and be able to discuss them, question their premises, think through the problems they pose, and make inferences about what is happening in them. I also want them to understand why the development of interpretive skill is important for them, and this unit is meant to help them reach that understanding. Keeping the focus on sonnets, I will frontload information about the poem and background information about the poet. We will learn how to look for, identify, and interpret elements of figurative language in the poems we read.

(Developed for Middle School Language Arts, grade 8; recommended for Middle School Language Arts and Special Education [Self-Contained], grades 6-8)

Year.02.07
Sounds So Sweet, by Torrieann Kennedy

Poetry increases student capacity for being fluent and expressive readers who understand what they are reading. Poems will be used to create readers, writers, and thinkers who actively engage in what they read and demonstrate an understanding of it through a variety of approaches. Poems related to themes and standards across the curriculum will be used as tools for second-grade students to understand and learn what they are expected to know at their their grade level, as well as to enhance their character development. Giving elementary students an opportunity to become experts at poetry creates in them a life-long skill and love for reading, understanding, and reciting poems.

Students will read poems, annotate what they know and discuss what they don't know in order to understand the meaning of the poem. Students will learn metrical and rhyme schemes as well as other vocabulary associated with poetry, including the different forms of poetry. They will share and discuss strategies for understanding figurative language and will research background information in order to better understand and connect to what they are reading. Students will read a variety of poems and respond to them by writing poems of their own, using the poems they have read as models.

(Developed for Integrated across all elementary subjects especially Reading and Writing, grade 2; recommended for Language Arts, Reading and Writing, Science, Social Studies, and Mathematics Integrated, Elementary grades 2-5)

Year.02.08
Using the Sonnet and Other Poems to Unlock the Speaker's Voice, by Denise Hall

How can teachers assist middle-school students with understanding the speaker's voice in poetry? Strategies for understanding voice in poetry will be an integral part of this unit. The speaker's voice in poetry must be understood if the poem is to be understood. For example, when the student reads a poem, he or she should not assume that the writer of the poetry is also the speaker. In many poems, the speaker is someone else. The teacher can assist students with this task by providing rich poetry to students and allowing the students to unravel the poems to identify the speaker. Why is this so important? When students develop a voice in writing, that speaker's voice transcends their writing and also demonstrates their unique understanding of the topic. Middle school students often read a poem and believe that the person writing the poem is also the speaker; however, the author often invents a voice to speak through. Through the use and implementation of this unit students will be introduced, exposed to, and taught how to develop voice in writing.

(Developed for English/Language Arts, grade 8; recommended for English/Language Arts, grades 6-10)

Year.02.09
The Concealed Story, by Lori Wiley

The "Concealed Story" curriculum unit has been created for sixth-grade struggling readers with a basic knowledge of poetry. In this unit, students will become familiar with the various types of literary devices and figurative language along with learning the background, types and proper form of sonnets. All the activities in this lesson were created for teaching sonnets with the overall goal leading to the students writing their own. Since figurative language and literary devices are taught in many grade levels, I have not included lessons for them; however, the unit does include poems that could be used to teach each device. While this unit was developed for a specific group of people, many of the activities can be adapted as needed.

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

III. The Idea of America

Introduction

What has "America" meant to different generations of Americans? The diverse and talented group of teachers in this seminar explored together the various hopes and disappointments that have been found in the word and idea of America since the nation's founding. America has stood for principles and for power, for freedom and for imperialism, for opportunity and for disillusionment. We explored these questions by reading eighteenth-century founding documents, writings by Europeans visiting nineteenth-century America, speeches by presidents and by former slaves, and writings by and about immigrants. We noticed the image of "a city on a hill" and the idea of "manifest destiny"; we discussed the surprising connotations in the image of a "melting pot." We spent time thinking about the traditional ideals of freedom and equality and also about the ways in which those ideals have been, and remain, unrealized. We found that we came at the topic from different perspectives, and yet were able to create a shared conversation in which no one's identity was melted away.

One of the wonderful things you will find in this collection of curriculum units is a genuine diversity of perspectives and backgrounds. Our group included not only history and social studies teachers but also an art teacher, a language teacher teaching musical theater, and elementary school teachers thinking about younger children's needs. For those younger children, you will find here a unit that explores the symbolism and meanings to be found in images and objects that children see often but rarely fully understand, such as the American flag (Carol Boynton), as well as a guide to thinking about the Declaration of Independence for the first time and seeing how it protects the uniqueness of individuals even as it gives us something to share (Laura Turner). For students around the third-grade level you will find a tour of key Inaugural Addresses by presidents throughout history, complete with original "translations" into language that is more age-appropriate (Kathleen Gormley), and also an innovative use of historical fiction to explore the experiences of different groups of immigrants at different moments in history (Waltrina Kirkland-Mullins). High-school history and social studies teachers can find here challenging units on the debates surrounding the U.S. Constitution and the question of whether it should be amended again (Sonia Henze), on the international "exporting" of democratic ideas to other places through a whole range of policies, from the gentle power of example to more invasive and forceful initiatives (Amanda Joy Hatcher), as well as a creative use of hip-hop to draw students in to empathizing with the historical experiences of three different waves of immigrants (Rodney Robinson). Middle-school teachers will find here a detailed and compelling exploration of Andrew Jackson's life and treatment of the American Indians (Pat Mitchell-Keita-Doe). Finally, readers interested in the arts will find innovative units on the way that different understandings of America and its democratic principles manifest themselves in key moments of twentieth-century musical theater (Michael Husni) and in twentieth-century

visual artists' collectives (Emily Faxon). The collection of units as a whole is a potluck dinner to which everyone contributed – a real Thanksgiving feast. Enjoy!

Bryan Garsten

Synopses of the Curriculum Units

Year.03.01
Let Freedom Ring!, by Carol Boynton

We, as citizens, are exposed to a number of American symbols daily in our buildings, neighborhoods, and cities. Each of these American symbols has a story to tell.

Through a project-based approach, this unit helps students understand what patriotic symbols are and that our nation has many symbols and icons to represent thoughts, feelings, emotions, and physical objects. Appropriate for kindergarten through second grade, this unit allows students to experience American objects throughout the year by connecting them, in a timely way, to their own lives. The sequence will mirror the activities at school and around the community and country: understanding the flag and pledge of allegiance at the beginning of the school year, being aware of celebratory parades in October for Columbus Day and November for Veterans Day, decoding coins and currency in February for Presidents' Day, and additionally, finding out about the bald eagle, the Statue of Liberty, the White House, monuments, memorials, Uncle Sam, even postage stamps. Through this year-long learning experience, questioning and inquiry are their guiding stars and stripes!

(Developed for Social Studies, grade 1; recommended for Social Studies, grades K-3)

Year.03.02
American Ideas in Three Artist Collectives, by Emily Faxon

This research and unit of instruction connect art history and art-making to American cultural history and citizenship; the lessons are intended for a high school photography class. By providing historical background and classroom experiences of artistic collaboration and participation in an artist collective, I hope to instill a sense of their challenges and rewards, and to generate student thinking and dialogue about the influence of democracy and the importance of participation in the making of American culture. The unit of instruction addresses key issues of the research—the idea of an artistic revolution; the exercise of democracy in an artist collective; the problems of unequal status of the individual members of a collective and how social inequality influences the story of culture. Each of the three collectives in the research produced photographic work—as pure aesthetic study (in the case of Group f. 64), as documentation of performance art (Fluxus), or incidentally, as part of the graphic design of posters and billboards (Guerrilla Girls). Students will produce and critique photographs that reflect these expressive and functional possibilities of photography.

(Developed for Photography/Art, High School grades; recommended for Photography/Art, High School grades)

Year.03.03
My Fellow Americans…A Trip through American History via Presidential Inaugural Addresses, by Kathleen Gormley

In teaching third-graders history, it is important to make the past seem real, not some abstract set of facts that are read from books or heard from the adults in their lives. Students need to find a way to make connections to their own lives and the events that are occurring today, as one day these experiences will be woven into the history of America. I will help students make this connection as we create a classroom Constitution and each student writes an inaugural address. What message will they create to share with the nation of our classroom?

Concentrating on our history and civic standards, students will be introduced to the Declaration of Independence and the Constitution for the United States. After we interpret some major themes found in these documents, we will begin to read and analyze the Inaugural Addresses of selected United States Presidents. Using the presidential inauguration addresses, we will explore what the presidents have chosen to highlight as they address the nation. Are there any common themes? How, if at all, has the message changed as our nation grew?

(Developed for Social Studies, grade 3; recommended for Social Studies, grade 3)

Year.03.04
Exporting the Idea of America, by Amanda Hatcher

Is Democracy for everyone? Can a population of uneducated people perform the basic functions of a democracy? Should the United States be involved in assisting or promoting democratic movements around the world? Are human rights, equality and economic opportunity dependent on a democratic political system? These questions are not only central to understanding U.S. foreign policy, they are also necessary when analyzing modern political and philosophical movements globally. Recent democratic movements in Egypt, Libya and Tunisia highlight the dramatic changes in political structures and public opinion that have taken place in the last fifty years. Our students need to be able to analyze their own country's involvement in these political revolutions to determine how and when to spread American ideals and values, now and in the future. This unit gives the teacher a background for the causes for expansion of the U.S. from 13 colonies to the Continental U.S., as well as a basis for understanding U.S. policies of global intervention in spreading American ideals of Democracy. This unit is designed for period six of the college board's advanced placement world history course and contains both an AP style Comparison Essay and Document Based Question.

(Developed for World History and AP World History, grade 10; recommended for World History [General or Advanced Placement], grades 10-12)

Year.03.05
Reviving American Ideas: The U.S. Constitution, the Anti-Federalists and the 28th Amendment, by Sonia Henze

Have you ever wished you were present at the signing of the U.S. Constitution? Would you seek to create a "more perfect union" or an entirely new political system? Who would you want to decide the fate of the nation? What issues would you debate? Which government model would you want to effectively promote the ideas of America?

This curriculum unit will enable students to understand how the ideals in the Declaration of Independence shape the political framework of the U.S. Constitution. I hope to inspire students to engage in democracy throughout the unit. The goal is to have students see the need for more democratic ideals in our current American political system. American citizens need to make the government more accountable and responsive to those who give consent: the people. Although a new Constitutional Convention seems too complicated for the American political system today, acknowledgement will encourage the next generation to get involved in *their* government. Once the youth take an active role in local, state or federal government they determine what is at stake. Without popular sovereignty, the U.S. government loses legitimacy.

(Developed for AP U. S. History, grade 11; recommended for AP U. S. History and AP U. S. Government, grades 10-11, and Civics, grades 9-12)

Year.03.06
American Musicals, American Freedom, by Michael Husni

In this unit, students will investigate the idea of freedom in America as represented in twentieth-century American musicals. The focus of this unit is to investigate different points in American history and how musical theater contributed/responded to the concept of freedom at each point. This unit highlights four examples of socially relevant musicals chosen specifically for their reflection of an evolving sense of freedom. *Oklahoma! looks at the use of nostalgia during World War II as an attempt to find a lost American ideal of the pioneer.* West Side Story investigates the presence of racial prejudice in order to understand the role of inclusion versus exclusion in America. *Hair challenges the notion of authority in an attempt to establish a more widespread sense of individual choice.* Urinetown problematizes consumerism and whether there should be limits to freedom. Overall, this unit aims will equip students with analytic skills that connect theatrical works to their historical contexts. Student will eventually produce their own mini-musicals that stage the freedoms they feel are relevant to their lives, using the analytic skills acquired to better understand their own place in history.

