

Curriculum Units by
Fellows of the
Yale National Initiative
Guide
2013

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Preface

In April 2013 the Yale National Initiative to strengthen teaching in public schools® accepted sixty-five public school teachers from sixteen school districts in nine states to participate in six national seminars held at Yale. The Initiative is a long-term endeavor to influence public policy on teacher professional development, in part by establishing exemplary Teachers Institutes for high-need schools in states around 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. Evaluations have shown that the Institute approach exemplifies the characteristics of high-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 Yale National Fellows came from school districts that are planning or exploring the establishment of a new Teachers Institute for Chicago, IL; Diné Nation, AZ; Emeryville, CA; Richmond, VA; San José, CA; San Mateo County, CA, and Tulsa, OK. 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. Overall, more than half of the Yale National Fellows were participating for the first time.

The National Fellows attended an Organizational Session of the seminars held in New Haven on May 3-4. The seminars reconvened during a ten-day Intensive Session from July 8-19 and concluded in mid-August when the Fellows submitted their completed curriculum units. The six seminars were:

- "Energy Sciences," led by Gary W. Brudvig, Professor of Chemistry and of Molecular Biophysics and Biochemistry;
- "Picture Writing," led by Janice Carlisle, Professor of English;
- "Interpreting Texts, Making Meaning: Starting Small," led by Paul H. Fry, Professor of English;
- "The Art of Biography," led by John L. Gaddis, Professor of History and of Political Science;
- "Invisible Cities: The Arts and Renewable Community," led by Joseph R. Roach, Sterling Professor of Theater and Professor of English, of African American Studies, and of American Studies; and

- "Genetic Engineering and Human Health," led by W. Mark Saltzman, Professor of Chemical and Biomedical Engineering.

The dual purposes of the program are to provide public school teachers deeper knowledge of the subjects they teach and first-hand experience with the Teachers Institute approach. This increases their leadership in an existing Teachers Institute or prepares them to lead the development of a new Teachers Institute. Each participating teacher writes a curriculum unit to teach his or her students about the seminar subject and to share with other teachers in their school district and, over the Internet, with teachers anywhere. The curriculum units contain five elements: content objectives, teaching strategies, examples of 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 six 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.

James R. Vivian

New Haven

August 2013

I. Picture Writing

Introduction

For nearly three thousand years, philosophers have been fascinated by and worried about the relation between words and images. Some formulations stress the similarities between the two media, as Simonides did in the sixth century BCE when he called poetry "a speaking picture." Other thinkers emphasize the differences between word and image, as Lessing did in the eighteenth century when he called them "friendly neighbors" who, despite their neighborliness, should always be separated by a strong fence. More recently, one literary theorist, W. J. T. Mitchell, has argued that there is no image without words and no word without images: all representations, verbal and visual, are, according to Mitchell, "imagetexts." How words work with or against images and how images work with or against words are topics that have become increasingly relevant in the past decade, even though – or perhaps especially because – we live, as postmodern theorists tell us, in an age of simulacra, an age in which images have taken the place not only of words but also of things.

The readings and topics and, most important, the units written for this seminar explore the various ways in which pictures write, the ways in which they communicate information and meaning; but they also explore how writing creates images, how it pictures. There are numbers of ways in which the two media combine: pictures may constitute languages like those built up out of words, pictures often make claims or tell stories, words can morph into pictures, and, most often, words define or explain pictures, just as pictures illustrate words. Central to many of our discussions in this seminar were the ideas that Scott McCloud develops in the sixth chapter of *Understanding Comics* when he sets out different possible ratios between writing and pictures. But we also explored Otto Neurath's attempts in the 1930s to create a universal language of symbols called ISOTYPE and Susan Sontag's famous attack on images that applied to the 1970s the lessons of Plato's cave. The purest example of picture writing that we read is a novel by Lynd Ward that he wrote entirely in wood engravings. Other readings were classic examples of works created by the interaction of words and images: William Hogarth's narrative in pictures, *Industry and Idleness*; *The Story of Ferdinand*, a picture book by Monroe Leaf; and two recent graphic tales, *V for Vendetta* by Alan Moore and David Lloyd and *Persepolis* by Marjane Satrapi. Included among the theorists who provided perspectives on this material were, along with McCloud, Edward R. Tufte, J. Hillis Miller, and W. J. T. Mitchell. Visits to the Yale Center for British Art and the Peabody Museum allowed us to think about the kind of teaching that is made possible when students are challenged to use words to make sense of the art objects or cultural artifacts that they are seeing.

Two of the Fellows in the seminar provide in their curriculum units compelling statements about the nature and significance of its subject. Matthew Kelly points out the

pressing need to understand how images function – how they create a particular kind of meaning with a particular kind of power – when he uses the term *art* to encompass all forms of visual imagery:

. . . media literacy – another name for the ability to use images, interpret images, and place images in context – is a relatively new emphasis in our comprehensive curriculum. While media literacy is usually construed in terms of electronic media, the truth is that almost every manufactured or artificially prepared surface that students see is designed or decorated in a way intended to influence their attitudes or behavior. They absorb, as we do, symbols and images telling them what to buy and how the things they buy establish social status. They are conditioned to obey these messages as unconsciously as we adults follow the yellow lines telling us not to drive into opposing traffic on the way to work. These symbols are created by professionals, professionals who have honed the tools of their craft in the tool shed of the fine arts and design. If students need to know one thing about images, it's this: art is all around us, and it's asking for your money. Art is everywhere, and it wants your brain.

Crecia Cipriano, who was the coordinator of the seminar, puts very clearly in her unit the conclusions that we reached when we had finished our readings and discussions:

Throughout the course of this seminar in Picture Writing, we have discussed the complex interplay between words and images, dissecting varied levels of effectiveness in terms of expression of information. A clear, uncluttered, and meaningfully selected or created image can say more on its own than it would if language were to be lazily or carelessly added, just as an effective and purposeful linguistic message might be obscured by vague or overpowering images. But when both language and image are consciously and carefully selected and combined, words and image can work in synergy to convey meaning most clearly, on perhaps a more holistically felt level.

As these two excerpts suggest, the subject of the relation between words and images became less a problem to solve than an opportunity to think about the communicative potential of two fundamental forms of media.

During the seminar the Fellows and I visited the Yale Center for British Art, as I had done with another group of Fellows in 2011. The results of our conversations there were as remarkable in 2013 as they had been two years earlier. Sheila McBride explains in her unit how we went about discussing a specific painting by J. M. W. Turner titled *Wreckers – Coast of Northumberland, with a Steam-Boat Assisting a Ship off Shore*. Half of the Fellows were asked

to notice visual features and elements of a painting at the [YCBA] without allowing us access to the painting's title or wall notes. Only after extended noticing and naming of what we could see, were we encouraged to interpret, analyze, and finally view the wall notes about the painting. Our discussion of this painting was much deeper, more insightful, extensive, and exciting than of other paintings where we did not follow this process.

This exercise allowed us to test a method of looking at images developed by Linda Friedlaender, Curator of Education at the YCBA, in collaboration with Dr. Irwin Braverman of the Yale School of Medicine. This pedagogical approach has been widely employed at the YCBA with students ranging from those attending kindergarten to those in medical school. First-year medical students, for instance, are trained to be better observers and therefore better diagnosticians. The means to that end are deceptively simple: those looking at an art object for the first time are asked to do precisely that – to look without the aid of any other information than what the piece of art itself offers. Only after all the details of, say, a painting have been noted is the viewer encouraged to offer an interpretation of those details (see <http://news.yale.edu/2009/04/10/class-helping-future-doctors-learn-art-observation>). On our visit to the YCBA, we complicated this process a bit by designating the rest of the Fellows as a kind of control group: they examined *Wreckers*, again looking carefully before interpreting, but they were told in advance its title, and they were given the information about it on the wall label: painted by Turner in the first half of the 1830s, it depicts a scene during a furious storm as people on the shore gather the debris from a ship that is breaking apart. As the wall label explains, wreckers were groups of people who lured ships onto rocks or other dangers so that they could salvage their contents when they went aground.



Joseph Mallord William Turner, *Wreckers – Coast of Northumberland, with a Steam-Boat Assisting a Ship off Shore* (1833 and 1834), oil on canvas. Yale Center for British Art, Paul Mellon Collection.

By seeing what happens when viewers of an art object are challenged to look at it before being told what it is or what it means, we were experimenting with an approach that is particularly pertinent now that the Common Core State Standards discourage what is called "frontloading," the practice of introducing students to an assigned reading by providing contextual information before those students have had a chance to grapple with it on their own. As Sheila McBride establishes in her thoughtful commentary on the recent debate over frontloading, this pedagogical strategy is second nature to those of us who teach in the humanities; but, as Sheila puts the point, "The consensus this past year is clear: most pre-teaching is out with the tide." Frontloading is, I realized, my usual practice: if I am teaching an essay by Susan Sontag, for example, I assign the essay and tell students a bit about Sontag, the role of public intellectuals at the time when she was writing, and her assumptions about the education level of her readers. In ways that I had not expected, the experience that the Fellows and I had at the YCBA made most of us feel more comfortable than we had been with the idea of dropping from our lesson plans the frontloading of information about context, the kind of information that might well offer

our students' interpretations that would limit, rather than increase, their understanding of a text.

The results of our experiment were, I think, genuinely remarkable – as they had been in 2011. Most of the Fellows looking at *Wreckers*, whether they knew its title and subject or not, focused on features like the ship in danger, the steam-boat in the darkest part of the canvas, and the castle-like structure towering unmoved during the storm. Yet in both cases most of the Fellows paid most attention to the human figures on the shore, people who, although they occupy the foreground of the painting, seem dwarfed by the drama being enacted on the sea and in the sky above them.



Turner, *Wreckers*, detail. Yale Center for British Art, Paul Mellon Collection.

After listing all the visual details that they saw in the painting, the two groups – one of them still without any information about the painting – began to offer interpretations of *Wreckers*, interpretations that turn traditional readings of this painting upside down. While one of the Fellows who knew what the people on the shore are doing remarked that they constitute an image of community, the group working with only what the painting itself said emphasized that point repeatedly and elaborated on it much more extensively than did their better-informed counterparts. What these Fellows saw – and here I am quoting the notes that April Higgins took – was a depiction of people doing "what they need to do to make it through the day," people "risking [their] lives," "working together, helping one another." This interpretation emphasizes the value of group effort, the coordinated straining of the people against the force of the sea, evident in the postures and groupings of the figures. In this reading the castle represents the forces that oppress workers like those on the shore: it is "pristine, untouched"; and this nameless, faceless image of power highlights, by contrast, the humanity of the people below it. The obvious

moral evaluation offered by the title of the painting – that the wreckers depicted in it are criminals, if not murderers – was undermined by a positive reading of the coordinated, almost heroic, action taking place in the foreground of the painting.

This interpretation is highly original. When I asked an art historian how a Turner scholar reads *Wreckers*, the answer could not have been further than it was from the interpretation that the Fellows had developed: according to this expert, the painting is a "sublime" depiction of "the cruelty of man added to the cruelty of nature." Such a reading makes unquestionable sense, visualized, as it is, in the composition of Turner's painting, the forms of the people aligned in parallel with the form of the breaking waves, so that the human world and the natural world might seem to be comparable forces, collaborating with each other to cause pain and death. Yet the Fellows' reading of *Wreckers* enriches that idea, making it possible to see the painting as an ambiguous, rather than judgmental, statement about the extremes of human life, blending and contrasting light and dark as the tones of the painting do.

This kind of enriched understanding characterizes all the curriculum units that the Fellows in this seminar are presenting here. The variety of their topics and of their approaches is impressive, and the units span grade levels from kindergarten to high school; the subjects covered range from language arts and social studies to foreign languages. Yet all the units share the same goal: to widen students' perspectives by making a number of different connections, not only between word and image, but also between past and present, the foreign and the familiar, students' experience and that of other peoples. I have arranged the units in groups that emphasize the differences between perspectives that are historical and geographical and cultural, although the lines between these categories blur in obvious and, I think, productive ways. Readers of this introduction will also notice my repeated use of words that use vision as a metaphor for understanding – the noun *perspective* and the verb *to see*, in particular – and that use is not simply the inevitable stylistic outcome of the topic of this seminar, but a tribute to the numbers of ways in which the writers of these units ask their students to see subjects, phenomena, and even themselves in entirely new lights.

Many of the units present ways of linking past and present. The first unit published here is by Katie Adams, and it deserves this placement because she asks her students to write in pictures, after first showing them how the written forms of language emerged many millennia ago from the drawing of pictures. Katie sees as analogous the developmental level of most of her students and of the pre-historical peoples who first realized that images have the power to communicate from one human being to the next. This conjunction allows her to set forth a series of activities that encourage her students to see that they have capabilities that they have not recognized:

I want [my students] to understand that they are capable of being great writers by communicating their thoughts and ideas in drawing images and pictures, as people have been doing for thousands of years. My unit is designed not only to help students see themselves as writers, but also to feel comfortable and confident in their ability to communicate their thoughts in the developmentally appropriate practice of drawing pictures and images.

When even young students grasp the narrative potential of images, they can become writers without having to use words. April Higgins, a middle-school teacher, plans to teach the meaning of the social contract by having her students read the graphic novel *The Girl Who Owned a City*, written by Dan Jolley and illustrated by Joelle Jones and Jenn Manley Lee. Also using classic theories of the role of government by Hobbes, Locke, and Rousseau, this unit sets the plot of the graphic novel, in which children are left alone in a world without adults, against the history of the increasing complexity of human social organizations from the family to the nation state. In her defense of graphic fiction, the teaching of which still tends to make parents and some teachers more than a bit nervous, April provides an argument to assuage their fears:

In reality, graphic texts are not just comic books with a new name: they are narratives, memoirs, historic fiction, and even nonfiction. Graphic novels today are written for readers of all ages and can be highly sophisticated. With a diversity of genres and writing styles, graphic novels can be used in the classroom to introduce or expand students' knowledge of a particular topic or theme.

Like Amanda Taggart, whose unit I describe below, April uses her unit to let us see how graphic texts can, in general, enrich what happens in the classroom and, in particular, make concrete an abstract concept like the social contract.

