Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2007

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Preface

In April 2007 the Yale National Initiative to strengthen teaching in public schools accepted sixty-three public school teachers from ten cities to participate in seven national seminars held at Yale. The Initiative is a long-term endeavor to establish exemplary Teachers Institutes in underserved school districts in states throughout the country. Following the approach developed in New Haven and demonstrated in Houston, Pittsburgh, and other cities, it builds upon the success of a four-year National Demonstration Project. 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 promotes precisely those dimensions of teacher quality that improve student achievement.

Half of the teachers, designated Yale National Fellows, were from six cities that are planning or exploring the establishment of a new Teachers Institute: Atlanta, GA; Charlotte, NC; Chicago, IL; New Castle County, DE; Richmond, VA; and Santa Fe, NM. Other National Fellows were from Teachers Institutes that are members of the National Initiative League located in Houston, Philadelphia, Pittsburgh, and New Haven. The Fellows attended an Organizational Session of the seminars held in New Haven on May 4-5. The seminars reconvened during a ten-day Intensive Session from July 2-13.

The seminars, which concluded in mid-August when the Fellows submitted their completed curriculum units, included "Adapting Literature," led by Dudley Andrew, R. Selden Rose Professor of Film Studies and Comparative Literature; "Renewable Energy," led by Gary W. Brudvig, Professor of Chemistry, Molecular Biophysics and Biochemistry; "Across the Curriculum with Detective Fiction for Young People and Adults," led by Paul H. Fry, William Lampson Professor of English; "Keeping the Meaning in Mathematics: The Craft of Word Problems," led by Roger E. Howe, William R. Kenan Jr. Professor of Mathematics; "Maps and Mapmaking," led by Mary E. Miller, Vincent J. Scully Professor of the History of Art; "Latino Cultures and Communities," led by Stephen J. Pitti, Professor of History and of American Studies; and "The Science and Technology of Space," led by Sabatino Sofia, Professor of Astronomy.

The twin purposes of the national seminars were to provide public school teachers a first-hand acquaintance with the Institute approach to high-quality professional development, and to cultivate their leadership either in a League Teachers Institute or in the development of a new Teachers Institute. Each participating teacher wrote a curriculum unit to teach students what he or she had learned and to share with other teachers locally and, over the Internet, internationally. The units contain four elements: objectives, teaching strategies, sample lessons and classroom activities, and lists of resources for

teachers and students. The curriculum units National Fellows wrote are their own; they are presented in seven volumes, one for each seminar.

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

James R. Vivian

New Haven

September 2007

I. Adapting Literature

Introduction

Adaptation is a terrific topic for teachers of language and literature to learn about and exploit. Students at all levels have a reservoir of tales with which they are at least vaguely familiar, from *Cinderella* and *Beauty and the Beast* to *A Christmas Carol* and *Lord of the Rings*. All children will have seen one or another well-known story in comic book form, as a puppet play, or dramatized on stage, not to mention via TV cartoons. They understand that a given story can be read, staged, visualized, and even sung. For decades teachers have used the protean quality of stories to liven up their classrooms with adaptations so as to generate enthusiasm about important works of literature and the themes and issues contained in them. And some teachers of theater or fiction have used adaptations as a way to isolate the specific properties of literature, by showing the kinds of effects impossible to achieve on film or by providing visual examples of theatrical properties (such as staging) or novelistic devices (such as point-of-view). When it comes to masterworks of theater and fiction, adaptations entice reluctant readers to experience a work in a familiar, less intimidating format. At the same time one can see how a story's greatness is a function of its powerful expression in its original medium.

Adaptation has always been a standard practice in the arts whereby a successful work is given extended and invigorated life in the body of another medium. Shakespeare, Cervantes, and Jane Austen are alive today in the many films through which recent generations have encountered them. To study adaptation might at first seem like a technical exercise whereby the powers and characteristics of the medium in which the work originally appeared (play or novel) are compared to those of its subsequent emanation. One can examine the successes and failures of any given text being adapted (*The Divine Comedy* has never met with critical or popular approval when transposed) or the quality of a particular version (did Baz Lurhman find the right formula in his 1995 *Romeo and Juliet*, compared to the celebrated Zefferelli attempt?). The abiding values of the original can be recognized in the limitations of what we experience as a kind of echo down the ages. And the powers of the medium for which it was created can be compared to the different powers of the media into which it is made to fit later on. Much can be learned from the careful side by side comparison of a prominent original and the versions it has engendered.