(Developed for Fundamentals of Acting I, grades 9-12; recommended for American History, English Language Arts, and Theatre/Drama, grades 9-12)

Year.03.07
American Tapestry: Interconnectedness Revealed through Historical Fiction, by Waltrina Kirkland-Mullins

America! Our nation is a complex mosaic of people across race and ethnicity whose lives are more times than none interwoven. Their interactions and/or contributions to the American framework are worth recognition. By learning about the experiences of diverse racial and ethnic groups within our society, we gain better insight into the American mosaic. Equally important, we learn to embrace one another as members of the American community. Literary resources across genre coupled with classroom instructional practices, however, reveal that complex aspects of our history are rarely delved into or acknowledged. Rather, the experiences of diverse racial and ethnic groups are often marginalized and/or excluded from courses of study—particularly in the primary grade levels. How do we create an inclusive learning environment where "uncomfortable" subject matter rooted in our country's history can be taught? In an effort to help young learners develop a true understanding of the American mosaic, should we make use of historical fiction to convey this—particularly at the elementary level? I contend "yes." Thus, the reason for my curriculum unit, "American Tapestry": targeted at students in Grades 3, but modifiable through Grade 5, this unit uses historical fiction to take students on a journey to the mid-18th through mid-19th century, where they experience the lives of a few common folk from diverse cultural backgrounds who possess a common vision: to thrive and live free in America.

(Developed for Social Studies/Language Arts, grade 3; recommended for Social Studies/Language Arts, grade 3 [modifiable to grades 4-5])

Year.03.08
An Opportunity for All? Andrew Jackson and the American Indian, by Patricia Mitchell-Keita-Doe

When the first Englishmen arrived on these shores they brought with them certain ideas and notions about freedom and liberty and just who can and cannot enjoy the benefits of such. These ideas soon became part of an "American " conciousness, and when projected upon people who held their *own* ideas and beliefs about the order of the world and how things worked, conflict was the result. Those ideas of superiority became codified into federal government policies, especially under Andrew Jackson, and the results were loss of millions of acres of Indian lands, life-ways, and sometimes, children.

During this unit students will read and analyze selected texts, images and other primary source documents. Students will decide whether Andrew Jackson is a hero and take a

stand to support their findings. I have incorporated film and a father's letter concerning his son. My unit is written for eighth grade.

(Developed for Social Studies, grades 7-9; recommended for Social Studies, grades 7-9)

Year.03.09
The Hip-Hopcracy of America, by Rodney Robinson

This unit will be an examination of American Ideas through the expression of the hip hop culture. Students will generate spoken word poetry, street art, and rap music samples based on the ideas of America at the turn of the eighteenth, nineteenth, twentieth, and twenty first centuries through the eyes of the various immigrant groups that were streaming into America during these time periods. The students will examine the motivations of these immigrants to come to America, and compare their expectations to the reality they faced when they arrived.
The unit will be taught at three separate points throughout the year with the same theme in US History, Immigration and the Idea of America. Each time period will be examined through primary sources available in books and at local libraries and newspapers. Once the students have a general understanding, they will create a hip hop interpretation of the immigrants' thoughts and experiences as they try to survive in America. Each unit will have the same rules and design; the only difference is that a different group and the challenges each faced will be examined each time the unit is taught. The three groups of immigrant experiences that will be examined are African-Americans during the 17th and 18th centuries, Italians during the late 19th and early 20th centuries, and Mexican immigrants during the late 20th and early 21th century.
(Developed for Virginia/U. S. History, grade 11; recommended for U. S. History, grades 6-12)

Year.03.10
The Declaration of Independence: Still Inspiring Americans to Fight for Freedom!, by Laura Turner

What unifies us as Americans? The philosophy of the Declaration of Independence does. In this unit, second-graders will recognize how each of them is a unique American and how the ideals of the Declaration of Independence unify them with every other American. Students will understand important phrases in the Declaration, identify where America is on a map, and compare and contrast the lives and actions of Americans who have used the Declaration to gain rights for American citizens who at one time were denied equality and/or liberty. The curriculum provides a concise history of events leading up to the signing of the Declaration of Independence. It also provides details on the lives of Martin Luther King Jr., Barack Obama, Cesar Chavez and Jane Addams as examples of famous Americans who have used the promises made by the Declaration to gain rights for all Americans.

(Developed for Social Studies/Writing, grade 2; recommended for Social Studies, grades 2-3)

IV. The Big Easy: Literary New Orleans and Intangible Heritage

Introduction

The curriculum units that emerge from "The Big Easy" reflect the intellectual, cultural, and pedagogical diversity of the teachers who wrote them. Their unity of spirit, however, comes from a common sense of purpose. Expressed differently by each teacher, that purpose is to heighten his or her students' awareness of the special character, history, beauty, imperfection, fragility, and promise of the place where they live by comparing it to one that they can for the most part only imagine – New Orleans, Louisiana, "NOLA," as it continues to live in memory, struggle in reality, and flourish in the imagination. Not every curriculum unit that follows here makes particular reference to NOLA, but none could have been conceived in the same way without awareness of it. It is one of those cities, as Andrei Codrescu puts it in *New Orleans, Mon Amour* (2006), where the official language is dreams. But dreams, we discovered, are spoken in many languages and in a variety of places. In addition to New Orleans itself, the places that come to special life in the following units include Tulsa, Oklahoma; Chicago, Illinois; Richmond, Virginia; Mexico City, the Diné Nation; and various loci in the Bay Area, California. In our work together, we did not insist on an official language, the same for every multilingual locale, just so long as each of us could speak in dreams.

The seminar derived its materials and approach from the premise that the allure of a strange place will highlight the magical as well as the nitty-gritty qualities of a familiar one. Representing the past of the Crescent City and re-envisioning its future, imaginative literature and popular culture have traditionally generated the idea of "New Orleans" in the minds of readers, listeners, and viewers world-wide, and, now more than ever, it is being generated by the city in turn. The terminology we used in the seminar – including "deep time," "map of desire," "map of memory," and above all "intangible heritage" – originated in this tragic but inspiring fact of our recent and not-so-recent history. Post-Katrina writing about New Orleans coincides with the global initiative of the Cultural Division of UNESCO on "Intangible Heritage," which identifies "world heritage sites" – places and practices so important that they belong not solely to the people who live there but to all "all humankind." According to the Web site of the Cultural Division of UNESCO, intangible heritage includes "oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe, and knowledge and skills to produce traditional crafts." Prior to listing works of Intangible Heritage as worthy of special preservation, the Cultural Division of UNESCO further stipulates that they must meet four general criteria. They must be 1) traditional, contemporary, and living at the same time; 2) inclusive; 3) representative; 4) community-based. New Orleans is famous for producing these and other related cultural phenomena in abundance, and literary works have just as famously taken them up as objects of representation, especially today, in light of the city's obvious vulnerability and its equally obvious tenacity. While it often is true, we decided, that people don't know what they

have until they come face to face with losing it, we also concluded that such a fate is not inevitable. Appreciation is not simply a gift, but a skill that can be well learned when it is well taught, especially when the tangible objects of appreciation only mark a landscape inhabited by more elusive ones.

Thus "The Big Easy: Literary New Orleans" explored the intangible sources of creative inspiration that writers and other artists find in NOLA, including its cultural mystique, its colonial history, its troubled assimilation into Anglo-North America, its tortured racial politics, its natural and built environment, its spirit-world practices, its raucous festive life, its eccentric characters, its food, its music, its predisposition to catastrophe, and its capacity for re-invention and survival. Our readings and viewings included novels, from John Kennedy Toole's *A Confederacy of Dunces* to Josh Neufeld's graphic novel *A.D* (2009), the poetry of Brenda Marie Osbey, and a special unit on Teaching The Levees*: A Curriculum for Democratic Dialogue and Civic Engagement* (Teachers College of Columbia University and the Rockefeller Foundation). We documented Mardi Gras Indian processions as well as debutante balls, and shared artifacts from beads to a well-used "voodoo" doll (deactivated).

The first four units concentrate explicitly on New Orleans literary history, material culture, and performance. Patrizia Mauti's *"La Francophonie,* beyond the Hexagon," designed for AP French Language, grades 11-12, at Avondale High School (Georgia) explores the works of the francophone poets known as "Les Cenelles" ("The Hollyberries"). The writers in this group, emerging from the educated ranks of Louisiana's "Free People of Color," joined forces under the direction of Armand Lanusse to publish the first anthology of poetry by African American poets, *Les Cennelles* (1845). Mauti has planned her assignments from this historic volume to include the oral recitation of the poems, which treat themes of love and daily life in a context that subtly evokes the troubled society of the authors. The language of the poems is accessible, direct, and affecting. The voices of the poets are haunting and elusive, however, providing a crux for nuanced interpretative performance as well as confidence-building explication. Costume-designer Barbara Wesselman's "Feathers and Beads: Exploring Culture through the Mardi Gras Indians" is created for performing arts students at Northwest School of the Arts (North Carolina). She targets students in Costume Design and Apparel Design/Development with shout outs to Math (measuring the fabric, counting the beads, paying the bills), U.S. History, and Civics. The Mardi Gras Indians – African Americans who identify themselves with Native Americans and parade through the back streets of NOLA in heart-stoppingly beautiful hand-sewn suits – speak a language of costume all their own. Wesselman translates that language into terms that students literate in fabric and thread can understand, with the metaphor of weaving descriptive of cultural expressions of all kinds.

As the introductory reading for the seminar, Dave Eggers' *Zeitoun*, the non-fiction novel about an Arab-American contractor and his family caught up the paranoid aftermath to

Katrina, provided an intellectual and emotional touchstone for all our subsequent discussions. As the world he knows turns upside-down, Abdulrahman Zeitoun re-discovers his city, the Crescent City, as a microcosm of the United States, but he re-discovers it as map of the cruelly unfamiliar superimposed on the neighborhoods he knew like the back of his hand. In this critical but ultimately inspirational spirit, Stephanie M. Schaudel' s interdisciplinary "New Orleans: Human Gifts, Human Lessons," which is designed for Social Studies and Earth Science (9-12, Oceana High School), asks her students the question that Katrina starkly posed to all of us: What is "Natural" about "Natural Disasters"? In "Strange Fruit: An Exploration of Imagery and Socio-Politics of Post-Katrina New Orleans," Amanda Davis-Holloway is making a civics lesson out of this humanitarian crisis and its aftermath for her classes in English for students with special needs in Richmond (Armstrong High School).

Although "The Big Easy" focused on New Orleans as an example, the concept of "Intangible Heritage" is portable, and the methods of identifying and interpreting it can be applied to other places and peoples – around the world and close to home. Using NOLA as a point of departure, we worked with the idea of two maps: "Flat and Pop-Up." The first is the (2-D) physical map of the place – its geography, its environment, its urban or exurban plan, its historic development, and its current spatial reality. The second map is the intangible one that authors and readers create and carry in their heads and in their hearts – conjuring up the memorial associations, the special locales, the secret landmarks, and the unique behaviors that make a place "traditional, contemporary, and living at the same time." This is the map of dreams, which "pops up" the past into the imaginative future of a place. It can be a map of nightmarish fear (well-grounded as well as paranoid), but it also can be a map of hope, and sometimes both at the same time.