The next four units – by Kimberly Towne, Sara Delman, Patricia Kephart, and Sheila McBride – also use images to bring historical subjects alive. Kimberly, a middle-school art teacher, looks back to British culture in the Victorian period at a time when the awareness of the rights of animals developed in tandem with new ways of picturing animals. In her combination of art and literature and community service, Kimberly makes connections between distant times and both the present and the future contributions that her students could make to the welfare of others. She employs Victorian artistic depictions of animals by Edwin Landseer and Harrison Weir, along with Anna Sewell's novel *Black Beauty*, to pique her students' interest:

Children enjoy looking at art that shows animals and reading stories about animals. I believe this unit will provide the students with an engaging unit that teaches a larger concept by using examples that they will find appealing. Sixth-grade students are coming to middle school and are trying to figure where they fit

and how to progress from being children to teenagers to ultimately adults. It is an awkward and confusing stage. I want this unit to influence the way they see the world and how they perceive the impact one person can make on that world. I want them by the end of the unit to feel that they can successfully make a difference, however small, in their world

Even farther afield than Victorian England, the Greece of the fifth-century BCE, when Sophocles wrote and presented his plays, is the subject of Sara Delman's unit, which she has prepared for her eleventh-grade AP English class. Sara recognizes a major difficulty that her students have when they read *Oedipus Rex*, and she plans to address it directly: her project asks her students to focus on the chorus precisely because they find that element of that tragedy so confusing and even irrelevant. Sara demonstrates how pictures drawn from a wide range of media – strange bedfellows that they are – can come together to make the historically foreign more familiar:

In this unit I'm attempting to teach the text *Oedipus Rex* by focusing mainly on the chorus and by teaching students about the incredibly important function of the chorus in classic Greek tragedy. We will use images of the Greek theatre as well as stills and clips from productions of *Oedipus Rex* to examine the role and function of the chorus in the tragedy. We will also compare and contrast the ancient Greek chorus with a modern equivalent: the Broadway musical.

As Sara says elsewhere in her unit, "Even my most chaotic after-lunch class can pay rapt attention as soon as there is a video or a picture up on my document camera"; and she therefore uses a time-honored practice from the discipline of art history by showing her students two images side-by-side so that they will have new ways to see what might otherwise seem a merely alien to their own experience.

Rounding out this group of units are two dealing with American history and presenting pedagogical approaches that can be adopted in both language-arts and social-studies classes. In her curricular plan, Sheila McBride uses paintings to help her middle-school students as they read *Forge*, a young-adult historical novel by Laurie Halse Anderson; and Patricia Kephart turns to picture books so that her fifth-grade students will recognize the significance of the contributions that women have made to the history of the United States. In addition to her commentary on the matter of frontloading, Sheila demonstrates how teachers can take advantage of the holdings in the Yale University Art Gallery, which include portraits of many of the historical figures depicted in *Forge*, who comprise, as she says, "Benedict Arnold, the Marquis de Lafayette, George and Martha Washington, Charles Willson Peale, and Baron von Steuben," along with lesser known people such as "Agrippa Hull – a free African American from Massachusetts; Oneida warriors; [James] Baumfree and [Elizabeth Baumfree or] Bett, parents of Sojourner Truth

and slaves of a Colonel Johannes Hardenburgh." Most important in this unit is, as Sheila explains, the fact that its "images and assignments"

direct student thinking to the contradictions in early American history between our founding fathers' ideals – "All men are created equal" – and their tolerance of or active engagement in slave-owning. Students will learn that 5,000 African Americans fought in the American army, but many times that number fought for or joined the British side. The historical contradictions that underlie America's early history are central to this novel and this unit.

Patricia Kephart's project undertakes an equally significant re-visioning of the past when it proposes to add women's accomplishments to the customarily male-dominated realm of American history. Reading picture books will allow her students to make connections, not only between pictures and past lives, but also between those lives and the students' potential in the present and future:

Without pictures my street-smart city dwellers would be hard-pressed to imagine Stagecoach Mary Field's wild 1880s Montana. Equally unimaginable to them is Eleanor Roosevelt absorbing political knowhow as FDR's supportive wife among the elite of 1920s New York. Illustrations set the historic scene, color the emotions, and make the story accessible by bridging cultural, generational, and linguistic gaps. Women who made their mark on America encourage this generation to conquer their fears and follow their dreams.

Also like Sheila, Patricia has taken advantage of the fact that the Yale Gallery of Art has made available on line a wealth of visual images that anyone can download and share with students. Her unit offers an equally rich resource for teachers in its impressively extensive list of picture books and the criteria that she has developed for evaluating their effectiveness.

Through their innovative and quite different pedagogical methods, Crecia Cipriano and Matthew Kelly, from whose curriculum units I have already quoted, are planning both to teach foreign languages and to broaden the perspectives of their students in geographical and cultural terms. Crecia begins her unit, specifically designed for eighth-grade students in her French classes, by explaining how confused she felt as a tourist in Paris, and she builds on that experience to create ways in which to conquer her students' even greater unfamiliarity with that city: they will build personal maps of Paris that allow them to "choose locations to explore based on interest and curiosity rather than on top-ten lists of best-known, must-see spots." Using icons and images, Crecia's students will develop a sense of Paris as a knowable city – one likely, I think, to make them more committed to learning the language spoken there. Matthew, who teaches Spanish in high school, adds the perspective of history to those of culture and geography so that he can introduce his

students to Spain and Mexico in the twentieth century. Matthew takes art objects and architecture as the visual texts of his project, helping his students to discover the significance of crucial periods in the histories of both countries, Spain under the rule of Franco and Mexico governed by Institutional Revolutionary Party. As he explains, the objects that he has chosen for analysis "are important because they are present in the lives of millions of citizens of Spain and Mexico. They provide a window on the Mexico and Spain of living memory, on political and social forces very much alive in these countries today." Particularly of interest in this unit is its demonstration of how a "dictatorial state" employs images to consolidate its power.

Finally, the curriculum units written by Julie So and Amanda Taggart help students learn about phenomena and circumstances unlike their own, with Julie introducing her northern-California kindergarteners to the kind of weather that they have never experienced (think snow) and Amanda Targgart broadening the cultural perspectives of her ninth- and tenth-grade students in her English classes by asking them to read Marjane Satrapi's memoir-graphic-novel *Persepolis*. Julie has developed a wide variety of ways to use the subject of weather to interest and, I predict, delight her students: at times the class becomes an art studio; at other, a science lab. Because her students are second-language learners, as Julie says, they need to build the prior knowledge that they are expected to have but often lack, yet they have ample capabilities to be successful learners:

Amusingly to me, young children, with their curious eyes, hands, and bodies, seek to understand the world around them, and they are naturally intrigued by science. This is one of the reasons why I can't wait to introduce a unit that will focus mainly on science standards, using strategies to connect images and words for deeper comprehension of weather and how it affects the world and earth's inhabitants.

Amanda Targgart plans to address a comparable lack, this one in her high-school students' knowledge and understanding of the history and culture of the Middle East; and she uses a visual metaphor in her subtitle to signal that she would like students to see with something other than their standard "American Lens." In a fashion befitting the concluding unit in this seminar, Amanda Targgart's remarks on what she plans to accomplish in her project provide a comprehensive account of the value of focusing on the relation between word and image:

Visual literacy must be explored in the English class curriculum in order to prepare students for our visual world. In addition, to be prepared for the global world, students must have an understanding of cultures from outside the United States. By reading the graphic-novel-memoir *Persepolis*, other supplementary texts, and by seeing photographs and videos, students will learn about Iranian

history and culture. Furthermore, they will take ownership in the development of their visual and verbal literacy

The subject of visual literacy has entered the English class as well as many others; and a wide range of teachers will want, I think, to take advantage of the thoughtful, resourceful, and inventive approaches to their subjects that these curriculum units set forth.

As a collection of pedagogical strategies and of viewpoints on important theoretical issues, these units are remarkable, as I have said, because they all share similar goals. Each of the Fellows in this seminar sees that the interplay of words and images has the potential to empower his or her students – to make it possible for them to think, for instance, that their commitment to social action really could make a difference or that they too might have a significant role to play in the life of our nation. More generally, the enriching perspectives of these curriculum units offer a wide variety of opportunities to the students lucky enough to be taught by their authors to be empowered as thinkers. That is, I would argue, the goal of the best of instructors, and I am grateful to have had a chance to work this summer with the genuinely exceptional teachers whose units are featured here.

Janice Carlisle

Synopses of the Curriculum Units

2013.01.01

[Picture-Tellers: How to "Write" a Story, the Kindergarten Way](#), by Katie Adams

"Kindergarten teachers get to do art and playtime; the upper grades are more academic." If I had a nickel for every time I heard that, I'd have an incredible listening center! To outsiders, Kindergarten is filled with playtime, painting, and learning to write the ABC's. However, Kindergarten is packed with reading, adding, and writing several sentences on a focused topic—how the times have changed! Many state-adopted curriculums link a child's ability to print letters to his or her ability to "write" a sentence. I want to step away from this criterion by allowing my students to begin the writing process where it is developmentally appropriate and where written language has historically began—in drawing pictures.

As Kindergarten is often a child's first academic experience, I want my students to develop an enthusiasm for and confidence in their ability to "write." They need to understand that drawing pictures is a great way to share their ideas and that it is historically how many forms of written language were created. With this knowledge, they will feel a sense of pride in the work they create and will be eager to take the next steps in the writing process.

(Developed for English Language Arts-Writing, grade K; recommended for English Language Arts-Writing, grade K)

2013.01.02

[Our Visible Social Contract](#), by April Higgins

What does a graphic novel have to do with civics?

This unit teaches students about the origin of governmental powers through an engaging and powerful graphic novel, *The Girl Who Owned a City*. The graphic novel outlines major themes in understanding the development of government such as theories about the state of nature and the social contract, instances of self-preservation, population growth, and structures of leadership. The essential question for the unit is, "Why does a government have certain powers?" By the end of this unit, the students will understand that the citizens agree to give up some of their personal freedoms to ensure that society is orderly and to protect their rights. A major component in this unit involves building a framework that the students can use when reading and discussing visual media. I will begin by teaching them about sequential art, and then I will introduce Scott McCloud's categories the relations of words to pictures. Finally, we will take a look at Williams Moebius's "Introduction to Picturebook Codes" to allow for in-depth conversations related to the composition of visual media.

(Developed for Social Studies, grade 6; recommended for Social Studies, U. S. History, and English Language Arts, grade 6-8)

2013.01.03

[One Starfish at a Time: Combining Animals, Art, Literature, and Community Service](#), by Kimberly Towne

This unit is designed for middle school art students, but it can easily be adapted to upper elementary and high school levels. The key concept is that students can have a positive influence on the world. After examining how art and literature facilitated change in the Victorian perception of animals, my sixth- grade students will create portraits of animals that will be reproduced as cards and given to the local SPCA to sell. The students will use oil pastels to create animal portraits and will complete a variety of activities that integrate writing and evaluating art. By connecting the novel *Black Beauty* and the art of Edwin Landseer and Harrison Weir with the idea that one person can make a change, I intend to have students understand that they can impact the world through their art, writing, and community service. By teaching this unit, I hope to give them a sense of empowerment. I want them to feel that they too, even if only in a small way, can bring positive change to the world.

(Developed for Art, grade 6; recommended for Art and English, Elementary, Middle, and High School grades)

2013.01.04

[Seeing Oedipus Rex: Using the Chorus to Understand the Tragedy](#), by Sara Delman

The main challenge for my AP Literature students when studying the Greek tragedy Oedipus Rex is reading and interpreting the chorus. It is densely worded and difficult, and I often get the feeling that students think of it almost as if it were a side note—one they don't really have to pay attention to in order to get the drift of the story. It's almost impossible to get them to ask questions about the chorus in order to find meaning, and in the past they've needed to have it spoon-fed to them. In this unit I'm attempting to teach Oedipus Rex by focusing mainly on the chorus and by teaching students about the important function of the chorus in classic Greek tragedy. I want both to pique their interest by uncovering the history of the chorus as well as comparing and contrasting the purpose of the chorus in classic tragedies with modern musicals that they are more familiar with. We will use images of the Greek theatre in addition to stills and clips from productions of *Oedipus Rex* and Broadway musicals to examine the role and function of the chorus in the tragedy.

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

2013.01.05

Inspiring American Women: Painting Them into the Picture, by Patricia Kephart

Women of American history need to be taught in elementary schools. Our textbooks are stuck in the male-dominated twentieth century. We need to pull the teaching of history into the twenty-first century by stressing the contributions of women in order to complete the picture of American life. Our list of women should be multicultural, reflecting our population's true variety. The best way to introduce young children to history is by having them read picture books. Picture books blend the media of words and images, creating easily understood content. This is especially useful for teaching second-language learners. Students learn strategies for "reading" pictures. They refer back and forth between text and image to make meaning. Illustrations provoke discussion by giving students practice in debating concepts—a crucial prewriting step. Biography links informational text and good story telling. Not all picture books, however, are successful with young readers. This unit lays out what makes a good picture-book biography. The student reference bibliography at the end of the unit is a treasure trove. The list will give teachers a strong start in building their own library of books about great American women.

(Developed for Language Arts and History/Social Studies, grade 5; recommended for Language Arts, grades 2-6, and History/Social Studies, grade 5)

2013.01.06

Picturing a Different America: "Reading" Images, Reading Strategies, and Historical Contradiction — Without "Frontloading"?, by Sheila McBride

"I read the words, but just didn't couldn't get any pictures in my head while I was reading." How can a teacher of reading help students visualize unfamiliar contexts? This unit offers an approach to using historical fiction in a middle-school English class to support and expand on what students are learning in Social Studies and vice versa. *Forge*, a young-adult novel by Laurie Halse Anderson, set during the American Revolution, puts a teen escaped slave, Curzon, in the context of a war, the contentious culture of slavery in a newborn country, and his conflicted feelings for a young slave girl, Isabel, whose own story of escape and rebellion is told in the companion book, National Book Award Finalist, *Chains*. Teachers might be tempted to pre-teach the historical context for this or other novels, but should they? This unit addresses new Common Core State Standards' recommendations in English Language Arts to downplay or eliminate the practice of "frontloading" reading with pre-reading lessons. Additionally, assignments in this unit are designed to help students critically evaluate the hypocrisy of our slave-owning Founding Fathers, while retaining empathy for them, some of whom appear in *Forge*, whose culture believed that only some "men are created equal."

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

2013.01.07

[Picturing Paris: Sites and Sights of the City](#), by Crecia Cipriano

The French language and culture often seem quite removed from the lives of my students. Whereas they see and hear evidence of the "point" of learning Spanish literally daily, it is often more difficult to convince them of the practical benefits of learning French.