Our seminar proceeded through case studies that sampled a number of categories of adaptation. Some examples such as *Beauty and the Beast* gave us a chance to look at several different historical moments and cultures when this fairy tale became relevant in one way or another: in France in the late 18th century; then again in France just at the end of WWII, and in the USA in 1991 in a version that still appeals to children around the world. The fact that both films were popular and critical successes allowed us to look

more deeply into the expressive properties and limitations of animation and live action spiced up with trick photography. This story's origin is not terribly important, and so later artists in many media feel justified in "borrowing" it for their own purposes and in their own style. Myths operate as part of the cultural pool, such as the story of "Orpheus" which has been passed down but without a definitive treatment. In 1959 a French filmmaker took it upon himself to set the tale in Brazil during carnival time, producing the award winning *Black Orpheus*. On the other hand, most classic tales come very much tied to the authors who made them famous: *Romeo and Juliet, Don Quixote,* and *Oliver Twist*, for instance. When such masterworks are adapted, you can be sure that the relation of the new version to the original is a matter of concern, and the question of "fidelity" is on the table. This issue has come under tremendous scrutiny and it spilled into our seminar as well. It provides the reason to look intently at certain adaptations that aim to "transform" the experience of the original into a modern medium. Our clearest example of transformation was *The Innocents* made from Henry James' *The Turn of the Screw* which helped us assess the powers of the both prose and cinema. Interestingly, this tale also became both a play and an opera, though we did not look into these versions. Effort spent examining "transformations" can greatly improve our (and our students') understanding of the original work and of the properties and powers of film and of verbal language to deliver a fiction. Effort spent examining "borrowings," on the other hand, leads directly to discussion of broad themes and of different cultural or historical attitudes toward those themes. Just showing a version of the "Orpheus" myth raises questions about the power of art and imagination, about death and eternity, and about jealousy. Such universal themes can be discussed on their own, but they take on a particular tone when "borrowed" by Jean Cocteau in Paris shortly after the German Occupation. Adaptation lets one study the universal and the particular, so that students can see connections between stories made with them in mind and much older or foreign versions. This is always the case with recent adaptations of Shakespeare, when Leonardo DiCaprio plays Romeo or Ethan Hawke plays Hamlet.

With the Shakespeare industry in mind, our seminar looked at processes of cultural dissemination whereby a great many books, movies, plays, and even musicals have interacted in a larger sphere governed by an economy that has its own momentum. We considered the franchising of art through Barnes and Nobles and other media conglomerates, as novels or plays become films and some films get turned into musicals. Does a work's identity get lost as it gains broad acceptance through its dispersal in different media? Does adaptation permit old forms to survive or does it distort them so much that they lose their original value?

The stakes of the question are broader than literature. "Adaptation" is the name for Darwinian processes by which species survive the changing circumstances of their environment. The word can be found in the cultural as well as the biological sphere too. Individuals, families, and large social groups adapt during the normal course of their life cycles, as when middle school children must adjust to changing classrooms, leaving the

womb of their home classroom and the security of a single teacher. More dramatically, individuals and groups can be forced to adapt—or else to atrophy—when history brings them into sudden contact with an unexpected situation. Many immigrant kids probably have a hard time adapting to the brusque social mores that operate in urban schools in the U.S.

How do we feel about adaptation? The moral force of this question imposes itself whenever issues of personal or ethnic identity are at stake, as when an overly sensitive child sheds his "poetic" nature to become "one of the gang," or when the youngest members of a group that has immigrated abandons the rituals and language they were born into so as to become fully assimilated (adapted) Americans. You can sense the ambivalence of this term clearly in the culture industry when famous works are re-shaped to meet modern audiences under new conditions. And so this seminar was concerned with that values as much as the techniques of adaptation.