Exemplary of the seminar's comparative methodology, Andrew Martinek's "Intangible Space and the Map of Desire in the Gage Park Neighborhood" (Chicago) builds a unit of 9th grade AP Human Geography into an intercity dialogue between Gage Park and the Desire section of NOLA. Teaming with a partner at George Washington Carver High School in New Orleans, which, like Gage Park, remains a traditional public high school increasingly isolated in a rising tide of charter schools, Martinek has literally mapped out walks and ethnographic tours for his students, who will share their findings with their collaborators in NOLA, who will reciprocate with "pop-ups" of the Desire neighborhood (about which suffice it say that the streetcar service there ended in 1950). Connected by Skype and speaking to one another (and potentially to any other GoogleMap-user) via cartographic postings and ethnographic reportage, the students will discover the magic of both the streets they imagine and the streets they walk every day. Similarly, Matthew Kelly's grade 11-12 Spanish and AP Spanish unit at Independence High School, "The Scene of the Crime, Mexico City: Performing History in the Language Classroom," invites the students to imagine the sites of two massacres, perpetrated centuries apart, as an urban palimpsest of cultural history. Kelly also plans to get his students on their feet by scripting scenarios of the historical events and acting them out in Spanish, echoing

Mauti's strategies in AP French. Jeffry Weathers (Westmoor High School, 11-12th grade Film as Literature) pushes off from NOLA to find the wonderful and the strange in a neighborhood that is satirized in song for its culture-less monochrome. He proposes to look inside "the little boxes, on a hill side" and see what is really inside today.

Molly Myers, in "Mind the Gap: Planting the Seeds of Cultural Awareness" (Lindblom Math and Science Academy, 9th-grade Human Geography), has envisioned a different kind of ethnographic project for her students in Chicago. She will introduce her students to the ethnic neighborhoods that define a complex map of human difference in the city and traverse the South Side where she teaches, but she will do so by leading them to a self-reflexivity about their own subject positions and identities. Barbara Prillaman (Conrad Schools of Science, 6th-grade Social Studies/Geography/English) will bring her students to a deeper understanding of the homes they have left behind to migrate to the United States by taking them along with her on a remembered journey of her Peace Corps years in South America. Hers is a project of preservation, but not of a physical environment. Rather, what is to be preserved is the hearts of her students, many if not most of whom will never return to the country of their births. Similarly, Mika Cade (Emery Unified District (9th-grade English/Social Studies) stresses cultural heritage and resiliency in her unit "Performing Resilience: The Study of Culture and the African Diaspora through Literature and Dance." Her medium of choice is embodied memory, using the methods of dance history and performance studies to ask her students where they are coming from – as evidenced by the dances they are dancing, live and on celebrity YouTube videos. She uses Ishmael's Reed's evocation Jes Grew from *Mumbo Jumbo* as a touchstone.

Two final units summarize the methods and approach of "The Big Easy," one in the urban palimpsest of Tulsa, Oklahoma, the other in the "deep time" of the Diné Nation. Shanedra Nowell has created "The 1921 Tulsa Race Riot and its Legacy: Experiencing Place as Text" for her 9th-grade Human Geography class at Edison Preparatory High School. Dividing her subject into the analytic rubrics of Pretext, Plaintext, Intertext, Subtext, and Context, she tells the long -suppressed story of the 1921 massacre known as the "race riot." She will walk her students through the past that is missing and assumed dead and the past that is still present through the searing photographs, memorial plaques, and memoirs of that historically defining but not ultimately definitive event. Finally, Marilyn Dempsey, in "The Intangible Heritage of the Diné," takes her students (and all of us who hear her speak and read her curriculum unit are her students) through the deepest investigation of all: sharing with her Diné students everything that she can tell them about their intangible heritage, so that they will sustain it by passing it on to their children, she is generously willing to share with the rest of us all of this inspiring heritage that is proper for us to hear.

Joseph R. Roach

Synopses of the Curriculum Units

Year.04.01
Performing Resilience: The Study of Culture and the African Diaspora through Literature and Dance, by Mika Cade

This unit uses literature and dance to explore culture, the African diaspora, and students' resilience. Two non-traditional texts are used, Ishmael Reed's *Mumbo Jumbo* and an Oakland, CA based hip-hop dance style called TURF dancing (Take Up Room on the Floor). The reading of *Mumbo Jumbo* will mainly be a character study of Jes Grew, a "virus" spreading across the U.S. and causing people to dance. We will study Jes Grew as a part of the African Diaspora and an example of resilience. Students will then use the same analysis to explore TURF dancing. As a final project, students will need to answer the question, "How does culture support the resilience of people and community?" They will answer this question through a self-created project in which they explore their own resilience, keep a journal, write a final essay, and participate in a student-created performance. Specific skills addressed are close reading, narrative writing, and a study of metaphor, personification, character, and theme. This is designed for my 9th grade English class but can easily be modified for higher-level English classes.

(Developed for English, grade 9; recommended for English and Social Studies, grades 9-12)

Year.04.02
Strange Fruit: An Exploration of Imagery and Socio-politics of Post-Katrina New Orleans, by Amanda Davis-Holloway

The essential questions for this unit are: What makes one a citizen and what happens when the government fails citizens? Why does the government fail them? What role should the government play in the wake of natural disasters? How do political dynamics affect public policy decisions?

Through an exploration of imagery, film, socially-conscious literature, and discourse, the students will examine the factors that contributed to the unnatural disaster that occurred post-Katrina. They will use graphic organizers and cooperative reading groups as described in the unit, to discuss the differences between political and humanitarian responses. Further, the students will investigate the idea that humanitarian crises that are exacerbated by public policy are unnatural and that due to the mismanagement of federal, state and local governmental agencies, thousands of residents of New Orleans were displaced, traumatized, or lost their lives after the levees broke.

The strategies in this curriculum unit will be integrated into the subjects of reading, writing and social studies and will be taught over the first quarter of the school year,

starting with the very beginning of the year by encouraging students to develop into engaged citizen-learners. The unit is recommended for English 11, U.S. History or Government classes.

(Developed for English, grade 10M; English, grade 11M; and Reading, grades 9-12; recommended for English, grades 10-12; U. S. History, grade 11; Government, grade 12; and Reading, grades 9-12)

Year.04.03
The Intangible Heritage of Diné, by Marilyn Dempsey

The focus of this unit is developing self-identity through learning oral history of Diné. The origin of Diné is the foundation of Diné oral history. There are two traditional oral historical accounts in the unit. First is the origin of Diné. Second is the origin of traditional Diné clans. These historical events guide the cohesiveness of the people even today. Understanding the origin of where one comes from affects the outcome of one's life. Many of the Native American Diné youth today have an identity crisis because of not having the "correct" knowledge of their people's past. The western history textbooks tell a Western perspective of Diné history. Diné tell its own history past from generation to generation. This is a part of the Diné heritage that is intangible. The events in the history are used to convey traditional teachings for Diné youth to develop their self-identity. With a positive self-identity students are able to face challenges in a multicultural society beyond the borders of Diné Nation. Students use second language strategies, vocabulary development, and teacher modeling that will develop an understanding of the importance of oral history in relation to self-identity as they learn to tell their personal history. Students will also be key individuals to maintaining Diné language for future generations.

(Developed for Diné Language and History, grades 5-8; recommended for Middle School Native American Culture classes, History, and Social Studies, grades 6-8; and Elementary Social Studies, grades 4-5)

Year.04.04
The Scene of the Crime, Mexico City: Performing History in the Language Classroom, by Matthew Kelly

In this unit aimed at upper and intermediate learners of Spanish, students will investigate two massacres committed in Mexico City 448 years apart: the 1968 massacre at the Plaza de las Tres Culturas at Tlatelolco and the 1520 Toxcatl massacre at the Main Temple of Tenochtitlán. In each case, they will work back through successive layers of the historical record to get back to the primary sources. Once they have read and interpreted primary sources for these events, they will interpret primary source documents through performance in the target language.

Through performance students will have an opportunity to engage with and experience culture in the target language with an emotional immediacy and sense of communal participation very often absent in the upper grades. Grammar and vocabulary, rather than ends in themselves, become tools for the students to access and express the literal meaning and emotional content of the texts. Students will develop a more dynamic sense of culture by exploring the ways in which watershed historical events shape societies. Working backwards through the historical record, working with primary texts, students will see how the historical interpretation of events is dynamic, shifting as evidence is brought to light or discredited.

(Developed for Spanish IV/World Languages, grades 11-12; and Spanish III/World Languages [portions, with modification], grades 10-12; recommended for Spanish IV/World Languages, Spanish V/World Languages, and Advanced Placement Spanish, grades 11-12)

Year.04.05
Intangible Space and the Map of Desire in the Gage Park Neighborhood, by Andrew Martinek

In this unit, the goal is to have students apply their study of geography and culture to themselves, their neighborhood, and an unfamiliar neighborhood adding interest and relevance to their learning. To help students broaden their horizons in this manner, we will partner with a class in another part of the country. In this instance, we will partner with a class at George Washington Carver High School in New Orleans. We will have our students communicate with each other throughout their examination of their neighborhood heritage. First they will share their biases about their own and each other's communities. Then they will share research strategies. Finally, they will share and inquire about each other's research findings. To do this comparative study effectively, students will examine the work of geographers who utilize this technique. To gather and report data for this project, students will take neighborhood walks and conduct ethnographic interviews of community members. We will examine both the tangible and intangible spaces of our neighborhood and report our findings in multiple ways. Students will post their interviews and final reports to the Community Transformed website and submit suggestions for pop-ups to Google Maps.

(Developed for AP Human Geography, grade 9; recommended for AP Human Geography, World Studies/Cultures, and Geography, grades 9-12)

Year.04.06
La Francophonie, beyond the Hexagon, by Patrizia Mauti

Examined through an interdisciplinary study touching upon geography, history, literature and language, a selection of authentic works from New Orleanian poets known as *Les*

Cenelles, will serve as a spring board for students of AP French to improve their reading comprehension skills, and to broaden their understanding of the Francophone world with boundaries stretching far past the borders of France.

Focusing on the French influence in Louisiana, we will endeavor to integrate the three modes of communication: interpretive, interpersonal, and presentational, while developing cultural perspectives, and connections. This unit lends itself well to performance-based student assessments; *de rigueur* in Foreign Language pedagogical circles. The interpretive phase of communication is the study of a text written by native speakers, intended for native speakers. Students will interpret, analyze, memorize and recite some poems from this anthology while gaining insight into the social predicament of the francophone, American poets who penned it. This group of nineteenth century *personnes de couleur libres*, produced the first anthology of African American verse ever published in the United States, carefully navigating the paradoxes thrust upon them because of their caste – not completely black or white – and in defiance of the racial ostracism they battled in antebellum New Orleans.