Although there are indeed plenty, perhaps the key is to finally drop the pretense that the competition is comparable in terms of present day, everyday relevance, and instead set our sights on the future, full as it is of possibility. Paris is the City of Lights! It's a city that begs to be dreamt of, that resonates with mystique and allure. So let's use that! Let's compel the adventurous nature of our future travelers and explorers through image-rich activities that will lead students to learn about the city based on what draws them in, familiarizing themselves with the landmarks that interest them most, and developing a conception of the city that has individualized meaning and significance.

Although this unit is specifically created for use in an 8th grade French class, it provides a framework that can be applied to other language and city study as well as other grade levels of French.

(Developed for French 1B, grade 8; recommended for Middle School French 1B, grade 8, and French I, grade 9)

2013.01.08

[Medals, Monuments, and Money: Nationalist Art in Spain and Mexico](#), by Matthew Kelly

In my unit, students of Spanish will explore nationalist art, architecture, and propaganda of Spain and Mexico. The specific pieces they examine will vary in terms of medium and national origin. They will range from the small (medals awarded by the Franco regime in Spain and currency notes issued by Mexico) to the very large (a monumental housing project in Mexico City.) Students will analyze these pieces of art in terms of their historical and political setting and will analyze the relationship between the medium and the message. We will talk about the interplay between text and image in the works selected. Students will become more aware of the images that bombard them and will become conscious consumers of art and design, especially work that is intended to influence their behavior. Furthermore, we will elevate students' overall schema of the history of Spain and Mexico in the twentieth century and of the twentieth century in general. Students will finish the unit by creating "nationalist" art of their own using a combination of text and visual art elements.

(Developed for Spanish III, grades 9-12; recommended for Spanish III, Spanish IV, and Spanish V, grades 9-12)

2013.01.09

[Weather and Building Knowledge](#), by Julie So

"Look at the snow!" exclaim my five-year old students on a cold winter day, even when it is only frosty dew melting away. Some students enter Kindergarten with comprehension of some weather words and images. Other students have limited prior knowledge of various weather concepts, vocabulary, and images. They all need to get a feel for the weather, and understand how much fun it can really be!

This Kindergarten weather unit addresses the difficulty teachers have in building on limited prior knowledge of young students by applying visual literacy strategies to construct foundational basic weather knowledge that students will use as prior knowledge in the future. Particular components of weather are difficult for students with limited prior knowledge. In this weather unit, teachers learn and apply visual literacy, visual language, and imagery skills to support student learning with intriguing science projects, engaging activities, and relevant use of technology. Students in Kindergarten are fun to teach because they are full of curiosity about the world around them. Using visual literacy ideas, imagery, and visual language research from the Picture Writing seminar, this unit provides information to help students gain a depth of knowledge about weather. (Developed for Science and ELA, grade K; recommended for Science and ELA, grades K-2)

2013.01.10

[Challenging Perceptions: Persepolis Beyond the American Lens](#), by Amanda Targgart Neeley

"That is why I wanted people in other countries to read *Persepolis*, to see that I grew up just as other children do." -Marjane Satrapi ¹

For this unit, students will examine the ways their eyes see other cultures, in particular, Middle Eastern culture. The graphic-novel-memoir *Persepolis* will be the central text. This unit will encourage students to question their own perceptions and will also allow them to recognize the ways in which different countries and cultures are seen from different points of view. Many of my students are limited in their exposure to other cultures. Many of them rarely leave the city of Chicago. Most of their knowledge of about other countries and cultures comes from the Internet, books, and television; the messages they receive through these mediums, however, are often not critically analyzed in the classroom. In order to analyze cultures outside the United States, students must first reflect on their own values, reflect on how those values were formed, and then question them. The goal for this unit is for students to discover a wider global lens by

learning about the Middle East and analyzing their own perceptions. This goal will be achieved through reading the story *Persepolis*.

(Developed for English I, grade 9; recommended for High School English Class, grades 9-10)

II. Interpreting Texts, Making Meaning: Starting Small

Introduction

The Fellows in this seminar shared a lively and productive interest in the "So what?" of teaching. Why am I doing this? What do I expect my students to learn? How can I get them to think harder about what they read?—or, in any case, how can I get them doing what Bloom's Taxonomy calls "higher-order thinking"? In the seminar, we began by working with very small or very elementary texts, having outlined some interpretive approaches to texts in general that have appealed to critics. We then settled into the interpretation of more challenging texts that involve what might be called an interpretive crux: for example, Tennyson's "Ulysses," James's *The Turn of the Screw*, and Shakespeare's *Hamlet*. We returned in the end (much to my enjoyment, at least!) to a group of poems by Robert Frost.

For their curriculum units the Fellows arrived in New Haven for the most part knowing which texts – mandated or allowed by their school districts – they wanted to teach, so it remained only to decide how to teach them. As nearly always in our seminars, the Fellows' interests fell spontaneously into clusters, and it's in the order of these clusters – four of them – that I want to present the units here. There are of course overlaps of interest that might prompt another arrangement, but these are the clearest linkages. First, there are two units, to my extreme but happy surprise, on Conrad's *Heart of Darkness*. Second, there are three units that involve the teaching of Native American culture. Third, there are three units that have as their main purpose the encouragement of spiritual and social understanding, if not activism. And fourth, there are three units that bring interpretive strategies to bear on a single age-specific text.

Ludy Aguada offers a unit on *Heart of Darkness* best suited for AP students that focuses interpretive skills on the text but also extensively engages with secondary materials (her base text is the Norton edition), focused on Chinua Achebe's provocation and the most thoughtful responses to it in the ensuing controversy. **Jo Stafford's** unit on *Heart of Darkness* takes a similar painstaking approach with the help of secondary material, but with a special emphasis on the theme of evil and its implications.

LeAndrea James from the Diné Nation teaches special education students in her school district with the hope of igniting in them an interest in the Navajo language and their culture. To this end, she assigns poems for children based on the seasons and concerning traditional practices that are illustrated and written in both English and Navajo.

Alexandra Edwards is a history teacher using fictional and semi-fictional texts to illuminate the historical circumstances surrounding outsiders attempting to secure and maintain landed property in the United States: Black families during Jim Crow (Mildred Taylor), immigrants in the Midwest (Cather's *My Antonia*), the Lakota Sioux and also the

Navajo after the Long Walk (various texts). **Christen Schumacher** fulfills a State of Virginia mandate for second or third graders by covering concepts of cultural difference and change through time with the comparison and contrast of Native American cultures from the Southwest, the Great Plains, and the Northeast, using illustrated books of fact and fiction for young children.

E. M. Miller encourages the appreciative understanding of her city, Chicago, and the urban in general, by "starting small" with a children's book about a transplanted house (gendered female) and ending small with haiku poems written in Paris by Richard Wright, ranging through Sandburg and other Chicagoans in between while invoking strong pedagogical mentors. **Jeff Weathers** writes an exhortation about making connections, reviewing advanced theories of interpretation and cognition with a pedagogical slant while proposing to teach – and in the meantime offering insight on – disparate texts addressing, first, the notion of being an "It," and second, the horror of Jim Crow violence. **William (Miles) Greene** offers a unit on the protest poem, providing some background for this mode, with an emphasis on three interpretive objectives: the author's purpose, the tone, and the poem's mood.

Leilani Esguerra sharpens her students' interpretive skills by approaching a single mandated text, Jon Krakauer's semi-fictional *Into the Wild*, with an emphasis on the narrator's reliability, partly introduced through a contrast with relatives' descriptions of the character described. Her particular focus questions whether the chapter epigraphs confirm or conflict with the chapters' content. **Cheree Charmello** teaches S. E. Hinton's *The Outsiders* in a unique way: Offering a full survey of the literature on improvisation ("Improv"), she explains how to teach the book by inducing students to "perform" each chapter successively in keeping with the many situations that are standard in Improv, one for each chapter. **Whitney Davis**, finally, engages the interpretive attention of very young students by walking them through the chapters of Roald Dahl's *The BFG*, covertly introducing both folkloric history and the concept of literary allusion by cross-referring to other books about giants, Jack in the Beanstalk (alluded to by Dahl) and Fin M'Coul.

I would encourage all interested teachers to read these provocative and helpful curriculum units.

Paul H. Fry

Synopses of the Curriculum Units

2013.02.01

[Moving Beyond "Huh?": Ambiguity in Heart of Darkness](#), by Ludy Aguada

The anchor text for this unit is Joseph Conrad's *Heart of Darkness*. In this unit, students will use Marlow's recounting of his journey up the Congo as a metaphor for their own journey into learning how to make meaning from a text that, for many of them, defies understanding. They will use Socratic seminars, dialectical journals, group reading, and in-class essays to build the close reading skills that serve as the foundation for being able to interpret texts. Hopefully, with my guidance and support from each other, their journey will end on a much more hopeful, less ominous and brooding note than that of Marlow and Kurtz.

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

2013.02.02

[Pathways to Making Meaning: Inroads to Interpretation of The Nature of Evil in Heart of Darkness](#), by Jo Flory

This unit is centered on study of the novella *Heart of Darkness* by Joseph Conrad. It begins with the use of more accessible, thematically related texts to introduce elements of the story and model the process of interpretation before applying that process to the novella. Throughout the unit the focus is on incorporating strategies that make interpretation of this challenging and rich text more accessible to and relevant for students.

One of the major themes in the book is the nature of evil. Students will engage in conversation and discussion of such essential questions throughout the unit as they interpret the work and express their understandings of and conclusions about this theme and how it is revealed in the book. Students will complete activities that enable them to make connections to the book and support their opinions with evidence from the text. This unit was created for students taking 11th grade Advanced Placement Language and Composition, but it would be well suited for any 11th or 12th grade World Literature or British Literature class.

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

2013.02.03

Seasonal Dine/Navajo Poetry: Interpreting the Seasons through Dine/Navajo Culture, by LeAndrea James

This unit will help students interpret the lifestyle of the Navajo people through poetry stories and literature. Student will be able to read the poetry stories and understand the historical background of the Dine people by reading through the text written in both the English and Navajo language. The text depicts the traditional way of living according to the history of Navajo/Dine people. The poem stories will help to remind students of how our Dine people lived in balance with the land and the seasons. The vocabulary written in the Dine language will be utilized as a medium for students to begin speaking their Dine language. The poetry stories illustrate the livelihood of a Dine family from the past. In addition, the students will dive into the historical aspect of the Dine culture by analyzing the Long Walk and the Navajo Code Talkers.

(Developed for Special Education and English Language Arts, grade 7; recommended for English Language Arts and Navajo Language Class, Middle School grades)

2013.02.04

Teaching Post-Civil War History in Document-Based Fiction, by Alexandra Edwards

I have designed a unit that empowers me to teach fiction and non-fiction books using interpretive methods. My goal with this unit is to increase students' personal knowledge of history in the US. I want my students to be able to clarify what American citizenship is and know the difference between true citizenship, according to what the Constitution and the Bill of Rights originally articulated, and the second class citizenship that was accorded many Americans during this time period. I also want them to determine the sacrifices made by all groups involved in the journey to true equality and becoming a part of the American nation. Finally, to answer the age-old question, why studying history matters, I want my students to make some sort of personal connection with the author, someone possibly not so different from themselves. Interpretation of what they read will undoubtedly produce many meanings, not just what emerges from my customary historical angle. This unit is not just a component to build a reading unit. It also encourages my students to interpret their reading and to see that there are several possible interpretations. That leads to discussion.

(Developed for U. S. and N. C. History, grade 8; recommended for Middle School U. S. History, grade 8, and High School U. S. History, grade 11)

2013.02.05

Real American: Making Literature a Means for Displacing Native American Stereotypes, by Christen Schumacher

How do you view Native Americans? Do you imagine clothing made of deer skin, feathers in a traditional headdress and cooking over an open fire? Or, do you know someone who is Native American and have a completely different idea of what it means to be an American Indian?

With the use of picture books, the students will journey through three distinct regions: the Southwest, Plains (Rocky Mountain Region), and the Eastern Woodlands (Northeast United States). Here, they will learn basic facts about how Native Americans lived in the past, and we will move through time (using an interactive timeline) into the present where we will discover what life is like for a child who is Native American.

The goal of this unit is not only to introduce my students to Native American culture, traditions, storytelling, and art, but also to have discussions about what it means to be an American Indian, both past and present. We will use children's picture books to displace stereotypes, learn about traditional stories and characters, practice interpretation skills with wordless books, and participate in other activities that will give the students a feel of life as a Native American, past and present.

(Developed for Language Arts and Social Science, grade 2; recommended for Language Arts and Social Science, grades 2-3)

2013.02.06

Interpreting the Urban Landscape, by Elizabeth Miller

This is a unit

Where students read, write, explore

The urban landscape.

(Developed for Reading and Survey of Literature, grade 9; recommended for English Language Arts, grades 3-12, and Social Studies and Creative Writing, grades 6-12)

2013.02.07

Interpreting the Literal for the Revelational, by Jeffrey Weathers

Interpreting the Literal for the Revelational provides theories for interpreting literature, as well as aspects of cognitive science and how we think via analogy and metaphor. I also include my own composite theory about similes, chiefly that since similes are

syntactically analogy *and* metaphor, having essences of both *is* and *like* in their nature, they are natural interpreters, the go-betweens and spirit, of *concrete* likenesses and *abstract* differences. The mind of this curriculum is works by literary critics (Frye, Perrine, Brower and Wimsatt), and linguists and cognitive scientists (Lakoff, Pinker, and Hofstadter and Sanders). The heart is literature about children who face loss and the struggle for identity (i.e., *Grisha*, *The Flowers*, *A Child Called "It"* and *The Catcher in the Rye*), following criteria for interpretation set forth by literary critics, and fourfold reading where the first reading is the literal story, the second is metaphorical with the understanding that it is something else, the third is with the question "how does this apply to me," and the fourth is for personal revelations the texts may provide. Collaborative interpretations are for students to problem solve as parents for the children in the literature and, ultimately, for their own future generations.

(Developed for English 3-4 College Prep, grade 10, and Film as Literature [except the literature will be films], grade 12; recommended for English and Humanities, grades 9-12)

2013.02.08

Teaching Tone, Mood and Purpose through the Interpretation of Activist Poetry, by William Greene

Students in urban high schools often feel uninspired and powerless over their own future but often excel or take interest in traditional forms of self-expression like song or poetry. Poetry is a special form of expression in that it allows one to express ideas and experiences through rhythmic language in an artistic fashion, often relying on the experiences of the reader for its interpretation. Specifically, Activist Poetry brings attention to social or political injustices and aims to encourage action against these social or political injustices through traditional activist methods. However, before awareness and action can be occur, a strong understanding of a poem's intention must be established. Understanding the author's intention is a vital step in the interpretation of a poem and is most effectively ascertained through the identification and consideration of a poem's tone. In this unit students will learn how to interpret the intention of a poem by examining the tone, mood and purpose of socially and politically conscious poetry. Consequently, students will improve their comprehension, literacy and skills in self-expression by analyzing the relationship between a poem, its author, subject and own personal experiences. Students will ultimately create poetry of their own, using techniques taught surrounding tone, mood and purpose, that aims to bring light to a significant social problem faced by that student's community.