(Developed for AP French, grades 11-12; recommended for French IV Honors and AP French, grades 11-12)

Year.04.07
Mind the Gap: Planting the Seeds of Cultural Awareness, by Molly Myers

"We see things not as they but as we are." This paraphrased quote from the Talmud perfectly captures the idea of cultural lenses. Our surroundings, both natural and man-made, have added layers upon layers of assumptions that rise out of us as truths. The purpose of this unit is to prepare students for a unit where they enter the cultural neighborhoods of Chicago as ethnographers. In order to achieve some measure of objectivity as ethnographers, students must first try to identify the origins and reasons for their deeply held beliefs. This unit was written for an AP Human Geography course that addresses culture, religion, and identity. Through reading, thinking, discussing, and writing, students will begin to separate themselves, if only for a moment, from their kneejerk responses. In that space of separation, students will realize that all such understandings are chosen and can begin to choose that which fits with the person they want to be.

(Developed for AP Human Geography, grade 9; recommended for AP/Honors Human Geography, Global Issues, and Psychology/Sociology, High School grades)

Year.04.08
The 1921 Tulsa Race Riot and Its Legacy: Experiencing Place as Text, by Shanedra Nowell

In this unit on the 1921 Tulsa Race Riot, students will gain a new understanding of their city by exploring its past, present, and future through history, local narratives, art, monuments, maps, and museums. Designed for secondary social studies courses, the unit tells the story of the Tulsa Race Riot and offers new meaning to the phrase "place as text" by walking students through: Pretext (Tulsa's beginnings), Plaintext (one tale of the riot), Intertextuality (multiple perspectives of the riot), Subtext (the social climate of the 1920s), Context (visiting Greenwood, where the riot took place), and Creating Texts: Maps of Desire and Civic Action (taking up the charge to change the city). Using collaborative learning activities, teaching analysis skills, writing, and field studies, students will gain a new perspective of Tulsa, see its intangible heritage, and understand its long-standing racial divide. With their newfound, expanded knowledge of the city, students can take up the challenge to change their city through civic action projects and economic development plans that create more equal opportunities for all Tulsa citizens.

(Developed for High School AP Human Geography, grade 9; recommended for High School Oklahoma History, U. S. History, Geography, and Current Events, grades 9-12)

Year.04.09
The Responsibility Is Ours: Preserving Intangible Heritage, by Barbara Prillaman

In this cross curricular (social studies/geography and English) unit, adolescent English Language Learners capture/learn/appreciate the uniqueness of a place — of their home country mdash; a place to which they most likely will never return. I argue it is their responsibility to preserve the intangible heritage of their homeland for themselves and their families so that it is not forgotten. Students will read literature that highlights the uniqueness of New Orleans as a model to inspire two sets of writings (1) descriptive pieces that demonstrate the uniqueness of *their original place*, their homeland and, (2) where they are now. The author's personal Peace Corps journal entries also will serve as a model for students to see the cultural aspects including the good and the bad physical and human characteristics of a place still provide for a loveable place. It is essential for them to understand that space can be crafted. They have agency in defining their place. In doing so, they will have opportunities to focus on these two places and to develop their writing skills in English.

(Developed for ELL Social Studies, grade 6; recommended for Middle School Social Studies Courses - benefits ELL/ESOL students but could be modified for all middle school students, grades 6-8)

Year.04.10
New Orleans: Human Gifts, Human Lessons, by Stephanie Schaudel

How "natural" are "natural disasters"? I'll explore numerous questions with New Orleans and Katrina as the case study for the ninth-grade interdisciplinary science and humanities Natural Disaster Project, but this one is the central one. Students will get to know New Orleans in terms of its unique and rich culture, economy and geography. They will *complexify* the meaning of "natural disasters" as they learn just how much the suffering of a significant population of New Orleans was rooted in the decisions of federal, state and local power holders before and after Hurricane Katrina. Students will deepen their knowledge and understanding of U.S. history, of colonization, resistance and reemergence by getting to know New Orleans: some of the past inspiration it has provided people and the current sources of resilience and questions which NOLA pushes us to wrestle with today. Examining points of New Orleans' "intangible heritage," I hope will lead all of us to explore the intangible heritage that exists and thrives in the places my students call home, and indeed, within the students themselves. This unit could be adapted for an eleventh-grade Social Studies class, as well as English or Science.

(Developed for Humanities, grade 10; recommended for Humanities and English, grades 9-12; U. S. History; and Earth Science, grade 9)

Year.04.11
'Imaginal' Performances in Memory, by Jeffry Weathers

Through the simultaneous examination of the familiar, which is Westmoor High School and the community of Westlake in Daly City, and the exploration of the strange, New Orleans and its people, with the aid of the imagination, which is symbolized with the Tree of Life, I have the hope of creating awareness of our universal responsibilities as responsive stewards. This unit will use Documentary, Film and Literature as windows and snapshots of another 'world' to help us all perceive better the actual world, in hopes of becoming, as Mahatma Ghandi encouraged, "the change [we] wish to see." This unit, while containing particular texts and films to illuminate the two specific locales, above, is actually designed to teach the value of developing the Imagination in each of our students and to model the means to be responsive stewards and make meaningful and purposeful changes in our selves and in our communities. The texts and films within can be surrogated with others that are particular to any school's communities and any other large city in the world.

(Developed for Film as Literature, grades 11-12; recommended for English Literature and Film, Film as Literature, History, and Humanities, grades 11-12)

Year.04.12
Feathers and Beads: Exploring Heritage through the Mardi Gras Indians, by Barbara Wesselman

What is woven together to create the heritage, tangible and intangible, of a culture?

Some things seem to have existed forever, a part of culture and society, when in reality their existence comes from years of struggle and development. When I think of New Orleans I think of the brilliant colors, feathers, costumes, food and more costumes! Looking into the Intangible Heritage of New Orleans is like exploring a world within a world and will provide fascinating comparisons in all interdisciplinary studies. As a Apparel Design / Costume Design teacher at a public magnet school for the arts making those connections for my students would provide an exciting learning experience.

We will learn about the people, their culture and costumes. Our goal is to understand why the Mardi Gras Indians create such vibrant and "showy" costumes, and the significance of their color and design choices. We will be able to look locally, or globally to find connections of arts, clothing, costumes and the history, in a quest for an understanding of the people and their culture.

The brilliant heritage of New Orleans is a fascinating starting point for comparisons.

(Developed for Apparel Development I and II, grades 9-12; recommended for Costume Design, Apparel Design/Development, Everyday Mathematics, and U. S. History, grades 9-12; and Civics and Economics, grade 10)

V. Chemistry of Everyday Things

Introduction

In our everyday lives, we use an incredible number of products that have been developed by the chemical industry. These include everyday things such as plastics, cleaning products, fertilizers, pesticides, electronics, cosmetics and medicines, to name just a few. Just look in the cabinets in your bathroom, under your kitchen sink or near your washing machine where you will find all kinds of chemical products, some quite hazardous, for cleaning, bleaching, polishing, etc. Learning about the Chemistry of Everyday Things is a great way to make science relevant to the social and personal lives of our students. In addition, a greater knowledge of the science underlying the products we use every day can help us to understand how to make better choices for our health and our environment. 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. The aim of this seminar was to illustrate how the principles of chemistry relate to products that we use every day and how a consideration of our use and disposal of these products 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 the Chemistry of Everyday Things.

The book by Cathy Cobb and Monty L. Fetterolf entitled *The Joy of Chemistry: The Amazing Science of Familiar Things* was used as the primary text for the seminar. During our first meeting in May, we generated a list of topics for discussion during the intensive session in July. These included Personal Care Products, Cleaning Products, Antifreeze and Deicers, Batteries, Hot and Cold Packs, Biofuels, Gunpowder and Fireworks, Refrigeration, and Plastics. Each Fellow then chose one of these topics and prepared a demonstration (or two or sometimes three) related to this topic to present during one of our meetings in July. I also provided some of my own demonstrations. As a result, we had at least one demonstration during every seminar meeting, and sometimes several, that provided a great basis for further discussion. We discussed the chemistry for production and recycling of different types of plastics in some depth. A demonstration on the synthesis of nylon added to these discussions. Our discussion of the chemistry of cleaning products included a great demonstration on making soap. The discussion of antifreeze and deicers was enriched by a demonstration on ice cream, which the Fellows (and seminar leader) made and consumed with enthusiasm. Renewable energy is a key aspect of sustainability. With this in mind, the seminar included a discussion 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. All of the Fellows developed units based on a theme or activity related to everyday things, including an innovative "survival chemistry" unit that illustrates the use of spiraling to reinforce the chemical principles from experiments to prepare pure water and biofuels. Other units are related to the chemistry of hair, cleaning products, batteries, weather, and plastics. The units include a number of excellent activities that will engage the students' interest by connecting to relevant topics and at the same time teach them about 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 the "Chemistry of Everyday Things" into the classroom.

Gary W. Brudvig

Synopses of the Curriculum Units

Year.05.01
Soap: Clean for the Environment or Just Us?, by Arlene Burns-Moguel

This curriculum unit is designed for grade 8 physical science but can be adapted for a chemistry class. The unit addresses the standards of states of matter beginning with atoms, molecules and solutions. It allows the students to explore the chemistry of soap making, while focusing on physical and chemical properties and changes, using creative and fun interactive activities. Students will investigate pH, surface tension, surfactants, emulsifiers, viscosity, temperature changes, substances, and solutions. The unit then considers the chemicals involved in making environmentally friendly soap versus those in traditional soap. Students will understand ionic and covalent bonding and how to balance chemical equations to reflect the law of conservation of matter. This unit will also encourage the students to become more personally aware of hygienic practices. It promotes a respect for the environment, and allows the students to make their own soap by using a number of variables. This curriculum unit encourages respect, responsibility, relevancy, and ownership of a common household item, in promoting the Georgia eighth-grade science standards.

(Developed for Physical Science, grade 8; recommended for Physical Science, grade 8, and Chemistry, grades 9-10)

Year.05.02
The Problems and Potential of Portable Power, by Jennifer Fleck

This unit on batteries is designed to give students a basic understanding of batteries so that they can apply that knowledge to a unit on energy and renewable resources in a freshman environmental science course. In addition to targeting the content knowledge necessary to understand how a battery works, it also explores the historical and societal contexts of science via the exploration of the development of the battery. Within these goals, students will hone their reading, presentation, and experimental design skills. Through the study of the chemistry of an everyday item, a battery, it is my belief that students will gain a deeper understanding of the nature of science, as well be in a position to apply content knowledge to the real world context of designing a power plant.

(Developed for Environmental Science, grades 9-12; recommended for Environmental Science and Chemistry, grades 9-12, and General Science, grades 7-12)

Year.05.03
It's All about Plastic, Everywhere…, by Jane Gerughty

We live in a plastic paradise. I have fond childhood memories of hula hoops, Frisbees and SuperBalls. There are several colonies of plastic flamingos in my neighborhood. Our lives are enhanced by contact lenses, synthetic carpeting and Tupperware. When the Titanic sank in 1912, virtually nothing was plastic. Now, our heads are protected by plastic helmets, our foods are sold in plastic packaging, many of our consumer products are plastic. IV bags are even plastic. Not long ago we depended on leather, silk, horn, glass and shell. We used to drink water from the tap or from water fountains. Since the 1940s our demand for materials has been met for the most part by plastic: nylon, plastic bottles, packaging, furniture, building materials, linoleum. The list is endless.