(Developed for English, grade 9; recommended for English, grades 8-9)

2013.02.09

Epigraph-allacy: Using Epigraphs to Elicit Student Interpretations, by Leilani Esguerra

The skill of interpretation requires students to begin with the small details of a text, such as background information and vocabulary. Once the details are understood, students proceed to make meaning from those details. And in the course of making meaning, interpretation requires students to address varying perspectives in order to create their own interpretative conclusions.

This curriculum unit is designed to give students a road map or skill set to understanding texts that offer multiple or even questionable perspectives. This unit provides teachers with ideas for developing the skill of interpretation with particular attention to epigraphs from Jon Krakauer's *Into the Wild*. Through the epigraphs, students will dissect and analyze the small details in order to gauge the reliability of the author-narrator. The goal of this unit is for students to readily practice the skill of interpretation. In doing so, students will learn that a single perspective is not always adequate for arriving at conclusions.

(Developed for Expository Reading and Writing Course [ERWC], grade 12; recommended for ERWC/English [High School], grade 12)

2013.02.10

Living Texts: Analyzing S.E. Hinton's *The Outsiders* by Thinking, Reading, Acting, and Thinking Again, by Cheree Charmello

Living Texts: Analyzing S.E. Hinton's The Outsiders by Thinking, Reading, Acting, and Thinking Again is an adaptable, English Language Arts unit that provides opportunities for middle school students to *physically* demonstrate their interpretations of S.E. Hinton's *The Outsiders* through improvisation. The implicit purpose of the classroom activities is encouraging personal and social responsibility. Included in this unit is a sequence that can be used by students to efficiently and effectively interpret text. Both the interpretation strategies and the improvisational strategies are used within a performance sequence that uses each chapter of the novel as the foundation. Integrating these strategies will help students to interact with text through visual, auditory, and kinesthetic means, thus accessing each student's learning modality. Use of improvisation will help students to physically, linguistically, and artistically put themselves in the shoes of other people (characters), places (settings), and problems (plot) in order to help them *see, hear, and feel* what is going on in the words of the text. The unit's creation was guided by Common Core.

(Developed for Humanities [Cross Curricular Studies], grades 7-8; recommended for Language Arts, grades 6-9)

2013.02.11

Giant Reading with The BFG, by Whitney Davis

This unit will focus on "growing giants in reading" through encouraging and improving your students' reading comprehension skills. I explain how to complete a chapter -by- chapter analysis of *The BFG* by Roald Dahl. Throughout this unit we will focus on strengthening reading comprehension skills, through reinforcing and improving your students' retelling, predicting, making connections, and critical thinking skills. Students will also gain background knowledge, and make text-to-self connections with fairy tales by reading books about giants such as: Abiyoyo, Fin M'Coul, and Jack and the Bean Stalk.

(Developed for Language Arts, grade K; recommended for Language Arts, grades K-2)

III. The Art of Biography

Introduction

This seminar, intended chiefly for teachers of reading, writing, social studies, history, and English, sought to encourage the use of biography (including autobiography) as a method of classroom instruction. Everyone has a life worth recalling, even if only to one's family or to one's self: learning itself, if by that we mean accumulated experience, is arguably the most important use of biography. Maybe that's why biographies, whether in print or electronic editions, continue to be so widely read.

How, though, do you go about writing a life, whether it's your own or someone else's? Because I've been working on a biography myself – of the 20th century American diplomat and strategist George F. Kennan – I've tried over the past decade and a half to learn something about the subject by teaching it to Yale undergraduates. I adapted the course for the Yale-New Haven Teachers Institute in 2012 and, in the summer of 2013, for the Yale National Initiative. My teachers and I concentrated on several things:

First, the reading and critical discussion of biographies and autobiographies, selected with the help of the seminar to reflect a range of subjects and approaches. I wanted the list to include both good and not-so-good biographies, because I think you can learn at least as much from each. I wanted the emphasis to be as much literary as historical, because biography – which is really about character – relies as much on the skills of novelists as of historians. And I wanted to explore particular genres of biography, ranging from the first great autobiography (St. Augustine's *Confessions*) through graphic biography, a recent innovation in the field (Chester Brown's life of Louis Riel).

Second, extending the concept of biography from the printed page to the new media that will – as costs come down – surely be making their way into classrooms. Yale's Collaborative Learning Center provided each of my teachers with iPads for the two weeks they were in New Haven, and we experimented with their use both inside and outside the seminar. Particularly valuable to us was Art Authority, a pre-loaded app that allowed us all instant access to thousands of portraits and landscapes, each suggesting something (usually multiple things) about biography.

Third, extracting from these readings and visual materials certain principles of biography that can, with appropriate adaptation, be "teachable" across a wide range of age groups and student skill levels. I was fortunate to have teachers working across a broad range of grade levels and student needs. Without the years of experience my teachers brought to our seminar, we would hardly have been able to connect principles with practice as thoroughly as we did.

Finally, based on the readings they'd done, the iPads they'd experimented with, and the principles they'd identified, each of the teachers in my seminar produced a curriculum unit for use in their own classrooms and we hope in others, meant to engage students in the reading and writing of biographies or autobiographies. These reflect several different approaches:

The use of autobiographies focusing on the experiences of childhood and adolescence. Carol Boynton's unit, designed for first through fourth graders, introduces her students to the idea of autobiography through the stories of two prominent children's authors, Patricia Polacco and Tomie dePaola. **Taylor Davis** employs a similar approach in a unit intended for sixth through eighth graders, based on the boyhood memoirs of the author Roald Dahl. Working with the same age group, **Michelle Hilbeck** explores the issue of bullying in school through the autobiography of Dan Greenburg. And **Raymond Smith**, who also teaches middle schoolers, concentrates on the *negative* lessons to be learned from the troubled adolescence of the author Jack Gantos. From these examples, their students will be able to compose, illustrate, and circulate their own autobiographies, in each case emphasizing, as do Polacco, dePaola, Dahl, Greenberg and Gantos, specific character-shaping episodes, some to be emulated, some to be avoided, drawn from the experiences of others roughly the students' own age.

Autobiographies and biographies documenting the lives of individuals within distinctive groups. Role models are important, especially within "minority" communities, a point stressed by several teachers in this year's seminar. **Torriann Dooley** introduces her second graders to this idea by way of a Dr. Seuss story, after which her students will read age-accessible biographies of Benjamin Franklin, George Washington, and Martin Luther King, Jr. **Lisa Christenson's** fifth graders will study African-Americans during the American Revolution, and then write about what they themselves might have experienced if they had they lived in that time and place. **Terry Anne Wildman** is teaching a similar unit on fugitive slave narratives before and during the American Civil War. **Audrelia Dugi**, a high school teacher in a Navajo school, is emphasize the lives of notable Navajos as a way of training her students in appropriate techniques for interviewing members of their own families about their history, which in their culture is rarely if ever written down.

Using the life of a single individual to teach principles of autobiography and biography. **Camille Pires** will put her third graders through a detailed analysis of Barack Obama's *Dreams From My Father*, letting them discover for themselves what it takes to write an autobiography. **Audra Bull's** middle-schoolers are particularly interested in Walt Disney, so she has made herself an expert on his life as a way of encouraging them to try their own hand at drawing, but also to show them how a biography is constructed. **Sonia Henze**, who teaches women's studies to high school students, undertakes a similar project, with parallel purposes, on the life of Gloria Steinem. Finally, **Liz Daniell**, who teaches English to high school students, takes advantage of the recent discovery of the

remains of King Richard III to teach Shakespeare's eponymous play, stressing the extent to which the Bard, like many biographers, had an interest in blackening his subject's reputation: her students will learn, from this unusually dramatic case, the importance of reading biography critically.

I've learned a lot from working with these dedicated teachers, and all of us hope the curriculum units they've prepared will be helpful to others. I'm grateful as well to the equally dedicated staff of the Yale National Institute, and to my seminar coordinator Carol Boynton, for having made our collaboration possible.

John Lewis Gaddis

Synopses of the Curriculum Units

2013.03.01

[The Story of Me](#), by Carol Boynton

Young students love to tell the stories of their lives. So many of their experiences are events happening to them or around them for the first time, making each memorable and, frankly, formative. As adults, we still carry such intensely meaningful events as memories formed by the powerful impact they had on our senses and feelings.

Useful in first through fourth grades, this six-to eight-week unit is designed for second graders to learn that biographies, the lives of people, are written expressions of memories and stories. The memories and stories in this case will be their own. The students will be introduced to the series of autobiographical stories of two children's authors, Patricia Polacco and Tomie dePaola. These mentor texts will set the foundation for the students to write, illustrate and publish their autobiography of small moments published in a series of bound picture books. Their inspiration and information will come from personal photographs from home and school as well as from their own drawings and art work.

(Developed for Writing, grade 2; recommended for Writing, grades 1-4)

2013.03.02

[Character Traits in Biography](#), by Torriann Kennedy

Throughout this unit my second grade students will be learning about the character traits and contributions of famous people in history by reading biographies and autobiographies. Additionally, students will be adding their own important stories into the genre by writing their own autobiography. Their learning supports Common Core standards in Language Arts, especially reading informational text, writing, and speaking and listening, as well as North Carolina Essential Standards for Social Studies. This unit will be integrated into these subjects starting at the beginning of the school year with parts being taught throughout the first half of the year and revisited as needed. Various strategies include using mentor texts, graphic organizers, timelines, technology and art integration, keeping a notebook, participating in a discussion, and writing a memoir. All of these strategies will be employed for students to better understand the Art of Biography.

(Developed for Integrated in Reading, Writing, and and Social Studies, grade 2; recommended for Reading, Writing, and Social Studies, grades K-5)

2013.03.03**[Memoir: Magical Moments in Young Children's Lives](#), by Camille Pires**

Third grade children will explore the genre of memoir while learning targeted skills and strategies to help develop their writing. Youngsters will be expected to take memories and experiences, bring these stories to life with descriptive elements while finding the deeper message or magical moment each of these experiences represent. The format for this instruction includes a mini lesson, followed by an uninterrupted 40 minute writer's workshop at least three times per week. The unit is approximately 10 weeks long. Children are expected to work independently on all stages of the writing process including topic selection, outline, rough draft, and published stories while learning how to peer conference and work with the teacher one-on-one. The goal is that all children will develop richer more thoughtful prose and the three end products include an illustrated, hardbound book, a graphic novel and confessional letter to a family member or friend.

(Developed for Language Arts/Writing, grade 3; recommended for Language Arts/Writing, grades 2-5)

2013.03.04**[From Narratives to Biography: Who will listen to their stories?](#), by Terry Anne Wildman**

In this unit, elementary students will focus on reading and writing different forms of biography including autobiography, memoir, and narrative. They will read an example of autobiography and memoir prior to writing their own stories, with the understanding that we all have a story to tell. These examples will be drawn from pre-Civil War fugitive slave narratives. Using these narratives, students will write about what they might have seen and how they might have felt if they had been in the narrator's place. From these examples, the students will develop an understanding of time, space, and scale. Finally, using the principles of biography that we develop in the classroom, students will write a short graphic biography of a family member.

Key words: biography, autobiography, memoir, narratives, fugitive slave narratives
(Developed for Literacy, grade 4; recommended for Literacy, grades 4-6)

2013.03.05**[Inspire, Reach, and Teach Through Biography](#), by Lisa Christenson**

This unit uses autobiography, biography, and realistic fiction to teach the American Revolution. The unit utilizes an assortment of Common Core requirements and academic skills such as reading, writing, researching, and the presentation of written and studied material. Strategies discussed from the YNI seminar, will be modeled and discussed

about the roles and responsibilities of the biographer throughout the lessons. Students will learn about African American heroes of the American Revolution as well those traditionally found in textbooks. Autobiographies and biographies will be assigned to students and as well, they will also self-select autobiographies and biographies to read in class and at home. Students will use graphic organizers to organize their findings from research on a person of choice from the American Revolution. This will culminate into a written multiple paragraph 'bio' on that individual and will be finally presented in Power Point to the classroom. The use of realistic fiction novels that reflect the lives of children of the 1700's will also be used to connect students to and draw them deeper into what life was like in early America. In addition to in-class readings and discussions, the use of educational DVD's will provide dramatic and visual support to deepen understanding of content. Lastly, a field-trip to the Museum of African Diaspora in San Francisco is scheduled where students will learn about the history of Africa, its culture, and its people.

(Developed for Language Arts and Social Studies/History, grade 5; recommended for Language Arts and Social Studies/History, grade 5)

2013.03.06

[Will They Remember Me? Finding Our Identity by Writing Memoirs and Biographies](#), by Michelle Hilbeck

In this unit, sixth grade students will learn the writing process by studying and writing their own memoirs and biographies. Focusing on the Common Core Reading Informational Text and Writing Standards, students will first read an established author's personal narrative and biography to act as models for writing. Through the writing process, students will create their memoir about an incident that has brought about change in their life. Next, students will apply the principles of biography to become biographers and write their peer's biography. Finally, students will reflect on their memoir and their lives up until this point and work with their peer to identify their lasting identity. Students will determine what they truly want to be remembered for to help them create a remembrance statement to conclusion to their books.

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

2013.03.07

[A picture is worth a thousand words: Rediscovering biography](#), by Audra Bull

Like a painter, a quality biographer paints a portrait of his/her subject. The biographer strives to convey an interesting and meaningful story. This unit will teach students to dig beyond the facts to a more revelatory exploration. This unit will employ four key lessons from the seminar. First of all, a quality biography, more than a simple recitation of facts, is a portraiture of a life presented in such a way to have relevance to the reader. In

addition a biography, technically a non-fiction piece of text, is written with the elements of fiction: characters, setting, plot and theme. The biographer is a storyteller, yet not all aspects of a life are worth telling so the biographer must decide what stories to preserve and what to prune. Lastly, a biographer must remember there is no right or wrong way to write a biography. This unit will begin by analyzing iconic pictures representing historic events of the 20th century as a method of revealing the story behind the picture. We will then transition to studying Walt Disney with the purpose of discovering the story behind his success. The unit will conclude with a living history presentation of a biographical subject.