Plastics are derived from chemicals which are by-products of oil and natural gas refinement. They have a long life cycle. They don't decompose well if at all. Few are recycled. Most of the material which is processed for recycling is actually down-cycled or made into other product s like carpets or clothing. In a single generation, plastics have become a dominate feature of our modern lives. Plastic is amazing and versatile. But, are we aware of the environmental impact it may have to us now and in the future?

In this unit, the history, chemistry and waste stream of plastic is explored through activities designed for secondary students. The students will evaluate plastic they come in contact with, they will make a polymer, they will investigate a thermoplastic and design a plastic up-cycle project to get them thinking about the plastic waste steam.

(Developed for Biology, grades 9-12, and AP Environmental Science, grades 11-12; recommended for Science, grade 8, and Biology and Environmental Science, grades 9-12)

Year.05.04

Bad Hair Days? Chemistry to the Rescue, by Marlene Gutierrez

This curriculum unit is designed for a college prep chemistry class composed mostly of sophomores and a sprinkling of juniors and seniors who have already completed college prep biology, algebra 1 and geometry. However, the unit may be modified as enrichment in a college prep biology class or an extension module of a biochemistry unit in honors or AP biology.

The unit is divided into three parts. Part 1 focuses on the structure of proteins. Part II deals with the relationship between the physical structure and chemical composition of

hair and hair properties, shape and color. Part III covers the chemistry behind a perm, straightening and coloring.
To appreciate how chemistry can come to the "rescue" of a bad hair day, students will engage in a variety of activities that illustrate that science is not only a body of knowledge but is also a way of doing and thinking. They will construct models, perform laboratory experiments, collaborate with peers, use 3-D graphic organizers, and find information and report findings through various platforms which include the use of online resources and digital devices. Through this unit, students will see not only the relevance of chemistry in every day life but also how it is not a spectator sport – to learn chemistry is to do chemistry!

(Developed for CP Chemistry, grades 10-12; recommended for College Prep Chemistry, Honors Chemistry, Biology Honors, and AP Biology, grades 10-12; College Prep Biology, 9-12; and AP Chemistry, 11-12)

Year.05.05
Survival Chemistry: Using Everyday Things to Create Energy and Drinking Water, by Rajendra Jaini

This six-week high school Chemistry unit designed for 10th through 12th graders has three foundational chemistry experiments that focus on energy and water. These experiments will be repeated and spiraled throughout the year, encompassing all Chemistry topics. The experiments are 1.) producing biodiesel, 2.) producing bioethanol, and 3.) purifying, filtering, and distilling water. The unit has been designed to be taught from the beginning of the year to engage students with hands-on experiments that they will get to repeat throughout the year. The 'big idea' behind this unit is that through repeated practice with complex experimental processes, students will develop higher level laboratory and critical thinking skills that will be critical for their future. Students will visualize applications for these experiments as well as gain the hands-on skills necessary to succeed in their future science endeavors through the culminating activity. The unit will culminate with an end of the year activity which will have students working together in a post-hurricane (or other natural disaster) scenario with limited supplies. Students will have to join forces to create a biodiesel processor, a bioethanol processor, and water purification, filtration, and distillation system to assist with the survival of their community.

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

Year.05.06
The Chemistry of Weather, by Deborah Johnson

The purpose of this unit is to provide information to elementary, middle, and high school teachers on the phenomena of weather and how it can be explained through the science of chemistry. It will also engage students in the elementary and middle school grades to be introduced to chemistry at an earlier age through observations of the weather and hands-on laboratory experiments on weather phenomena.

The hands-on approach to inquiry will increase students' understanding, interest, retention, and introduce them to a practical approach to chemistry concepts at a young age. Teachers will realize that what they have been teaching, as it relats to weather, can be enriched by understanding the science behind the concepts taught, that weather is caused by chemical changes through air and water, which is the water cycle. Pressure and temperature changes occur due to chemical processes. It has been proven that students at a very young age can be introduced to complex terms, even if the terms may be too abstract to understand completely. Empowering students to know that they are learning "chemistry" will possibly have students choose to major in the sciences that could lead to choosing a career in the sciences because students will not have a fear of the sciences.

Activities will include students building devices to record weather observations and activities that will relate weather phenomena to chemistry, such as learning about air pressure, changes in volume, temperature, and density. Students will learn about properties of water and changes of state that can be explained by molecular movement. They will learn about energy transfer to understand what precipitates changes in weather patterns. This unit will give students the opportunity to learn about weather at a higher level of science.

(Developed for Weather Unit, grade 6; recommended for Weather Unit, grade 6)

Year.05.07
Materials for the Future, by Sally Martin

This unit is designed to create a final project for a high school Chemistry 1 course or to be used during a non-AP, Chemistry 2 course. It is an opportunity for students to apply their knowledge of bonding, intermolecular forces, and molecular composition. In particular the major objective is for students to see the correlation between molecular arrangement and properties of matter. Students will look at the different properties of plastics and relate these to the properties and uses of the materials. This will necessitate students learning about polymers and the different opportunities for interaction between the longer strand molecules. The unit is designed to focus more on representing the molecules as strands, rather than covering the particulars of each molecule's specific composition and arrangement. Some time will also be spent on nanochemistry as this is the thrust for new materials. Demonstrations and labs are provided to help re-enforce concepts. As a final activity students will be asked to think of a material that they think would be useful or even fanciful, and then determine the required properties of this

material at the macro-level and then translate these properties to molecular structural requirements. This may only entail designing the necessary sub-units without actually designing an assembly process.
(Developed for Chemistry I Gifted, grade 10, and Chemistry II Non-AP, grades 11-12; recommended for Chemistry First Level, High Level, and Second Level Chemistry class, High School grades)

Year.05.08
Trash – Seriously!, by Ellen Shackelford

This unit is intended for students in grades 4-6. It can supplement students who study ecosystems or other physical science programs that introduce pollution; or it can adequately address the topic of pollution and recycling, independently. The unit focuses on three particular products, plastic water bottles, plastic bags, and paper that students use daily, so that students will make personal connections, and, as a result, be motivated to make meaningful decisions about them. Students will be introduced to chemistry in the unit in an elementary way, in order to present the objectives effectively. One purpose of the unit is that the students will obtain a better understanding of the composition of polymers and paper. From this understanding, the students will explore the problems of pollution with these products. Then, the students will explore and evaluate recycling and reducing the use of the products. The culminating intent of the unit is that students will initiate a recycling program in their school or community, as a result of the unit. The unit should take 2-3 weeks, depending on how many science classes are scheduled each week. It will not only address science standards, but also math (volume) and English language arts (persuasive writing) standards. The activities can be addressed by regular students as well as those with disabilities, since most activities are hands-on in the context of cooperative groups.

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

Year.05.09
I Got the Power! Misconceptions of Recycling Batteries, by Nancy VanKirk

This unit is designed for intermediate students in grades 5 through 7. This unit is focused on responsible recycling of batteries. Batteries are carelessly thrown away daily and ultimately are dumped into landfills. The million dollar question is what toxins and hazards do they leach into our environment? Despite the government's classifications of household batteries as non-hazardous, studies show that there are many toxins to be concerned about. So who is going to educate our students to recycle responsibly? Education is the number one tool for success. Providing our students with research-based facts, can enable our communities and assist in the recycling efforts.

The science literacy of our students may well determine the path they choose to follow in the future. Thus, by allowing my students to participate in science-based decisions, we can hope to diminish the harmful impact of pollution of our air and water in our community. The recycling of batteries and understanding of some of the misconceptions of improper disposal of batteries, I believe, can have a significant impact on our local environment. We can empower our students, through background knowledge and education, to use rechargeable batteries as a simple alternative choice from the single use household batteries that power their electronic devices. The unit will teach the students the simple chemistry of what a battery is, how it works, its history, applications, and the misconceptions of recycling batteries. The students will be actively involved with hands-on, minds-on investigations that will provide an in-depth thorough understanding. Each lesson is followed by a hands-on investigation lab that provides students opportunities to explore the concepts further.

(Developed for General Science, grade 6; recommended for Physical Science and Chemistry, grades 5-7)

Year.05.10
Polytails and Urban Tumble Weaves: The Chemistry of Synthetic Hair Fibers, by Lesia Whitehurst

The focus is the chemistry of polymers. The goal is to introduce the subject of polymers to students in a fun and engaging way. Students will investigate the basic properties and behavior of polymers, through the lens of synthetic hair fibers. The encapsulated view of hair, natural and synthetic, as expressed in popular media, will serve to open the discussion on polymer chemistry. Exercises and assignments in the unit will draw from the social and cultural experiences of the students. Through facilitated discussions, students will be guided to survey polymers around them. They will create and test various polymeric materials, including various types of synthetic hair. Using appropriate tools of investigation, students will observe and evaluate the properties of synthetic hair fibers along with other polymers. Additionally, students will construct models that simulate polymer structure to inform their understanding of morphology of synthetic and real hair. The unit is designed to promote collaborative learning, to stimulate students to generate questions in order to consolidate their learning, to reinforce reasoning skills and laboratory skills. Daily re-looping of content will be essential in assisting students to retain and learn material.

(Developed for High School Chemistry, grade 11; recommended for High School Physical Science and Chemistry, grades 9 and 11)

VI. Great Ideas of Primary Mathematics

Introduction

The seminar on *Great Ideas in Primary Mathematics* had as its goal the study of the basic ideas that underlie much of the mathematics studied in elementary school, but which often do not get the explicit attention that might enable more effective learning. Because of the substantial representation of middle- and high-school teachers among the seminar Fellows, the overall level of the topics in the seminar was more advanced than originally planned. We appreciated that the Fellows showed substantial enthusiasm for discussing topics at many grade levels.

A substantial amount of seminar time was devoted to the idea of place value. This is frequently treated in the U.S. as a vocabulary item, but in fact, it is the basic principle by which we deal with numbers, and it is relevant to all grades, first through high school. Carl Friedrich Gauss, often described as the greatest mathematician since Newton, considered the place value system as a tool of unparalleled value. He is paraphrased by the mathematics historian Howard Eves as saying, "The greatest calamity in the history of science was the failure of Archimedes to invent positional notation."

The key idea of place value is summarized in the sequence of equalities

$743 = 700+40+3 = 7x100+4x10+3x1 = 7x(10x10)+4x10+3x1 = 7x10^2 +4x10^1 +3x10^0$

The first expression is our usual compressed way of writing seven hundred forty three. The second, often called "expanded form," reminds us that each digit in the compressed form represents a number of a special type, and that the whole number is implicitly a sum of these special numbers. In the seminar, we called these special numbers "single place numbers," because each has a non-zero digit in only one place. The third expression decomposes each single place number as a product of a digit times a "base ten unit." In this example, only the three units 1, 10 and 100 are involved. The fourth expression exhibits the fact that each base ten unit is a product of some number of 10s. The final expression uses exponential notation to write these products as powers of 10. Each way of writing 743 represents a conceptual advance over the one to its left. Arithmetic instruction should see to it that students learn all these levels of representation, so that they would leave middle school with a conceptual understanding of the place value system (including its extension to decimal fractions); but in the U.S., this typically does not happen.