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

2013.03.08

Understanding Character Development Through the Use of Autobiography, by Taylor Davis

In this unit students will focus on mastering the skill of characterization through the study of the genre of autobiography. The objectives of the unit include understanding the genre of autobiography not only as the story of a person's life, but also as a portrait of a person's character, identifying evidence within a text that can be used to infer a character trait, and writing short student autobiographies with a focus on incorporating writing techniques that can be used to reveal character. The primary mentor text for the unit is an autobiography by the award-winning children's author Roald Dahl entitled *Boy: Tales of Childhood*.

The unit of study is intended for middle school students and can be adapted for grades six through eight. A variety of resources and approaches to teaching characterization will be used in the unit including visual aids, such as pictures and graphic organizers. Throughout the course of the unit, students will be asked to connect with the text by drawing from their own experiences of childhood, considering the development of their own internal character, and determining how it can best be shown to someone else.

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

2013.03.09

Other's Mistakes Don't Have to be Your Own, by Raymond Smith

This unit will use three books loaded with personal trials and triumphs to achieve two goals: teach critical reading and writing skills to low income/high poverty area students and to build awareness around behaving with integrity and perseverance in their lives. By the end of this unit, students will be better readers and writers, able to effectively identify

character traits and give evidence that supports them. In addition, they will have a better awareness about themselves and the difficult circumstances they face on a daily basis, and possible positive solutions and outcomes to these situations. I hope that as students get older and the consequences of their actions become more apparent, that they give some thought to what they learned in this unit by at least stopping, thinking, and choosing the best decision for themselves...

(Developed for English/Reading and Writing, grades 7-8; recommended for English/Reading, grades 7-8)

2013.03.10

[The Significance of My Great-Grandparent](#), by Audrelia Dugi

This unit will deal with Navajo people enduring unplanned events over the past century. Students will be able to identify the character traits of the heroic, political, ordinary person, and military genres. My students will study a particular person that is associated with one of the four genres. Each student will become a biographer, starting with simple strategies and moving towards more complex interviewing and writing styles. First, students will read short biographies that highlight the four genres that we are studying. This will give them practice identifying characteristics from each genre. Secondly, students will begin by practicing the interviewing process. They will informally interview peers in class and then an elder will be invited to the classroom for students to practice a formal style of interview. The final project will be students interviewing family members about a great-grandparent. This particular assignment will be about a deceased person and this is a touchy subject for Navajos. With practice, guidance and rules taught in the classroom, students will have the confidence to break the barrier about speaking of the deceased.

(Developed for English Basic, grades 9-10; recommended for low level or struggling students in English, grades 9-10)

2013.03.11

[The Tangled Web of Richard III: Shakespeare and the Art of Biography](#), by Elizabeth Daniell

Richard III is one of William Shakespeare's more interesting anti-heroes. He is funny and clever, a master puppeteer. He woos his future wife over the bleeding corpse of her former father-in-law. He plays verbal hopscotch with his mother and sister-in-law. He even manages to convince great men to kill children. While not an accurate history, this is what most modern audiences think of when we try to visualize the last York king: the hunchback monster who stole the English crown.

The purpose of this unit is to explore the Shakespearean history Richard III as an example of biography, one that seeks to subvert the truth in an effort to please an absolute monarch. This unit, designed for 10th grade English class, will focus on College Board's SOAPStone strategy—subject, occasion, audience, purpose, subject, and tone—in understanding the relationship between Richard III, Elizabeth I, and Shakespeare. Students will use both the historical and biographical approaches to literary criticism in examining the play. Finally, students will research fictional versus factual Richard III using the recent discovery of the remains as well as historical records.

(Developed for English II Teaching Academy, grade 10; recommended for High School English, grades 10-12)

2013.03.12

[Glory Daze: Gloria Steinem's Biography Untangles the Mystique of Feminism](#), by Sonia Henze

This unit, *Glory Daze*, will take the reader on a journey through the second wave of the women's movement in America starting with Gloria Steinem and spiraling out to her sisters in action over several decades then ending with the student as a modern feminist. Sources will include the autobiographical writings of Ms. Steinem and biographies by Carolyn Heilbrun and Sydney Stern. Several articles written by Steinem in the sixties and seventies will be used to show her own evolution into a feminist and the backlash she suffered along the way. By zooming in on this one woman, students will be able to see how the ordinary life of an average woman can impact the world. Ms. Steinem's words, actions and reflections helped change those around her. If nothing else she constantly provoked critical thinking and used humor as a bridge to awareness and understanding. She reminds us that words matter. Gloria Steinem continues to inspire people to get involved in human rights issues especially those affecting women.

(Developed for Women's Studies/Social Studies, grades 10-12; recommended for AP U. S. History, grade 11)

IV. Invisible Cities: The Arts and Renewable Community

Introduction

Deriving its title from the novel of the same name by Italo Calvino, the Invisible Cities seminar investigated relationships among the cities, neighborhoods, and communities that artists have reimagined by their creations. We aimed to find teachable strategies for discovering the amazing in the commonplace wherever students live and learn. To accomplish this, we developed a method of perceiving and interpreting the urban environment. Our method foregrounds the value of what cannot be seen until it has been imagined. Called an "ambient poetics," this method depends on the curricular arts—fine, performing, and literary—for its inspiration, and on careful observation for its realization. We defined "cities" as constructed physical and social spaces (not all of them densely urban) organized by human activity and imagination into special places. Guided by Calvino, we numbered among them cities that once were there but now are gone, cities that will be there in the future but that exist only as plans, cities that live only in dreams and never will be, and cities that are hiding in plain sight all around us. Such cities will likely remain unseen until art and artists—better still, the art and artists that students will find in themselves—make them visible.

Krista Waldron, a YNI Fellow who teaches at Phoenix Rising, a school for adjudicated youths in North Tulsa, Oklahoma, summed up our approach in the Rationale section of her unit, "The Study of a Zip Code: Tulsa's Invisible City." For its accuracy as well as its eloquence, the passage merits citation in full by way of introduction:

The anchor text for our Invisible Cities seminar has been Italo Calvino's *Invisible Cities*. In it, during long conversations between Marco Polo and Kublai Khan, Polo tells story upon story about cities he has encountered in his travels. Or perhaps they are in his head. Or maybe they are simply dozens of manifestations of Venice. This distinction is irrelevant. It is the cumulative effect of all those ambient impressions that caused me to think about our rich and varied relationships with our cities. I found these ideas to be connected to my unit and to some unspoken thoughts I had been harboring about it. Some of these cities are defined by their residents, some by what is there or not there. Others are identified by the perceptions of visitors or the imagination of Marco Polo. Nothing is clear or certain in the narrative except that cities are complex places, and that we have deep, emotional connections to them through experience, memories, symbols, and history. Our relationships with our cities define who we are by how they capture our imagination and how they reflect what we love, hate and fear.

Leading her students first to conceive Mind Maps of North Tulsa, she will conclude with Heart Maps—the graphic representations by her students of the beauty they find in their neighborhood that they might have neglected and others might not be able to see at all.

To see these places Krista's students don't need to know exactly what they're looking for, but they do have to know how to look. That means keeping in mind that the first thing to look for is what they can't see at first sight. The practice of an ambient poetics is based on observation and participation, even (or especially) if the activity is as simple as taking a walk in the city. Always on the alert to catch a lucky glimpse of the unseen, practitioners recognize two overlapping phases of experience—perception and interpretation—organized into eight modes of inquiry. The perceptual modes are *optics* (what do they see? and what don't they see?) *sonics* (what do they hear? and what don't they hear?), and *mnemonics* (what do they know and what don't they know?). In this perceptual phase, it is also useful to take any opportunity to engage the other senses as well: tactile, kinesthetic, olfactory, and gustatory. The interpretive modes correspond to different kinds of human performance or given-to-be-seen behaviors: *kinesics* (movements); *proxemics* (groupings); *histrionics* (interactions), *architectonics* (the built environment, divided into paths, nodes, landmarks, borders, and compelling destinations), and *forensics* (the social consequences of the above, and their likely causes). The effective practice of an ambient poetics does not require practitioners to use all of this terminology, or even any of it; what it does require is a willingness to imagine what they know, feel what they perceive, and interrogate what they learn.

The seminar got started by reading an essay by Margaret Olin on the *eruv*, which is a special boundary around a neighborhood that allows the observant Jews who live within it to engage in activities that they would not otherwise be able to do on the Sabbath. These include carrying physical objects like house keys and pushing baby carriages from place to place through the streets. The symbolic perimeter of an *eruv*, which is typically marked by a continuous strand of monofilament line, turns all the houses in the neighborhood it encloses into a single home, within which such efforts are permitted even on the day of mandated rest. In a passage typical of *Invisible Cities* but especially applicable to the interpretation of the *eruv*, Calvino vivifies the imaginative process of seeing the invisible. Marco Polo recounts the distinctive character of "Ersilia," one of the fifty five magical cities on his itinerary:

In Ersilia, to establish the relationships that sustain the city's life, the inhabitants stretch strings from the corners of the houses, white or black or gray or black-and-white according to whether they mark a relationship of blood, of trade, authority, agency. When the strings become so numerous that you can no longer pass among them, the inhabitants leave; the houses are dismantled; only the strings and their supports remain. (p. 76)

Blood, trade, authority, and agency sum up as well as any four words can the many kinds of behavior-tracing "strings" that we found woven into the fabrics the cities we perceived and interpreted by our method. But the strands of meaning we sought were actual as well as imaginary.

The entire Yale campus is encircled by an *eruv*, and at our first meeting together in May, the seminar Fellows and their Leader took a walking tour to see if we could find it. The boundary marker itself, a fishing line strung from telephone pole to telephone pole, is all but invisible to observers until they actively search it out by finding the perfect angle in the right light. Andrea Krulas, English teacher at Roberto Clemente Community Academy in Chicago and alumna of the Film Studies program at Northwestern University, spotted it first. The author of "Paseo Boricua: Discovering Our Own Division," her unit on the Puerto Rican neighborhood surrounding her school, Andrea, with an eye for art, was able to guide our eyes so that eventually the rest of us saw it too. And once we saw it, we could not un-see it; nor could we see Yale or the city of New Haven again in quite the same way. Under the aegis of an ambient poetics, having made the invisible visible, we turned the oft-unremarked space through which we walked every day into a remarkable place.

Waltrina Kirkland-Mullins needed no prompting to agree that New Haven is remarkable, even where it is hardest for some to see. Pointing out that many of her students at the Davis Street Arts and Academics Interdistrict Magnet School have very limited knowledge of the historic New Haven Green—some have never been there even though they live within shouting distance of it—she designed "Whence We Stand: A Visual Geography/History Adventure" for her 3rd graders. Invisible until it is pointed out, the architectural detailing of the metalwork around the Green reflects its origins in West African forms. Waltrina's title plays on the familiarity of the phrase "Where We Stand," substituting the word *whence*, which suggests arrival from another time, to convey dynamic movement forward. With the cooperation of the New Haven Museum, her students will study the site of every building around the Green, which was first laid out in 1638, with an eye to what occupied the address before, what occupies it now, and what might occupy it in the future. Sometimes in order to see our way forward, however, the first thing to do is to look down. In "Travel Stories: Mapping the Vision, Walking the Journey," Gloria Brinkman is drawing the attention of her North Mecklenburg High School art students to their feet. Respecting the importance that they attach to their shoes, known to them as "kicks," she calls on them to use multi-media art projects to tell their stories of travel, whether along the transnational paths of migration that brought so many of them to Charlotte, North Carolina, or the pedestrian paths of habit and desire that lead them to walk in patterned directions every day, telling a story with their footsteps.

From day to day in the intensive session, our seminar discussions centered on four case studies, each honoring the unique circumstances of a specific situation in a school district that participates in the Yale National Initiative: 1) "Forking Time": downtown redevelopment in Richmond, Virginia and the expansion of the VCU School of the Arts; 2) "Division Street, Chicago": Boundary Performance in the City on the Make; 3) "Polk Street Stories": GLBT oral history and "The Poetic City that Was," San Francisco, California; and 4) tradition and innovation in the arts of the Diné Nation, from sand painting ("places where the gods come and go") to the Black Sheep Art Collective. The

method of an ambient poetics, however, is applicable to any city. To illustrate that point, we began by reading three units from "The Big Easy: Literary New Orleans and Intangible Heritage," a seminar from YNI 2011: Shanedra Nowell, "The 1921 Tulsa Race Riot and its Legacy: Experiencing Place as Text"; Marilyn Dempsey, "The Intangible Heritage of the Diné"; Barbara Prillaman, "The Responsibility is Ours: Preserving Intangible Heritage"; accessed at

<http://teachers.yale.edu/curriculum/units/2011/4/>

We continued with three literary accounts of invisible cities on our (imaginary) walking tours: Nelson Algren's *Chicago: City on the Make* (1951; Anniversary Edition, 2011); Lawrence Ferlinghetti's *San Francisco Poems* (2003); and Diné poet Luci Tapahonso's *Blue Horses Rush In* (1997), supplemented by theoretical writings by Michel de Certeau, "Walking in the City," from *The Practice of Everyday Life* (1984) and Erving Goffman's "Regions and Region Behavior," from *The Presentation of Self in Everyday Life* (1959). We also accessed the web resources cited below and many others. Sidney Coffin, for example, builds his course materials entirely from web-based poetry, written and spoken, in "Invisible Migrations: The Journey from Spanish to English and Back Again Through Performance Poetry" for Edison/Fareira High School in Philadelphia.

Mindful of the importance of the forensic mode of our ambient poetics, we noted how the arts have tended to take the lead in the creative transformation of living spaces for diverse peoples—revitalizing moribund communities through the magnetic draw of cultural attractions, sustaining tradition through historic preservation, and promoting local identity through art centers and educational outreach; but also bringing about (un)intended consequences, such as socioeconomic displacement through "gentrification." Our goal in part was to imagine the utopian possibilities of balancing arts-driven development with community diversity, sustainability, and vitality. In that spirit, Benjamin Barnett-Perry's unit, "People with Disabilities: An Invisible Community," takes up the cause of Universal Design, a strategy of maximum architectural accommodation for all, exemplified in practice by the Ed Roberts Campus at UC-Berkeley, which is nearby Oceana High School, where Ben tutors students with special needs. Applying the logic of the late disability activist Ed Roberts to students classified with various learning disabilities, he asks them: "What, for you, is a curb?" His unit records the fact that the first "cut curb," now familiar nationwide as an accommodation to the differently mobile, was installed along Telegraph Avenue in Berkeley—a humbly (in)visible local monument to the grand arc of a universe that bends toward justice.

In fact, the Fellows in the Invisible Cities seminar discovered that they had already done much of the preliminary research for their curriculum units by living where they do. For some time now they have been learning and teaching the physical and mental nodal

points, marked and unmarked, in networks of local meaning that already abound in memory and imagination. Barbara Prillaman, of Delaware's Conrad Schools of Science, discovered the inspiration for "Appetizers, Main Courses, and Desserts: A Menu of Sociological Research Methods" in the signature dishes of her favorite local restaurant. Culinary arts are arts indeed, and food ways render otherwise opaque folk ways highly transparent. We are not only what we eat, she argues, but also how we eat. The continuing influence of "The Big Easy" seminar from YNI 2011 is gratifyingly evident in Barbara's "Menu."

In the writing of such curriculum units, however, God (or the Devil) is in the details. The somewhat awkward phrase "forking time," for instance, comes from architect Steven Holl's programmatic description for the VCU Institute for Contemporary Art in Richmond. "The idea of 'forking time,'" he writes, "suggests that in the world of contemporary art there may be many parallel times. The notion of ongoing time and its 'grand narrative' are questioned." In a place where the memory of the Civil War is performed by outsized equestrian statues of Confederate generals lining Monument Boulevard, grand narratives are ripe for questioning. Evoking his plan for the Institute building's divergent ("forked") wings, which quote ironically the street plan of the historic "Fan District" beyond it, Holl proffers his landmark design to a deeply traditional city that is in the process, led by the arts, of postmodern reinvention. Even before ground for the Institute for Contemporary Art has been broken, however, time has forked again. Two miles downtown from the Institute site, which at this writing is still a (frequently robbed) gas station, lie the partially excavated foundations of the Lumpkin Jail, once the place where enslaved people were held captive until they were auctioned off in Richmond's thriving slave market. In the parking lot adjacent to this site, partially overshadowed by Interstate 95, the weathered shell of the "Winfree Cottage" rests on a temporary scaffold of rusting steel beams. Saved from demolition at the last moment four years ago, the Winfree Cottage is thought to be the only surviving structure in Richmond that was once owned by a slave, who inherited it from her master (who was also her husband). This is precisely the kind of history—the disavowed sharp end of "forking time"—that the one-time Capital of the Confederacy doesn't quite know what to do with, except to park it haphazardly somewhere like a trailer. But the Winfree Cottage is also now the centerpiece of Valerie Schwartz's YNI curriculum unit, "Invisible Richmond: The History Behind the Urban Landscape," which develops the contrast between history, which is cognitively grasped, and memory, which is personally felt by her 4th graders in their language arts and required Virginia Studies curricula at Richmond's Mary Munford Elementary School.

The fact is that even structures that have not escaped demolition persist in memory. They stick in the mind's eye with poignancy undiminished (or even intensified) by their disappearance. As in Calvino's *Ersilia*, the "strings" of living memory defy the abandonment and even the dismantling of the buildings they once entwined. Sarah Weidmann teaches language arts and social studies at National Teachers Academy in

Chicago. She knows at first hand that in public housing, as in public education, Chicago is a city on the un-make (*pace* Algren). Sarah's school looks out on the fields of rubble that until 2010 were the Ickes Family Homes, in whose name the original neighborhood of tenements was likewise bulldozed in the 1950s. By taking oral testimony from the survivors, she has reconstructed their stories for re-enactment by her middle-school students in "Vacant Lot: The Chicago Ickes Community Remembered." She has found answers to the forensic question that frames her unit: "Where does a place go that is no longer there?"

Yet of other invisible cities, neither living memory nor even the ruin remains. Sara Stillman's "Discovering the Invisible Bay Street: Uncovering Emeryville's History and Understanding Our Own" mentally and emotionally excavates the many-layered site of the Bay Street Mall. "The Mall" (for her students, there is no other) rises over the apocalyptically polluted remains of an industrial-era paint factory, which rests on the site of a Gold Rush dance hall, which once crowned the debris of an Ohlone Indian shell mound and burial site dating back millennia. No living informants speak of this buried city, but its address is at the intersection of Ohlone and Shell Mound, a crossing of Calvino-esque "strings" that Sara's students at the Emery Secondary School will be able to see when, using her method of Art Based Research on the street signs they pass by every day, they catch them in the best light at the right angle.

The Diné (Navajo) artists of the Black Sheep Art Collective have carved for Italo Calvino a special niche of critical admiration. Balancing tradition and innovation in the face of assimilationist pressures, as Native Americans have done for centuries, these painters and sculptors, like the novelist, know how to render invisibility in several dimensions. They follow the patterns made by the strings that wind their way through the byways of Navajo life. At first glance, the Diné Nation is not a city. But reading thousands of years of inscriptions etched on the rocks of the sacred canyons by the Holy People, the beholder learns otherwise. Some 300,000 petroglyphs by Puebloan artists have been identified across the canyon region, a mere fraction of the likely total. Diné Nation is therefore in fact a very old city, the oldest one in North America, already ancient when New Haven was founded in 1638. Precisely capturing the emotional tangibility of the traces marked only by slender lines, Calvino writes: "Thus, when traveling in the territory of Ersilia, you come upon the ruins of abandoned cities, without the walls which do not last, without the bones of the dead which the wind rolls away: spiderwebs of intricate relationships seeking a form" (p. 76). Marilyn Dempsey, of Tséhootsoóí Diné Bi'olta, Window Rock Unified School District, Arizona, inspired our seminar with her accounts of the intricate relationships of Navajo life and culture—blood, trade, authority, agency, and so much more. In the example her curriculum unit for the traditional Navajo language school in Window Rock, only a small fraction of which can ever be written down, all of our other invisible cities seek their aspirational form.

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Joseph R. Roach

Synopses of the Curriculum Units

2013.04.01

[The Study of a Zip Code: Tulsa's Invisible City](#), by Krista Waldron

I work with adjudicated youth who are very reluctant students in a blighted urban area. This unit is for similar secondary English classrooms but is adaptable for any zip code, provided the teacher is willing to research and assemble documents for his/her students' geographies. In short, my two key objectives are to engage my students as agents of change and beauty where they live and to improve their reading and writing skills for complex Common Core writing tasks. The six week unit has three segments. First, after discussing a Tupac poem to introduce the unit, we will spend one week exploring and defining our area via on-the-ground activities. We'll be out in taking pictures and doing some reflective writing. The second segment is the academic centerpiece, with document studies and written responses to those documents, which are selected from a variety of resources and represent our geographic area. The histories, stories, and statistics they convey are engaging for traditionally unengaged readers. There are accompanying Common Core style reading and writing practice assignments. Finally, we revisit Tupac and again to find the area's beauty in all manifestations we can. It will culminate in artistic map-making projects celebrating their communities.

(Developed for ninth- and tenth-grade combined Language Arts, grades 9-10, and eleventh- and twelfth-grade combined Language Arts, grades 11-12; recommended Language Arts, grades 9-11, and State History, grades 9-10)

2013.04.02

[Paseo Boricua: Discovering Our Own Division](#), by Andrea Kulas

Currently, high above the intersection of Division and Western on Chicago's Westside (Humboldt Park) stands a large metal Puerto Rican bandera (flag). Another of these flags appears directly six blocks west of Western at the intersection of Division and California. Together these two banderas represent the geographic boundaries of the Puerto Rican neighborhood of Chicago. Erected in 1996, the 30th anniversary of The Division Street Riots, these two flags and the space between them were renamed the Paseo Boricua. Not only does this area represent a physical presence of Puerto Rican pride, but it is also a cultural mecca of heritage in regards to the Taino Indians (the original inhabitants of Puerto Rico) and Puerto Rican culture. While my students understand the physical layout of the Paseo, many don't know the history and importance of the Paseo. Before students set out on their post-secondary career I want them to journey through a rich history that is right across the street from their school. By using original and gathered artifacts, students will examine the history of Chicago's Paseo Boricua by engaging students of both Puerto Rican and non-Puerto Rican heritage.

(Developed for Senior Seminar, grade 12; recommended for English, Social Science, and Humanities, grades 11-12)

2013.04.03

[Whence We Stand: A Visual/Geography/History Adventure](#), by Waltrina Kirkland-Mullins

Invisible cities. They are all around us, revealed in the most obvious yet overlooked places: revealed in beautifully adorned masonry on the exterior of Baroque and Victorian edifices, awnings and windowpanes, and centuries-old wrought iron fences that surround a common space where sightseers stroll, the homeless find shelter, and community activist convene to protest injustice, and more ... all revealing past and present contributions of people across cultures—some too often too omitted and/or forgotten. This premise serves as the undergirding for my curriculum unit, *Whence We Stand*. Targeted at third graders, it has been created to help young learners—particularly residents within urban settings who have had limited interaction beyond the boundaries of their immediate neighborhoods—internalize being part of a broader, historically and culturally rich locality. Students across cultures will take an experiential journey to New Haven Green and surrounding areas, navigating diverse landscapes layered in "invisibly visible" cities. Through complementary visits to landmark venues, coupled with related readings, collaborative map-making exercises, and complementary writing activities, young learners will grasp the concepts of time and place; its collective impact on physical and human characteristics and interactions; changing landscapes and since the inception of the New Haven colony that render all inhabitants across centuries a valued, integral part of the historic community.

(Developed for Social Studies/Language Arts/Mathematics/Social Development, grade 3; recommended for Social Studies/Language Arts/Mathematics/Social Development, grades 3-5)

2013.04.04

[Travel Stories: Mapping the Vision, Walking the Journey](#), by Gloria Brinkman

The pathway of one's personal travel story is a richly textured avenue of investigation for adolescent students. In this unit students will explore ways to articulate and creatively illustrate their stories of migration and urban mobility. The high school campus is a mirror of the migratory landscape of the modern city. In present day the city has become a mecca for families moving across geographies both global and local. Significant to this cultural dynamic is the fact that cultural traditions and social customs play out in adolescent students' personal histories as they are lived throughout the school day. This contributes to cultural visibility and invisibility in our urban school community. In the classroom the challenge, for even the most experienced educators, is to rethink the design of instruction to address the often transitory conditions of student engagement.

This curriculum unit seeks to develop students' awareness of the virtual environments within which we act out our lives every day. These 'invisible cities' are the physical, social, political, economic and cultural dimensions of life active within both the urban milieu and its microcosm, the urban school campus. Inspired by Italo Calvino's Invisible Cities, this curriculum unit explores students' own travel stories as a path to creative expression in written and visual formats.

(Developed for Visual Art, intermediate, IB Middle Years Program, grade 10; recommended for Visual Art Intermediate, Creative Writing, and Theatre Arts, grades 10-11)

2013.04.05

Invisible Migrations: The Journey from Spanish to English and Back Again Through Performance Poetry, by Sydney Coffin

How do we address our own relationships with language? What are the immediate and/or historic origins of our heritage? How do we form identities around language? How can poetry highlight the beauty of communication across cultures? This unit explores ways to celebrate bilingualism in schools and surrounding neighborhoods through close readings of Spanish and English performed, spoken words. Students will address their own relationships with language through their own varied vocabulary in order to explore how our identities are formed through language during this unit of five, ninety-minute periods. In the context of an English class, students will reflect on personal aspects of language acquisition and ultimately compose a poetic narrative expressing the intangible journey towards fluency in a bilingual poem, with the expectation of a performance.

(Developed for English I, grade 9, and Poetry Elective, grades 10-12; recommended for English Language Arts and English as a Second Language, grades 7-12)

2013.04.06

People with Disabilities: An Invisible Community, by Benjamin Barnett-Perry

Students with disability often feel stigmatized. They struggle with feeling abnormal and inferior to their general education peers. The goal of this unit is to examine the idea of normalcy and how it relates to disability. The history of normalcy and the inception of the medical model of disability give a glimpse as to why disability is thought of as negative. Through this process a new model emerges, one that rather than attempting to "fix" people with disabilities to allow them to fit into society, instead seeks to alter our environment to accommodate all people. This social minority model is best illustrated through the examination of Ed Roberts and the history of the disability rights movement. The concrete of Roberts' success teamed with the introduction to the concept of Universal Design illustrates how the social minority model has worked to promote independence

and foster community. Self-advocacy plays a big role in this investigation and is necessary if this model is to be transferred to our current education system.

(Developed for Tutorial Resource, grades 9-12, and Psychology, grades 11-12; recommended for History/Social Studies and Special Education, grades 6-12, and Psychology, grades 9-12)

2013.04.07

[Appetizers, Main Courses, and Desserts: A Menu of Sociological Research Methods](#), by Barbara Prillaman

In this unit, high school students will solidify their understanding of sociological research methods and implement them in individual authentic situations. They will focus on the guiding questions: What is the sociology of the art of the dining out experience? What are the social research methods that sociologists use to collect data including their strengths, and limitations? How do sociologists justify the importance of their research? In collecting data, how do we make the invisible visible? Following the Common Core Standards to integrate knowledge and ideas, students will actively participate in an action project in which they will synthesize Internet resources (documents) they have collected, observations and interviews they have conducted, and field notes they have written to answer the question: In collecting data, how do I make the invisible visible? This unit is collaborative in nature in that students in different schools will work together through the use of Google Docs and Blogs, to focus on developing their technological skills necessary for college or the work place.

(Developed for Dual-Enrollment Sociology, grades 11-12; recommended for Sociology or another course regarding Research Methods, High School grades 11-12)

2013.04.08

[Invisible Richmond: The History Behind the Urban Landscape](#), by Valerie Schwarz

There is history all around us, just waiting to be discovered. Some is visible and some is invisible. Some is shared and some is concealed. Richmond openly portrays the military prowess of its Confederate past, but is also full of untold, hidden secrets waiting to be revealed. This unit will seek out Richmond's invisible history from the days of slavery and reconstruction that some might wish to forget. The slave and tobacco industries, the Lumpkin Jail, and the Winfree Cottage will be examined. The legends of Henry Box Brown and Anthony Burns will also be explored. The unit will teach fourth graders to distinguish between history and memory and how to discover the past even when it has been selectively omitted. This unit could be adapted for social studies and history classes from grades 3-12.

(Developed for Language Arts, Virginia Studies [Social Studies], grade 4; recommended for Language Arts and Social Studies, grades 4-6)

2013.04.09

[Vacant Lot: The Chicago Ickes Community Remembered](#), by Sarah Weidmann

My unit, Vacant Lot: The Chicago Ickes Community Remembered, answers the essential question: Where does a place go that is no longer there? The content objectives connect sociology, history, and drama. Through a case study of the Chicago public-housing project, the Harold Ickes Towers Community, students will write reflective essays in relation to the essential question and a historic quotation. The quotation asks students to consider the decisions of policy-makers about public housing in Chicago. Students will also re-enact a moment in time from Ickes' oral history that shows the fight for human dignity, the theme (or heart) of this work. The purpose of this re-enactment is to create public dialogue about social policy in real peoples' lives in Chicago. As the final component, students will create a memorial (inspired by the process of Maya Lin) to place at the Ickes Community site, now a vacant lot behind our school.