The place value system governs not only how we write numbers; it also governs all the computations we do with them. It is not much of an exaggeration to say that the standard methods for computing (adding/subtracting and multiplying/dividing) with base 10

numbers are governed by computations with single place numbers, combined according to the Rules of Arithmetic. Computations with single place numbers in turn are controlled by the sums and products of single digits — the "number facts" — which is why these facts are so basic for computation. Estimation is also greatly facilitated by a grasp of the size relationships among single place numbers.

The last way above of writing 743 suggests to think of a number expressed in base ten form as a "polynomial in 10," and we spent some time exploring this idea. In fact, there are substantial parallels between computing with base ten numbers and computing with polynomials, and students might enjoy and benefit from explicit study of these parallels.

After whole numbers, fractions are probably the largest topic in the elementary curriculum, and in a lot of ways they are the most problematic. To deal successfully with fractions, it seems necessary to pay more attention to what numbers are and how we use them. We took as our working definition, that numbers express a relationship between a quantity and a unit or between two like quantities, with one effectively functioning as the unit. Less formally, one might say that a number is an adjective that modifies a noun (the noun being the unit). At any rate, it is clear that a number usually is incomplete in itself, and needs to be attached to a unit to have a definite meaning. We emphasized the point, that in dealing with fractions, it is vital to keep the unit in mind. Also, working with different units for a given type of quantity can be useful for getting acquainted with fractions. Thus, if a can (of say, soda)is the unit, then a six-pack is 6, and a case of four six-packs is 24. But if a case is the unit, then a can is 1/24 ,and a six-pack is 1/4.

We also discussed the circumstance that the common way to teach fractions in the U.S., by describing, say, 5/8 as "five out of eight" things may be an example of example insufficiency, meaning that it is too narrow a conception of fractions, and does not accommodate all the ways that fractions get used. If it gets established as a student's only way to think about what a fraction is, then it may limit the student's ability to work with fractions in contexts where it does not apply. We use fractions in many situations where the fraction is not part of the whole. We can talk about 1/2 gallon of milk, without the half-gallon being part of any specific gallon.

In the seminar, we took the point of view that the basic fractions are the unit fractions, 1/2 , 1/3 , 1/4 , 1/5 , ... Each unit fraction effectively defines a new unit, of which it takes several copies to make the original unit. Thus it takes 2x(1/2) s, or 3x(1/3) s, or 4x(1/4) s to make 1. Non-unit fractions are then multiples of unit fractions. Thus 3/2 gallons of milk would be 3 half-gallons of milk.

It is also important to have ways to visualize fractions. We discussed breaking rectangles into equal pieces to represent fractions, and also representing them using a number line. If the number line is thought of as being divided regularly into intervals of unit length, with

the division points labeled by the integers, then halves give a regular division of the line that is twice as fine, with two half-intervals fitting into each unit interval. Similarly, thirds would produce a regular division in which each unit interval consists of three equal subintervals. It is an interesting exercise to imagine the unit interval being divided into, say thirds, and also into fifths, and to find the lengths of all the subintervals created in this way.

We also discussed some topics related to algebra, such as variables, expressions and equations, and word problems. Our basic point of view here was that a variable is a symbol that can stand for any member of some set, usually a set of numbers, such as the whole numbers or the rational numbers. We dealt with expressions as recipes for calculations. For example 3x - 4 would say, "Take a number x, and multiply it by 3, then subtract 4 from the result." We saw that word problems can be solved either algebraically or arithmetically (meaning, without the use of variables), showing a stronger relationship between arithmetic and algebra than is commonly apprehended by students.

The seminar units reflect all aspects of this wide-ranging discussion. The units of Emily Dentel, Autumn Laidler and Kishayla Payne-Miller deal primarily with whole number arithmetic, with an emphasis on place value. Michael Pillsbury's unit also focuses on place value, but from a more advanced perspective that emphasizes its connections to algebra, and especially, computation with polynomials. Troy Holiday's unit also utilizes place value ideas, to discuss scientific notation, especially how it emphasizes size and accuracy, making it useful for science. The units of Valerie Schwarz, Joseph Condon and Jonathan Fantazier present fractions from multiple perspectives. Sarah Kingon and Aimee MacSween have written units that discuss the beginnings of algebra based on working with expressions as recipes for computations, and using the Rules of Arithmetic to transform and simplify expressions. Finally, Nancy Rudolph's unit borrows ideas from all parts of the seminar to create warm-up exercises for her pre-calculus class, with the goal of increasing their number sense. We are sure that all the seminar Fellows join us in hoping that readers will find the treatments described in these units provide a more unified perspective on their respective topics than do typical textbooks.

Amanda L. Folsom and Roger E. Howe

Synopses of the Curriculum Units

Year.06.01
Using Place Value to Teach Addition and Subtraction, Let's Count the Ways, by Emily Dental

This unit is for 2nd grade, and can be used to teach any student struggling with regrouping or basic addition and subtraction. It utilizes ideas from Singapore math and intertwines the concepts of place value, addition and subtraction throughout. By working with these concepts together, students will gain a deeper, lasting understanding of the value of a number, and also of the operations of addition and subtraction. This unit utilizes three models from the Singapore approach to mathematics: the concrete model to introduce a concept, the pictorial model to further a student's conceptual understanding, and finally the symbolic model. This will allow for students' diverse learning styles and preferences to be reached, as well as students' differentiated learning stages.

(Developed for Mathematics, grade 2; recommended for Mathematics, grades 1-3, and Mathematics Remediation, all grades)

Year.06.02
Exploring Valuable Places: Extended Place Value Concepts into Operations, by Autumn Laidler

Place value is a foundational mathematics concept that often does not get enough instructional time in intermediate elementary grades. The concepts of place value are often considered primary, but their importance can be seen in most levels of math. A weak understanding of place value can be magnified when students are presented with the task of performing basic operations (addition, subtraction, and multiplication) on multi-digit numbers. The goal of this unit is to integrate place value concepts, such as values of digits, relationship between place values, and exchange, into the teaching operations that are grade-level appropriate.

The unit will cover strategies to first unpack multi-digit numbers by expanding them according to their base 10 expansion, and then use this expansion to perform operations on numbers. These strategies also explore trades within addition, subtraction and multiplication. This unit offers teachers and students multiple ways to approach addition, subtraction, and multiplication problems, which will lead to a sense of flexibility in students.

The included activities provide experiences for students in game form. Activities also include real world math problems in order to connect mathematics to students' everyday lives. The activities in this unit can be modified and adapted to reach a wide variety of

learners. This unit is intended for third- and fourth-grade students, but could be modified for fifth-grader in need of remediation.

(Developed for Mathematics, grade 4; recommended for Elementary Mathematics, grades 3-5)

Year.06.03
Cracking the Place Value Code, by Kishayla Payne-Miller

This unit teaches addition and subtraction using the concepts of place value, with an intended audience of second-grade students. This unit could also be used with talented first-grade students that need additional challenges as well as with third-grade students who are still struggling with solving addition and subtraction problems. This unit emphasizes three main teaching strategies: conceptual, pictorial, and symbolic, modeled after the Singapore approach to mathematics. This unit emphasizes four steps, leading towards addition and subtraction of general two-digit numbers. These steps stress place value concepts and the understanding of a number according to its base-ten expansion. Within this unit, mathematical techniques are shared that will reach a wide variety of types of learners. The steps and strategies here crack the "place value code" allowing students to add and subtract with a deep understanding of the concepts involved.

(Developed for Mathematics, grade 2; recommended for Mathematics, grades 1-3)

Year.06.04
Algebra Really Is Just Arithmetic, by Michael Pillsbury

This unit has been developed for use in a middle-school mathematics classroom. The concept of this unit is to provide middle-grades students a better understanding of place value and then relate this understanding to Algebra. Students will begin by using exploding dots which is a new concept for exploring the base ten number system. Teachers can also use exploding dots to explore other base number systems and model how our own base ten number system functions while performing operations. From exploding dots students will move on to explore writing numbers in expanded form and then perform operations with those same numbers. This concept may seem simple on the surface but it is very rich in math content. Students will practice working with exponents and writing numbers in base ten as well as understanding why they "carry" and "borrow." The culmination of the unit brings us to the connections of arithmetic and Algebra. Students will see the connection to Algebra through an understanding of the addition and multiplication properties, as well as the relationship of operations using base ten and oprations with variables.

(Developed for Mathematics and Mathematics Honors Level, grade 7; recommended for Mathematics, grades 7-8, and Mathematics Honors Level, grade 7)

Year.06.05
Exponential Explosion: Analyzing Scientific Notation and Its Application to Astronomy and Order of Magnitude, by Troy Holiday

The unit centers on providing students with the tool sets to understand the purpose and concepts of scientific notation. This will be done with students engaging in the practice of the notation in terms relevant to their own lives. The objectives of the unit are to open student's minds to the many applications of scientific notation and break down its underlying meaning. If students are able to achieve those objectives, they will be prepared for more advanced applications of scientific notation and the processes that follow it.

To obtain those objectives students must engage in the practice of scientific notation often. The best practice for them to have are real-world examples that utilize scientific notation is a variety of ways. This will encourage them to sustain their motivation throughout the unit offering an environment conducive for learning. The examples themselves will assist with students understanding of the applications of scientific notation, but only repetition of the process will facilitate the students understanding of what the notation represents. Through many examples and much practice, students will come to understand how scientific notation is an excellent way to accurately represent values very big, and very small.

(Developed for Astronomy, grade 6; recommended for Astronomy, Middle School grades; Exponential Notation and Arithmetic, all grades; Chemistry, High School grades; and General Science, Middle and High School grades)

Year.06.06
Fractions: Building a Strong Foundation Based on Conceptual Understanding, by Valerie Schwarz

This curriculum unit is designed to teach fractions by developing concepts in a deep, meaningful way. The curriculum unit will focus on the "unit": unit fractions, general fractions, equivalent fractions, mixed numbers, improper fractions, and adding and subtracting fractions with like, related and unlike denominators. The strategies and activities are carefully planned to provide a framework to build on students' prior knowledge. The goal of the unit is for students to truly grasp the meaning of fractions instead of memorizing algorithms. Through hands-on techniques students are exposed to the many variations that fractions represent. The target audience for this unit is fourth grade. Parts of the unit could be used in second and third grade, and other parts of the unit could be used in fifth and sixth grade.

(Developed for Mathematics, grade 4; recommended for Mathematics, grades 3-5)

Year.06.07
A Deeper Understanding of Fractions through Number Line Explorations, by Joe Condon

In elementary and middle-school mathematics, there is nary a concept so misunderstood as fractions. Students will groan, whine and generally do anything possible to avoid using these rational numbers. This lack of confidence, combined with only a cursory understanding of the algorithms connected, has had a ripple effect on higher-level mathematics. The National Council of Teachers of Mathematics (NCTM) stated in 1989, that students' understanding and comfort with fractions is directly related to their success in proportional reasoning. The concept of proportional reasoning is believed to be one of the gateway concepts to success in algebra and beyond.

In this unit I will describe alternative ways for students to deepen their understanding of fractions. By using number lines, I believe students will embed the concepts of comparing value, addition, subtraction and multiplication of whole numbers and fractions in particular. By moving beyond the typical part to whole understanding of fractions and opening up the idea that fractions have value and can be represented as space on a line, students will move past the superficial and begin exploring the depths of fractions.