(Developed for Language Arts and Social Studies, grades 7-8; recommended for Writing, Reading, Social Studies, and Drama, grades 6-8)

2013.04.10

[Discovering the Invisible Bay Street: Uncovering Emeryville's History and Understanding Our Own](#), by Sara Stillman

Beneath Bay Street at the corner of Shellmound Street and Ohlone Way lays a story of our nation's growth, decline, and rebirth. When examined closely, the Bay Street site tells the story of the Ohlone people, Gold Rush settlers, and the industrialization of our of a city and subsequent contamination of the land. This history is rich in beauty and uncomfortable truths that my students will explore as they question what they will leave behind to tell their story and how our society will be viewed by those who come after us. As they fill in the gaps of our historical narrative through an Art Based Research approach: students will create a timeline to visualize the scope of our investigation, map each period of history to track the city's evolution, visit locations that existed in the past to uncover what they have become, examine primary and secondary historical documents, and create a public art installation that gives voice to Emeryville's past, present, and future.

(Developed for Advanced Art, grades 11-12; recommended for High School Visual Arts/Social Studies, grades 10-12)

V. Energy Sciences

Introduction

With concerns about the impact on the environment of our current use of fossil fuels and our national energy security, energy is in the news on a daily basis. Many students have seen Al Gore's movie "An Inconvenient Truth" and are familiar with some of the issues relating to energy use, but they may not know much about the science related to energy. The aim for this seminar was to discuss the science related to current sources of energy and potential future sources of energy. We can learn much about sustainable energy use by studying natural processes. Nature has solved the renewable energy problem through the process of photosynthesis that is carried out by green plants. Plants are amazing chemical factories and provide a working example of renewable solar energy conversion, but this is often not appreciated. By understanding how plants carry out the processes of solar energy utilization, we can obtain some answers to the question of how we can harvest solar energy by using processes of artificial photosynthesis.

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, and frequently 2-3, in each seminar meeting. These demonstrations were chosen so that they could actively involve the students and at the same time illustrate the scientific principles related to energy.

The books by David Walker entitled "Energy, Plants and Man" and by David J. C. MacKay entitled "Sustainable Energy – without the hot air" were used as the primary technical books for the seminar. We also read Daniel Yergin's "The Quest: Energy, Security and the Remaking of the Modern World", a fascinating but not highly technical analysis of our current energy use. The beginning of the seminar focused on energy, light and photosynthesis. The seminar began with a discussion of how plants use light to convert carbon dioxide and water into sugar and oxygen gas. This included discussions on the nature of light and the fundamental steps by which light is absorbed by plants and converted into chemical energy. Demonstrations of the colors in light using diffraction glasses aided these discussions. A connection was made between natural photosynthesis and the excess production of biomass that has been buried to form the "fossil fuels" that provide most of our current energy. Next, we delved into various forms of energy, including hydroelectric, biofuels, wind, geothermal, solar and nuclear. 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 seminar also included a discussion of energy use in the future that included progress in development of systems for artificial photosynthesis and fuel cells.

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 students can read, textbooks that the teachers can use, demonstration sourcebooks, suppliers of equipment and many addresses of sites on the world wide web. Several of the Fellows developed units around a theme or activity related to future sources of energy, including an innovative Physics unit on the prospects for the use of fusion as a unlimited source of energy in the future. Other units are related to comparisons of current sources of energy based on fossil fuels with the renewable energy sources such as biofuels. Information on the responsible use of current sources of energy to lower our carbon footprint, as well as the impact of our energy use on the planet Earth, is also provided in many of the curriculum units. The units include a number of excellent activities that will engage the students' interest and teach them about energy sciences.

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 "Energy Sciences" into the classroom.

Gary W. Brudvig

Synopses of the Curriculum Units

2013.05.01

Energy Usage and Conservation: My Impact on the World, by Leonardo DeAndrade

In spite of alarms and warnings, the era of fossil fuels seems to still have a long life ahead. However, our environment keeps paying the price for our constant reliance upon them to power our world. The overall goal of this unit is to help students at the elementary level be aware and proactive about energy usage and conservation. We measure energy consumption at home and use a variety of resources -fiction and non-fiction texts, videos, hands-on experiences, and guest speakers- to enhance students' awareness, understanding and mastery of the concepts. The unit is organized sequentially to initially studying the definition of energy, its sources and ways of storage, and later energy consumption in the US, and rising concerns. More specific objectives include learning about the process of photosynthesis, petroleum, natural gas and coal as nonrenewable sources of energy, and finishing with solar and wind power as renewable sources. We also explore the consequences of our overdependence on fossil fuels both in discussions and through hands-on activities. Towards the end we return to energy consumption at home and progress to concluding with a look at how to commit to energy conservation right now.

(Developed for Science Integrated with Mathematics and Language Arts, grade 5; recommended for Self-Contained Science/Mathematics/Language Arts, grade 5, and Science, grade 6)

2013.05.02

Soaking Up the Sun!, by Miesha Gadsden

Children love asking questions, especially when it relates science or inquiry. Our world is full of science and questions that are just waiting to be answered. Why is the sky blue? What makes a car move? Why do bees buzz? This unit will help students tap in to their own natural curiosity about energy in a fun and exciting way! This science-based unit is designed for elementary age students, specifically 3rd -5th. We will discover the vital role the sun contributes to the survival of plants, humans and the balance of our ecosystem. Energy is a very abstract concept to teach to younger students and this unit will give students a basic understanding and foundation of science that they can use to help them in the future. Energy is defined as the ability to do work. I want students to understand that energy is all around us and can be seen in various forms. We will specifically target how light energy from the sun helps plants make their own food, which we eventually eat and use for survival. Students will develop their own exploration activity where they research plants around the world and the impact the sun and humans have on them. My hope is that students become more aware of their surroundings and the role they play in their

environment. I want students to walk away with a new appreciation of where they live and understand that their actions not only affect themselves, but the world.

(Developed for Science, grade 3; recommended for Science and Social Studies, grades 3-5)

2013.05.03

A Chemistry Perspective: Gasoline or Biodiesel?, by Jinsue Hafalia

Energy. Where does it come from and why do we care? This unit is designed to help high school chemistry students see the relevance of chemistry to their lives and to encourage them to become critical thinkers and responsible citizens of their community. In this curriculum unit, students investigate the effects of energy use on the environment. Over the course of four weeks, students will explore parts of the California State Standards for chemistry under the sections titled "conservation of matter and stoichiometry" and "chemical thermodynamics." The theme of energy will tie together the standards for reactions, stoichiometry, and heat energy.

Specifically, students will investigate the chemical equations for the combustion of high octane gasoline and biodiesel in order to compare the energy output as well as the environmental effects of the two fuel types. The unit includes combustion demonstrations and the production of biodiesel from vegetable oil in the classroom. In addition, they will analyze scientific articles to develop their own opinions on the issue of energy consumption and conservation. As a culminating task, students will take on the role of different members of the community and pitch their own proposal for a solution to this energy problem.

(Developed for Chemistry and AP Chemistry, grades 10-12; recommended for Chemistry and Environmental Science, High School grades)

2013.05.04

Fusion: The Energy of the Future?, by Eric Laurenson

This seminar is dedicated to renewable energy and the consequences of our energy intensive society including global warming. This unit will explore the nature of energy sources and generation. In my AP Physics II B class and Gifted Physics I classes, I will explore the viability of fusion as an energy source. I will also make the case that we need to have a monumental effort much like the Apollo Missions on a global scale to be able to solve the scientific issues of fusion. Money and lots of effort would drastically reduce the time to realize a commercial fusion reactor. In my physics classes, we spend a lot of time on energy and electricity. I will explore the need for carbonless fuel sources, primarily fusion, as well the relative amounts of energy we get and use from different sources, including fossil fuels and renewables. I will make the case that we should be

pursuing controlled fusion. The unit will culminate in a Creative Design Project to design parts of a fusion power plant.

(Developed for AP Physics 2B, grade 12, and Gifted Physics 1, grades 11-12; recommended for Physics first-year courses, grades 9-12, and Physics second-year courses, grades 11-12)

2013.05.05

Mathematics of Energy Efficiency: Use Less, Save More, by Kenya Lawrence

Humanity's number one problem for the next 50 years is energy. Solving the energy problem involves a comprehensive approach which includes renewables and energy conservation. Blending the science of energy with Algebra I supports sociopolitical awareness of the energy industry in our students, makes connections to real-world mathematics and exposes students to careers in the energy industry. The curriculum unit provides an overview of the origin of our electricity, the impact of our use on the environment, the potential of wind energy and biodiesel, and the case for energy conservation. Through this unit students will reason algebraically to analyze important environmental and economic impacts of our past and current energy use. Through demonstrations and inquiry-based learning opportunities students will acquire and retain mathematical concepts which include writing, solving and graphing linear equations and inequalities, systems of linear equations and inequalities, and direct and inverse relationships. Students will also analyze data statistically using box-and-whiskers plots, mean absolute and standard deviation, z-scores, and curve of best-fit. Some unit activities are repeated in a chemistry or physical science class; nonetheless, do not feel like you are stealing the science teacher's thunder.

Keywords: coal mining, renewable energy, biodiesel, algebra, inequalities, equations, statistics, energy efficiency, wind, math

(Developed for Algebra I, grades 8-10; recommended for Algebra I, grades 8-9)

2013.05.06

Math Equations of Energy, by Luis Magallanes

This curriculum unit is directed to students in Algebra-1 and Algebra-2, with the analysis of data and the discovery of empirical formulas, related to solar energy. Some mathematical manipulation can be used in 6th, 7th and 8th grades, with the concepts of ratio and proportion, calculation of areas and measurement of angles.

A brief information on the ancient use of solar energy by the Incas is included. There is background information on renewable sources of energy, in search of cleaner options that will not compromise the security and health of our mother earth. Although there is not an

assurance of a real clean solution, we need to balance the options and take the least damaging one.

Currently, 60% of the electricity used in the US comes from coals and 20% from nuclear energy. One can imagine the amount of waste produced by either of these two options to obtain electricity. On one hand, mining the coal leaves the land unusable, and on the other hand, a lot of waste from the result of nuclear fission is being "stored" in the same plant, which normally closes after a period of time.

This curriculum unit presents the benefits of using solar energy. Calculations related to efficiency including cost and usage of solar energy in comparison to the use of traditional electricity are as well included.

(Developed for Algebra I, grades 9-12, and Algebra II, grades 10-12; recommended for Pre-Algebra, grades 6-8; Algebra I, grades 8-9; Geometry, grades 8-10; and Algebra II, grades 8-12)

2013.05.07

[It Don't Come Easy: The Promises and Challenges of Biofuel Production](#), by Robert McDowell

This curriculum unit is designed to provide engaging lessons in biofuels and biofuel production. Students will start by discovering the levels of carbon dioxide that are created by the combustion of the fossil fuel gasoline, and move on to explore the deficiencies and environmental consequences of using corn as a feedstock for ethanol production. The effects of farming the corn as well as its production will be discussed in class. Students will engage in activities exploring the production of cellulosic ethanol and discuss the advantages of biobutanol over cellulosic ethanol. Emphasis will be placed on the principles of sustainability and environmental unity to teach the students about the promise and possible drawbacks of the use of biofuels as an energy source. Implementation of the lessons will involve hands-on student centered activities in order to engage the students and have them understand the issues at a very high order. Energy will be tracked from photosynthesis through to combustion, and students will gain an understanding of the complexities of energy and carbon dioxide pollution. Student led debates and group discussions will form a large part of my assessment of the success of the curriculum.

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

2013.05.08

[From Plants to Horsepower – an Introduction into the World of Oil](#), by Arcadia Teel

My students can easily see the benefits of the oil industry in our state. Students should be able to understand the processes that form petroleum and refine it, so that they have an understanding of why petroleum can be used as liquid fuel energy. This leads to an understanding of why refining petroleum and burning it contributes to an increase of carbon dioxide in the atmosphere and causes other environmental problems. They will also be able to make predictions about which types of fuels are most efficient. This unit incorporates MYP standards and guidelines in a 10th grade Chemistry I class. Activities featured in this unit include balancing equations with colored candies or bingo chips in order to practice coefficients and mole ratios. A group presentation regarding the different types of oil deposits, their location, how they are recovered and the environmental effects is also included. Artistic students are given the opportunity to shine with a poster project describing the different stages of refining and the final assessment of the unit is a 700-1200 word essay.

(Developed for Chemistry I, grade 10; recommended for Chemistry I General and Chemistry I Pre-AP, grade 10)

2013.05.09

[Nihodzaan \(Mother Earth\)](#), by Jolene Smith

Although the United States is known as the richest nation in the world, we still have issues similar to people in other countries. Globally, nationally, and locally there are educational, environmental, and energy problems. People need to be educationally informed about their environment and how energy can help make their lives better. To remedy this, we need to begin with our children in our classrooms and schools, because they come to us for help, counsel, and for academic discourse. The subject of energy science is way to connect to our children because it incorporates fossil fuels and the renewable energy with Mother Earth (Nihima asdzaan). Mother Earth has the components of respect, reverence, balance, harmony, beauty, power, and wisdom; we need to teach our children so they can have the knowledge of Mother Earth's reverence, balance, harmony, beauty, power, and wisdom. This is when Mother Earth and people will live in Hozho doo haa' ayiih do hodilzin; then environment and energy will not be so challenging. Earth's fossil fuel and renewable energy have their places and can be brought to balance because these resources came from her.

The unit will cover the fossil fuels of coal, petroleum, and natural gas and the renewable resources of sunlight, wind, geothermal, and biofuels. I will introduce my unit at the global level of how the world's resources are extracted from the earth and how the resources are exported and utilized. Then I will move to the national level of how the US

extracts transports and uses the resources. Finally moving to the local level on the Colorado Plateau and on the Navajo Reservation, the unit will cover how the locals extract and use the resources. The learning activities will be an extensive hand-on synthesis level of learning where students will create and explain their projects.

The Kayenta Unified School District is located on the Dine Nation in northeastern Arizona. There are approximately 2,200 students from kindergarten through 12th grades. The majority of our students are bilingual speaking English and Navajo at home and school. A majority of our students are on the free lunch program at the three school sites (elementary, middle, and high school). About 99% of our students are predominantly American Indians (Navajo a.k.a. Dine').