(Developed for Mathematics/Fractions, grade 7; recommended for Mathematics/Fractions, grades 4-7)

Year.06.08
A Fraction of What We Know, by Jonathan Fantazier

My intention in this paper is to explore problems that secondary students face in managing fractions, and to help students turn the solutions to those problems into extended learning that will improve their performance in secondary curricula. Throughout my teaching career, working at the levels between 6^{th} and 12^{th} grade, in various curricula of mathematics, the notation and representations of fractions have consistently been points of difficulty for my students. The work I present here is composed of research that I have done on the primary mathematics and fundamental mechanics of fractions. Based on this research I set basic objectives for student learning about fractions, as that learning is situated within secondary courses. I will then present some strategies for conceptualizing and managing fractions, along with examples for assignments, which other teachers may either use as is, take in small parts and modify, or reject in favor of other activities.

The intended audience is secondary teachers who instruct algebra courses, but I hope for most observations here to be pertinent to any teacher who has students who might struggle with the rational fraction as they encounter it within any particular course.

Primary teachers may find aspects of the unit helpful as a reference for the topics of study that their students go on to in secondary courses.

(Developed for High School Algebra I, grade 9, and Algebra II, grade 11; recommended for Algebra I, grade 9; Algebra II, grade 11; Geometry, grade 10; and Middle School, grades 7-8)

Year.06.09
What an Expression Expresses, by Sarah Kingon

This is a unit that focuses on the ideas of variables, expressions, and equations. It develops the idea of an algebraic expression as a recipe for a computation. It will explore how variables are used to create simple expressions, and how more complicated expressions can be formed from simpler ones, using the grammar of expressions and the rules of arithmetic. Too often I find my students solving an expression because they assume they are supposed to find an answer. This unit is meant to clarify the concepts of variables, the equals sign and expressions as recipes for computation–by looking at their components, different contexts in which they occur, how we manipulate expressions and the justification behind the manipulations, and the logic behind solving equations. The nine rules of arithmetic will be emphasized as proven ways in which we can justify mathematical manipulations as well as balance properties for solving equations (equal added to equal makes equal and equal multiplied by equal makes equal). Likewise, in dealing with equations, the main classical principles for transforming equations will be made explicit. The unit continues from expressions to equations and emphasizes the connections as well as differences between the two, presenting expressions as recipes for computation and equations as questions, asking for which value(s) of the relevant variable(s) the expressions on the two sides of the equation are equal. The idea of equivalence, first of expressions, and then of equations, is prominent throughout the unit. My students will be expected to use the properties to justify all of their reasoning when simplifying and solving. This will encourage them to think about the math they are doing. The goal is that they should come to see that solving an equation is a process of logical reasoning.

(Developed for Algebra I/Math, High School grades 9-12; recommended for Algebra I/Math, High School grades 9-12, and Pre-Algebra, Middle School grades)

Year.06.10
Strong Foundations = Success In Equations, by Aimee MacSween

This curriculum unit, Strong Foundations = Success in Equations, is intended for 8thgrade Algebra students. However, it can be modified for Pre-Algebra and Math Intervention classes as well. The unit begins by focusing on expressions. It introduces numerical expressions and then transitions to variable expressions. Using real life examples, the

unit's intention is that students see expressions as mathematical recipes for calculations. Once students understand the structure of expressions it leads them into simplifying expressions using the Arithmetic Rules. The rules are taught with visual models, numbers, and variables. Students who conceptually understand expressions and the Arithmetic rules used to simplify them will be able to use those skills to solve multi-step equations. The unit also addresses the difficulty students encounter when given expressions and equations in word problem format. Students will learn to break down word problems and identify important pieces of information. The focus on conceptual understanding should reach students at all levels and help prepare them for higher-level mathematics.

(Developed for Pre-Algebra, grade 7; recommended for Middle School Algebra, grade 8, and could be modified for Pre-Algebra or Math Intervention, grades 7-8)

Year.06.11
Boosting Number Sense in High School Students, by Nancy Rudolph

Many students reach high school having received high grades in math because they learned the algorithms, but using algorithms does not guarantee conceptual understanding. Many students lack number sense. In this unit, number sense is defined by three characteristics: understanding Number Systems, Mathematical Operations, and Flexibility in Mathematical Situations. The Number Systems refer to the different types of numbers, place value and the relative magnitude of numbers. Mathematical Operations are addition, subtraction, multiplication, division and the relationships between them, the Rules of Arithmetic that govern them, and the effect of these operations on different types of numbers. Flexibility is being able to recognize multiple ways to work with numbers and identify the most efficient method with which to proceed. This unit encompasses Roger Howe's Great Ideas in Primary Mathematics, which build number sense, in the form of *calculator-free*, daily warm-up/bell-ringer activities for one semester, focusing on one topic per week. Throughout the unit, students are expected to describe and defend their thought processes to their classmates. Although this unit is written for upper-level math students, many of the ideas are basic enough to be used for younger students.

(Developed for Pre-Calculus, grades 11-12; recommended for Pre-Algebra and Pre-Calculus, grades 7-12)

VII. Organs and Artificial Organs

Introduction

The human heart is one of the world's most fascinating machines, as is the human brain and kidney and each of the organs that operate in concert to make our bodies work. We now understand the working mechanisms of the organs in the human body, often in sufficient detail to describe how the organ does its job, and how it fails in cases of disease. Further, we have learned how to make artificial or synthetic organs – including the heart and the lung and the kidney – which can be used to replace human organs that have lost their function due to disease. This seminar presented an overview of the mechanisms of operation of the human body by considering each major organ, one at a time. The structure of each organ, as well as its anatomy or arrangement of parts, was examined with particular attention to how that structure leads to reliable, efficient function. Then, we discussed plans for an artificial organ, or a replacement part, for each organ that can be built with man-made materials.

The work from this seminar should be of interest to teachers at many grade levels, since instruction in biology happens throughout the K-12 curriculum. In addition, the seminar introduced elements of design, particularly design that works by mimicking nature. Because the design process depends on mathematics and geometry and creative thinking, math and art teachers may also find the work of this seminar helpful.

Specifically, the seminar covered the following topics:

1. Cell Physiology

2. Lung Physiology

3. Heart and Blood Vessels

4. Kidney, Liver, Pancreas

5. Dialysis and Related Artificial Organs

6. Tissue Engineering

7. Growing Organs in Bioreactors

8. Making Materials for Artificial Organs

9. Ethics of Organ Transplantation

The discussions in the seminar were enhanced by our reading from: *The Physiology Coloring Book*, Kapit, Macey, and Meisami, Addison Wesley Longman, Second Edition (2000); *Biomedical Engineering*, W. Mark Saltzman, Cambridge University Press (2009); and selected physiology text books including *Textbook of Medical Physiology,* Second Edition (2009) by Walter Boron and Emile Boulpaep, (B&B) Saunders Elsevier.

The Fellows prepared curriculum units that covered a breadth of information on organs and artificial organs. The material presented in the units assembled in this volume span an impressive range and are designed for use in classrooms from upper elementary (fourth to sixth grade) through high school.

Many of the units focused on material that is appropriate for high-school students. Kristin Peterson prepared a unit called "The Perfect Team–Our Heart and Lungs," which is designed for advanced high-school biology students (such as the IB Biology students that Kristin teaches). The unit provides an overview of heart/lung physiology and includes information on transplantation and health. Vanessa Vitug prepared a unit titled "Under Pressure! The Circulatory System and Hypertension," which is designed for 11th- and 12th-grade students but can also be adapted for middle-school health classes. Vanessa's unit describes the cardiovascular system with a focus on blood pressure, and includes information on health and hypertension, which is a substantial health problem in the U.S. Richard Taylor prepared a unit called "Dimensional Analysis: A Mathematical Tool to Dissect the Circulatory System," which presents concepts in dimensional analysis using examples from the cardiovascular system. Richard's unit is appropriate for introducing concepts of unit conversion and graphical analysis to high school students. Mary Whalen prepared a unit called "Your Liver, Can It Survive Your Abuse?" which is directed to high-school health and biology students. Mary's unit describes the function of the liver, and focuses on problems that can develop with viral infection and drug abuse. Eric Laurenson prepared a unit titled "Building a Heart – The Function and Mechanics," which describes the mechanical function of the heart and uses prior student knowledge of mechanics to design artificial systems that replicate heart function. Luis Magallanes prepared a unit titled "There Is Math in Your Heart," which uses concepts from cardiovascular physiology to enhance student interest in critical math skills such as scientific notation, ratio and proportion, and graphs. Deborah Smithey prepared a unit on "Heart Disease, Transplants, and New Technology," which presents information on the cardiovascular system to introduce high-school students to the underlying basis of selected heart diseases. Most of these units can be adapted for use in middle-school classrooms, as well.

Four units focused on material specifically designed for middle-school students. Shamsu Abdul-Aziz prepared a unit called "Symmetry and Fractals in the Lungs," which presents a description of fractal geometry and uses it to examine lung structure. Deanna Boyd prepared a unit titled "A Recipe for Success: The Semi-Sweet Pancreas," which introduces the important concepts on pancreas function, focusing on the role of the

endocrine pancreas in producing insulin for control of sugar metabolism. Deanna's unit discusses diabetes, with particular attention to the effect of diabetes on female students and self-esteem. Stephen Griffith prepared a unit called "The Cardiovascular System: Mechanics and Dynamics," which focuses on flow through the blood vessels, with particular attention to mechanisms of oxygen delivery. Amanda Reasoner prepared a unit called "Teaching Osmosis and Diffusion through Kidney Dialysis," which uses the function of kidney to enhance understanding of the important – and difficult to teach – concepts of diffusion and osmosis.

Finally, Jolene Smith prepared a unit aimed at upper elementary students, such as the sixth graders that she teaches. The unit – called "Diabetes, the Silent Enemy" – describes the essential functions of the pancreas, with particular attention to presenting these physiological concepts together with the Navajo Philosophy of Life and Navajo language.

W. Mark Saltzman

Synopses of the Curriculum Units

Year.07.01
Symmetry and Fractals in the Lungs, by Shamsu Abdul-Aziz

This unit is designed for seventh and eighth-graders about symmetry and fractals. This will be accomplished by looking at a very common organ in all animals, lungs, to see the symmetries and fractals that exist in them. This unit can also be used, with some additions to activities, to teach high school students about fractals and symmetry as well. It will be taught over approximately 2 weeks for 90 minutes each day. Instruction will be given to students in a whole and small group setting. Students will also receive hands-on mathematics experience that will help them apply what they learn to their everyday scenarios. Students will learn and apply a lot of symmetry and fractal concepts through classroom group exercise and projects. At the end of the unit, students will be able to create and identify fractals in nature, will be able to calculate fractal dimensions, and be able to accomplish all these with computer applets as well. Not only will the students be able to create their own fractal designs, they will be able to explain their knowledge of the symmetries and fractals that exist within them. This unit will help them see how the concepts of fractals and mathematics as a whole can be easily related to the environment in which they live.

(Developed for Mathematics/Geometry, grade 7; recommended for Mathematics/Geometry, grades 6-10)

Year.07.02
A Recipe for Success: The Semi-sweet Pancreas, by Deanna Boyd

Various individuals have learned how organs work and what causes organs to stop working in the case of illness or disease. Mankind has also discovered ways in which to create some artificial organs to replace those that have been damaged by disease or trauma. This curriculum unit will focus on the pancreas, diabetes, and the effect of diabetes on the female student's self-esteem. The unit can serve as a culminating set of lesson plans after teachers have taught cells, organs, and organ systems. The students will learn about the pancreas in a manner in which they can apply the knowledge to their personal lives. The unit starts with a description of the pancreas and its normal role within the body. The next section describes the differences in a diabetic pancreas as compared with a normal pancreas. The various types of diabetes are presented with a focus on Type I diabetes. The unit also addresses ways to encourage students to prevent diabetes. Finally, the unit describes artificial pancreases that have been created. The learning experience that students will gain from this unit will enable students to live healthier lives and share their learning experience with their families at a parents' night event.

(Developed for Life Science, grade 7; recommended for Life Science, grade 7 ,and General Biology, grade 9)

Year.07.03
The Cardiovascular System: Mechanics and Dynamics, by Stephen Griffith

The cardiovascular (or circulatory) system is one of the most vital systems in the human body. This system provides a transport mechanism for oxygen through the body as a fuel source for cellular respiration, and then the return transport of carbon dioxide, a byproduct of cellular respiration, that the body expels as waste through breathing. It also provides for the transport of amino acids, nutrients, hormones, and the other components that make up blood.

Seventh-grade life science in Georgia is a general study of biology including an introduction to the kingdoms of life, the interdependence of life, and the structure of life. The state standards require students to understand the structure of cells and their functions as well as how cells form tissues, organs, and organ systems. This unit takes an alternate approach, to provide an interesting backdrop about one body system and its functions. Through the instruction of this unit students will be able to redefine their understanding of cell structure and apply it to an understanding of oxygen transport in the body through the circulatory system, blood pressure, and flow of blood.

(Developed for Life Science, grade 7; recommended for Life Science, Middle School grade 7, and Biology, grade 9)

Year.07.04
Building a Heart: The Function and Mechanics, by Eric Laurenson

The heart is an inconceivably beautiful organ combining form and function. In high school physics classes it is rare to get an opportunity to spend time on an extended project. It is my intention to begin the year with my second-year AP Physics B students with the challenge of designing and constructing an artificial heart. The initial process will rely on their previous year's knowledge of Mechanics. This will serve two purposes. The project will reinforce their prior knowledge while developing or reinforcing the students' hands-on construction knowledge. We will begin by determining the necessary parameters of the heart, through research and guided reading. My students will then incorporate their acquired knowledge of the heart as a system with their knowledge of Mechanics to produce a simplified heart pump. Their prototype will simulate the left heart that pumps oxygenated blood to the body. As my students work on their artificial hearts, I intend to provide them with opportunities to explore the background fluid dynamical properties of blood flow through the circulatory system of the body. This will enable my students to transition from the study of Mechanics to that of fluid dynamics.

(Developed for AP Physics II B, grade 12; Physics I Gifted and Physics I Scholars, grades 11-12; recommended for AP Physics II B, grade 12, and Physics I Gifted and Scholars, grades 11-12)

Year.07.05
There is Math in Your Heart, by Luis Magallanes

This curriculum unit can be used for students in Algebra 1 and Algebra 2. The math concepts used in this unit are: scientific notation, ratio and proportion, formulas, equation of a line and graphs; sequences, series and summation; speed of circulation of the blood, properly called flow, blood pressure, atmospheric pressure and conversion of units.

Pressure, whether blood pressure or atmospheric pressure, is measured and described using a common approach, although a variety of units can be used to quantify them. Some of the units used to express pressure are presented in this unit providing a comparison between the metric and the U.S. system. Currently, the metric system is the international system used.

Facts about the cardiovascular system and the heart are introduced as a background to stimulate interest in math exercises. The speed of the blood in our circulatory system depends on the actions we are performing, the size and the age of a person. Assuming that our analysis is done in persons without health problems, the calculations should be very similar for people of the same age and within a similar weight range. This is one of the reasons why the heart rate is different for people of different age, weight or size. How much different? Calculations of diameter of vessels will be very important to analyze the speed of the blood.

(Developed for Algebra I, grades 9-12, and Algebra II, grades 11-12; recommended for Algebra I, grades 8-12, and Algebra II, grades 9-12)

Year.07.06
The Perfect Team—Our Heart and Lungs, by Kristin (Peterson) Anton

Odds are, neither you nor your students think about the approximately 21,000 breaths you take or 100,000 times your heart beats each day. Yet, these two simple actions are so important that if either ceased, we would die in a matter of minutes. This physiology unit, designed for a senior-level biology class, examines the heart and the lung as individual organs and integrated systems. Students will begin by learning where these organs are found in the body and how they work, the ways in which they affect other organs and tissues, and why they are so important to the body's overall function. They will then examine the body on a more philosophical level by looking into health issues concerning these organs and the ethics of transplantation. The content of the unit is supplemented with labs and activities, and students will create various types of multimedia to present in

an online portfolio. This gives the students not only the knowledge behind these two important organs, but the means to share it. It is my hope that students will complete this unit with a newfound appreciation for their heart and lungs, and the empowerment to communicate this to others.

(Developed for IB Biology, grades 12; recommended for Advanced Biology [IB or AP] and Anatomy and Physiology, grades 11-12; and Health, grades 9-12)

Year.07.07
Teaching Osmosis and Diffusion through Kidney Dialysis, by Amanda Reasoner

The purpose of this unit is to teach middle-school students about osmosis and diffusion in cells. In order to make the material more relevant, the unit will focus on how osmosis and diffusion are two of the processes necessary for urine formation in the kidneys. Students will briefly review the structure of the kidney and how the nephrons help maintain homeostasis in the body. Students will also learn how our current understanding of these cellular functions within the kidney has made kidney dialysis. Students will watch demonstrations of osmosis and diffusion and will also perform several labs, including one in which they will create their own mini kidney dialysis machine in order to filter artificial blood. The unit was developed specifically for eighth-grade students and provides hands-on activities and higher level comprehension questions. However, it could easily be used in a high school biology class with minor changes.

(Developed for Integrated Science, grade 8; recommended for Biology, General Science, and Health, grades 6-9)

Year.07.08
Diabetes, the Silent Enemy, by Jolene Smith

On the Dine Nation the enemy diabetes is rapidly increasing. Various communities within the nation are educating and teaching individuals and families who have had or will experience the disease. At one time, the Indian Health Service was the only facility to serve patients with the diagnosis. Currently there are other facilities, which provide more information about diabetes like the community fitness and recreation centers, the schools, the townships halls, and the chapter house.

Diabetes is a disease that prevents the cells from absorbing and using glucose (sugars). Insulin excreted from the pancreas has been exhausted and the pancreas is unable to produce sufficient quantities. This causes glucose to saturate around cells waiting for the insulin, which causes an individual to become extremely sick.

The unit will be for students in grades four to six. It will include an overview, introduction, rationale, strategies, content background on diabetes, Dine Philosophy of

Education, and activities. The teacher will use this unit to make students aware of diabetes as a disease that can kill if it is not managed accordingly. The unit discusses the prevention, the traditional Dine' teachings (Dine' Philosophy of Education) and how diabetes affects individuals and families.

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

Year.07.09
Heart Disease, Transplants and New Technology, by Deborah Smithey

The curriculum unit is designed for students taking a biological science course. Cardiovascular disease claims the life of a large number of people. It is important for individuals to know that you can greatly reduce the risk of developing heart disease by simply changing your lifestyle. The medical community will be overwhelmed when the number young individuals suffering from heart disease rises. The major cause for the increase is dietary intake. Students are constantly eating foods high in fatty content. Their cholesterol levels are extremely high and many students suffer from obesity. It is important to for students to become knowledgeable about how their behavior patterns will affect that lifestyle in the future.

(Developed for Biology and AP Biology, grades 10-12; recommended for High School Biology, grades 10-12)

Year.07.10
Dimensional Analysis: A Mathematics Tool to Dissect the Circulatory System, by Richard Taylor

In the fall of 1999, NASA announced that it had lost the $125 million Mars Climate Orbiter because the scientists guiding the satellite made their calculations using metric measures, while the computer controlling the orbiter had been programmed using English units. Through all the years of design, testing, and simulations, no one had sensed that anything was wrong until the craft disappeared. Units are what give numbers meaning. Attach the wrong units to the numbers and even the most precise calculation is worthless. As medical technology develops new therapies to replace malfunctioning organs in our bodies as we age or injure ourselves, there will be questions as to performance, longevity, and reliability of those replacements. Will engineers look at the data in precisely the correct way to give them that extra insight? When engineers design these organs, will they make the same mistakes that NASA made, getting all the big pieces of data correct but missing the most basic consideration of knowing what the numbers mean? This unit will guide students into a way of approaching data and getting a feel for what numbers say so that little considerations like the meaning of the numbers get their due.

(Developed for Calculus AP/AB and AP/BC, grades 10-12, and Algebra I Support, grades 9-10; recommended for Algebra I, Geometry, Algebra II, Trigonometry, Calculus, Physics, Chemistry, and Biology, High School grades 9-12 [also appropriate for Middle School])

Year.07.11
Under Pressure! The Circulatory System and Hypertension, by Vanessa Vitug

This unit is designed to enhance the traditional high school anatomy and physiology classes but can be adapted for middle school level health classes. The unit focuses on the circulatory system with an emphasis on hypertension. Engagement and inherent motivation to learn a subject is a constant struggle for my students. Thus, I have written a unit that focuses on them, their families, and the community. Because of my student population, the topic of high blood pressure and hypertension allows me to easily engage my students into discussion. Once interested and hooked on the effects of hypertension on the circulatory system students are encouraged to use critical thinking skills and scientific investigation skills to delve deeper into a cardiovascular disease. Students, through the use of web-based readings, writing, presentation skills, and discussions explore and make connections to the real world, making the classroom textbook come to life. In the process they participate in memory games, expert panel discussions, and a Gallery Walk which will showcase their expertise on a particular heart disease. With this culminating project students will not only have learned the fundamentals of the circulatory system, but would have become their own advocates for healthier living.

(Developed for Anatomy and Physiology/Science, High School grades 11-12; recommended for Anatomy and Physiology/Science, High School grades 11-12)

Year.07.12
Your Liver, Can It Survive Your Abuse?, by Mary Whalen

The liver is a very important organ in your body, yet is a mystery to most of us. This unit focuses on the biology and functions of the liver, particularly as they relate to drug abuse and risky behaviors. It focuses on several examples of consequences of risky behavior. To illustrate these consequences, I describe the effects of two viruses that are fairly common and can have major consequences for the liver and general health. The first is hepatitis C virus (HCV), which is usually spread through sharing needles, including IV drug abuse and tattoos and piercings with unsterilized, shared needles. HCV can also be spread sexually. Hepatitis B virus (HBV) is generally spread by unprotected sex, although it can also be spread through sharing needles. I also describe the effects of acetaminophen (Tylenol). Acetaminophen is a very common over the counter drug. In high doses, it can destroy the liver. In fact, it can do major damage in recommended doses if the patient has a compromised liver. The unit is also about the ethics of organ transplants. Finally, it touches on artificial organs. This was written for high school

health, but would be suitable for biology as well. It would be appropriate for middle school.

(Developed for Health, grades 9-12; recommended for Health and Biology, Middle and High School grades)