(Developed for Science, Diné© Culture and Language, grade 5; recommended for Science, grades 5-6)

VI. Genetic Engineering and Human Health

Introduction

One of the most well-known stories in science involves the discovery of the structure of DNA, which was accomplished by James Watson and Francis Crick in 1953, when both were young men working at Cavendish Laboratory in Cambridge, England. Watson's autobiographical book, *The Double Helix*, describes that period of accomplishment, but it retains its popularity because it deals directly with a more general theme. It might be the best description for modern readers of the magical quality of science and its appeal for young people seeking adventure and fame. In this way, the story of DNA, beginning with its unveiling, has been linked to romance, celebrity, and power.

DNA is worthy of this glamour. Nucleic acids are the key information storage molecules of life. Genetic information is encoded within the nucleic acids of almost every cell in our body, where it is capable of being inherited from one cell to the next, generation after generation. The study of nucleic acids is multifaceted: it involves examination of the structure and function of nucleic acid polymers, the capacity of these molecules to hold information, the changes in information content that happen upon modifications of nucleic acids, the diverse roles of nucleic acids in the life of a cell, and the characteristics that make them useful tools in biotechnology and bioengineering. DNA is also intimately involved in human health. Many diseases result from failures at the DNA level. These failures can arise from defects in genes themselves (causing genetic diseases) or in the regulatory regions of genes (causing cancer). Some diseases are the result of a defect in a single gene. Although many of these diseases are rare, some—such as cystic fibrosis and muscular dystrophy—are relatively common. Many scientists and engineers are now involved in the search for safe and effective methods for gene therapy in humans, in the hope that the defective genes can be replaced with new functional genes, which will cure the disease.

From the origins of recombinant DNA technology in the 1970s, our society has quickly gained the capability to manipulate and use DNA as a tool for understanding and treating disease. DNA technology has also changed the way that we manufacture drugs. Human genes can now be inserted safely and efficiently into bacteria, yeast, viruses, or animal cells. This capability has already led to the production of recombinant proteins as therapeutic drugs; diabetics around the world now use recombinant human insulin that is safer and cheaper than previous insulin drugs, which were harvested from animal tissues. DNA technology is also changing forensic science, agriculture, and other aspects of contemporary life. Some bioengineers are even learning how to use DNA as a tool, deploying DNA molecules as molecular Tinker Toys for building tiny but well-defined objects.

This seminar examined nucleic acids, beginning with an introduction to the science of genetics and ending with descriptions of some of the ways that DNA is now used in human health. Along the path from genetics to bioengineering, the seminar focused on the structure of nucleic acids and the basic concepts underlying molecular biology. The seminar also made excursions into the field of biotechnology, which harnesses what we know about DNA to manufacture new medicines, to improve foods, and to treat diseases where medicines fail. The curriculum units that were produced in this seminar should be of interest to teachers in science, mathematics, and health. In addition, because there is so much material now written about the science of DNA and its impact on society, this seminar may be of interest to teachers interested in how students can read for information.

Specifically, the seminar covered the following topics:

- Introduction to molecular biology
- Introduction to genetic engineering
- Tools of genetic engineering: host cells and vectors
- Medical applications of gene manipulation
- Forensic applications of genetics
- Genes and genomes (with a visit to Yale's West Campus, Genome Analysis Center)
- Polymerase chain reaction
- Transgenic plants and animals

The discussions in the seminar were enhanced by our reading from: *Introduction to Genetic Engineering, Third Edition*, D.S.T. Nicholl, Cambridge University Press (2008); and *Biomedical Engineering*, W. Mark Saltzman, Cambridge University Press (2009).

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

Many of the units focused on material that is appropriate for high school students. Amanda Issa wrote a unit called "Genetically Engineering Cures for Single Gene Diseases," which provides a sound review of the principles of modern gene therapy, focused on four diseases that result from single gene defects: Huntington's disease, sickle cell anemia, hemophilia, and cystic fibrosis. Her unit provides a description of the genetic basis of each of these diseases, as well as descriptions of how changes in the gene affect the physiology of individuals. Further, she challenges students to think about new approaches for correcting or reversing the genetic defects. Vanessa Vitug produced a unit titled "DNA in Forensic Science," which she uses to present information on the molecular biology in the context of forensic science. The unit covers a range of important and

timely topics, including DNA fingerprinting and role of polymerase chain reaction (or PCR) in crime scene analysis. Timothy Spence prepared a unit titled "HIV: From Horror to Hope." His unit, designed for high school mathematics and biology teachers, describes the early history of the AIDS epidemic and the unraveling of the mystery of its cause, through discovery of the structure and genetic characteristics of the human immunodeficiency virus (HIV). Importantly, he describes how the special properties of that virus make it one of the most promising vehicles for treating genetic diseases. Timothy also provides examples of how mathematics teachers can use genetic principles as the basis of real-world applications of statistics and mathematics.

Three of the units in this volume focus on the use of DNA in agriculture and, in particular, on important issues surrounding genetically-modified foods. Two of the units are prepared for high school classrooms. Maria Orton's unit, called "Effects of Genetically Modified Organisms on Agriculture," approaches the topic from the point of view of chemistry, examining the differences that result in agricultural products as a result of genetic modifications. By presenting a topic that is important to every student and parent—how safe is the food that you eat?—the unit provides a practical example of the relevance of chemistry in all of our lives. Stuart Surrey wrote a unit called "Controversial Issues Regarding the Consumption of Genetically Modified Crops" which focuses on both the means of production of genetically modified foods and the history of their development. Laura Kessinger explores many of the same themes in her unit, "The Evolution of Genetic Engineering." Laura's unit was designed for elementary school students, but should also be appropriate for many middle school classrooms, as well. Importantly, in each of these units, Stuart and Maria and Laura provide scientific material that allows teachers and students to explore the pros and cons of genetic engineering in agriculture.

Laura Carroll-Koch prepared a unit called "Harnessing the Power of DNA," which was designed for elementary school teachers and students. Her unit provides a description of the basic science of DNA and molecular biology, including a presentation of ways to use this information to treat diseases that have proven very difficult to treat. Laura also brings to the foreground a theme that is present in all of the units in this volume: teachers can generate excitement in their classrooms by exposing their students to new concepts in genetics and genetic engineering, with the hope that many young people will be inspired to careers in science, to help realize the potential for science and engineering to improve the lives of the world population.

Mark Saltzman

Synopses of the Curriculum Units

2013.06.01

[Imagine the Unimaginable Harnessing the Power of DNA: Principles of Genetic Engineering](#), by Laura Carroll-Koch

Imagine a band-aid that when applied fuses and heals the skin or a bio-lens that when placed on the eye corrects one's vision; or cancers, when discovered, can be attacked and destroyed by nano-armies, armed with healing genetic arsenals, DNA warriors. This is the potential of the science of genetic engineering. This unit is designed to introduce students to the fundamental concepts of genetic engineering through hands-on activities, interactive projects, and creative problem solving. These activities will offer opportunities for students to think like engineers practicing innovation, invention, and cooperative learning. Through the study of the human cell, students will learn the elements of cell biology. The structure and function of DNA and the processes of replication, translation, and transcription will afford students the conceptual background to understand the ways in which genes can be manipulated. Students will then study concepts of gene therapies and the ways DNA can be engineered. In the end, students will apply these concepts in a project where they create their own gene therapy to correct a genetic illness.

Ultimately, the purpose of this unit is to offer students a glimpse into the world of genetic engineering, inspiring a new generation prepared, excited, and empowered to advance the landscape of global health.

(Developed for Science, Reading, and Writing, grade 4; recommended for Science, grades 4-8)

2013.06.02

[Genetically Engineering Cures for Single Gene Diseases](#), by Amanda Issa

This unit is suited for students enrolled in Biology and Biology AP. This unit examines the genetic makeup of a disease or medical condition and seeks out possible cures using genetic engineering. This unit is modeled around STEM education and involves project-based learning, which is aligned with the New Generation Science Standards that California schools will soon adopt. This unit is extensive and will be carried out over 8 weeks because it requires students have a proficient understanding of fundamental DNA structure, function, mutations and biotechnology. Cell Biology and Genetics have been the two most interesting units for my students in past years. Although there is a large amount of content to cover, the students are generally engaged in understanding the structure of the most basic unit of life. Students of all learning levels are capable of grasping a basic understanding of the structure of DNA and the purpose of our genes. During my Physiology unit last spring, I observed the intense interest students have in

disease and human health. I anticipate the students will be quite engaged when presented with this project because it brings together their knowledge of how genes are determined from DNA and diseases that result.

(Developed for Biology/Life Sciences [Genetics and Cell Biology], grade 10, and and Biology AP [Genetics and Cell Biology], grades 11-12; recommended for Biology, grades 9-10, and Biology AP, grades 11-12)

2013.06.03

The Evolution of Genetic Engineering, by Laura Kessinger

The evolution of Genetic Engineering unit is comprised to give students a thorough understanding of the field of genetic engineering, its past, present and future. The unit begins by fully introducing the human genome, traveling through a complete set of chromosomes, individualized genes, DNA, and base pairing. It is essential that students are able to visualize, explain, and build genetic material before they begin experimenting with the engineering concepts introduced. The unit continues with an explanation of genetic engineering's roots in husbandry, elaborating on how humans began to choose breeding patterns and interrupted some of the natural processes through selective breeding, grafting, and simplistic hybridization. Students should see the evolution from farming experimentation to Mendel's inheritance specifics.

From Mendel's work to today students will discover the explosion of knowledge, interest, and experimentation that has brought genetic engineering to its biomedical and agricultural applications today. Students will be exposed to the replication process of PCR and plasmid manipulation. Students will also be expected to verbalize a stand on consumption of genetically modified organisms and support their stand with researched facts and figures. Finally, students will be exposed to what the future applications of genetic engineering might be, how a career in genetic engineering might suit their curiosities, and where the college programs for genetic engineering are. This unit is designed for fourth grade but could easily be adapted up to eighth grade.

(Developed for Science, grades 4-5; recommended for General Science, grades 4-8)

2013.06.04

Effects of Genetically Modified Organisms on Agriculture, by Maria Orton

This unit is written for a general chemistry course in an urban setting which will have covered bonding, polarity, molecular structure, and types of chemical reactions. Students will use their chemistry background to reason through how basic chemistry concepts can be used to help explain the structure of DNA and how genetic engineering works. The intent is to relate the foods we eat and genetically engineered crops to what they have learned in science and the effects on Agriculture. This unit is meant to elicit their prior

knowledge of particle behavior and relate it to their everyday lives in order to provide meaning behind why they should choose to study science. Students will read several articles and case studies around genetically modified foods and have a chance to grow and analyze crops. As a culminating project students will be asked to create a position paper using the claim-evidence-reasoning model to state why they think genetic engineering of crops should continue or not and most importantly why they believe that. Since students will actually grow both modified and nonmodified zucchini they will have real data to help guide their opinions and use facts from their research to back it up.

(Developed for Chemistry I PSP and Conceptual Chemistry, grade 10; recommended for High School Chemistry, grade 10)

2013.06.05

[HIV: From Horror to Hope](#), by Timothy Spence

If there was ever a good time to integrate science and technology into a high school math curriculum, that time is now. This curriculum unit focuses on HIV-1, the virus which causes AIDS. It looks at both the frightening early history of AIDS, and also at our present condition, where antiviral therapies have made HIV infection manageable for most patients. Today, incredibly, HIV offers hope to those afflicted with other genetic diseases as well, through the science of gene therapy. HIV is a lentivirus, and lentiviral vectors, which are altered forms of virus which can be introduced into a patient's cells to turn on or turn off some genetic expression, are a fairly recent introduction into this rapidly growing field. The unit can be separated into three sections, and each can be taught separately, or as an integrated lesson plan. There is a history component that focuses on the early years of the AIDS epidemic, and a science component which explores the mechanism of retroviruses. Finally, there is a subunit that integrates mathematics, using the topic of probability, which is one of the California standards for Algebra II, and also a component of the new Common Core Standards.

(Developed for Algebra II, grades 10-11; recommended for Biology, grade 10, and Chemistry and Mathematics, grades 10-11)

2013.06.06

[Controversial Issues Regarding the Consumption of Genetically Modified Crops](#), by Stuart Surrey

The artificial manipulation and insertion of genetic material from one organism into that of another is the basic underlying principle of genetic engineering. As we enter the twenty-first century, applications of genetic engineering will become particularly important in the areas of medicine, agriculture, and industry. At the present time, however, there are a number of deep seeded controversial issues regarding the creation and/or use of genetically engineered products. The two major objectives of this

curriculum unit are to: 1. examine those issues involving the creation and consumption of genetically modified crops, and 2. improve the critical thinking and reading comprehension skills of my students. Since it is essential that the students have a thorough understanding of molecular genetics, a significant portion of this unit will be devoted to reviewing the structure of DNA, transcription, translation, and genetic engineering. After an in-depth review, the students will be given the opportunity to debate a number of scenarios involving the consumption of genetically modified crops. This curriculum unit is intended for eleventh or twelfth grade students enrolled in an average or honors environmental science class.

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

2013.06.07

[DNA in Forensic Science: genetic engineering applications in forensics](#), by Vanessa Vitug

The TV shows CSI, House, and Elementary dramatize the forensic analyst. In watching forensic scientists at work, we believe, "I too can be Sherlock Holmes." However many of us do not have Sherlock's deduction skills and must rely on the study of genetics, forensics, and biotechnology to solve real world cases. "DNA" is used in everyday language but few understand the elegance of its construct or power to reveal our internal machinery. Students at Mt. Pleasant High School struggle with connecting science to the real world. They do not connect DNA structure, DNA replication, and protein synthesis to genetic engineering, biotechnology or medicine applications. My unit is written to help students make real-world applications of science tangible and address Common Core State Standards. Students will understand DNA structure, restriction enzymes, DNA purification, DNA amplification through PCR (polymerase chain reaction), and separation through gel electrophoresis in a mock-crime case setting. Students will be assessed through laboratory writings and a final essay which summarizes their findings and conclusions. Finally, students' ability to articulate their overall understanding of DNA use in forensics will be assessed in mock-trial setting. This unit can be adapted for high school Biology courses but intended for forensic science.

Grade Level: 11th-12th grade Forensic Science

(Developed for Forensic Science/Science, grades 11-12; recommended for Forensic Science/Science, grades 9-12, and Biology/Science, grade 9)