Being such a common practice, adaptation is an umbrella term under which all sorts of curricular units could be devised. Participants developed their individual units using the vocabulary and concepts that were tossed around the seminar table. One unit focused on contemporary avatars of the Greek hero Ulysses, first so that students might recognize that all people, including themselves, should cultivate virtues to meet the trials that will inevitably come their way. Homer's particular way of linking these trials episodically will give these students a sense of this foundational text and how it underlies so many of our stories. Naturally topics associated with Shakespeare (and we had three of these) involve questions of fidelity. Since his plays are sacrosanct, every deviation from them suggests an important "updating" either to make the original relevant in a different context or to bring out some aspect of the original that a filmmaker wants to highlight or exploit for reasons of personal expression. Several other units involved famous novels that became even much better known thanks to adaptations that ensued. This has been true of H.G. Wells' *War of the Worlds* (1898) put on famously as a radio hoax in 1938 and then made into two popular films (in 1953 and 2005). With *The Color Purple*, we have a Pulitzer Prize winning novel that became a Steven Spielberg film three years later, leading to a much discussed Broadway Musical. There is something powerful about the main themes of both the Wells and the Walker novels and about the ways they were successively adapted, drawing huge audiences on each occasion. With *Blade Runner* we have the case of a film bringing attention to an important but much overlooked 1968 novel. The differences between these two equal artworks initiate a dialogue students can follow out about crucial themes (artificial intelligence, animal rights, free will) and about the power of books and films. Some units combine a great deal of contextual material alongside works of literature and film. One aims to expose students in Spanish classes to masterpieces of literature that open onto cultural questions about Spain and Latin America. Another takes its point of departure from the 1961 film *A Raisin in the Sun* to explore the landmark play written by Lorraine Hansberry, and through it, the history of social change and social outrage involving African Americans in northern cities. One unit

looks at the general situation of entertainment culture in America, particularly animated films, to help students understand where their values come from. Like all the units, but more directly, it aims to give students tools with which to watch films critically.

And this was surely a chief value of studying adaptation. We all come away better able to understand how films make meaning and, because of this, we can see just what kind of significance a story holds for the person or culture adapting it. This leads to a far greater understanding and appreciation for the work's original composition and situation. Teachers may be enthusiastic or appalled by the promiscuity of adaptation, by the way it so often tries to entice the public through a seductively youthful look, the product of media cosmetics. Yet in parading famous literature, adaptations provide an extraordinary opportunity to observe the entire mechanism of culture at work, including the significance of these works and the cultural operations of the media in which they appear.

Dudley Andrew

Synopses of the Curriculum Units

2007.01.01
The Odyssey: Seeing My Journey through Film, by Susan Greene

Finding purpose—discovering meaning in life—the journey…each describes our quest to become better individuals. Some find meaning within the context of socially stereotyped structures, others in religious (or dare I say mysterious) traditions; yet, of the two, religion has been most instrumental. Our understanding of such relationship or lack thereof, ultimately forms our concept of self.

Homer's *The Odyssey* juxtaposes the struggle of one man, Odysseus, finding his place in this relationship as he journeys home. He is not unique in his quest. In literature and in films, such characters—be they heroes or the girl next door—are prevalent (even Dorothy was hailed as a savior after killing the Wicked Witch of the West). Many works themselves parallel epic characteristics with their vast setting, covering many nations/worlds, consistent deeds of valor and supernatural interventions.

This 2-week unit designed for ninth grade students at Booker T. Washington High School enrolled in the School of Fine, Visual and Performing Arts examines the elements of the written epic as well as contextual parallels through the use of modern films, *O Brother Where Art Thou?* and *The Wiz*.

(Developed for Literature, grade 9, and AP English Literature, grade 12)

2007.01.02
Hamlet and Hollywood: Using Film Adaptation to Analyze Ophelia and Gertrude, by Kristen Kurzawski

Hamlet and Hollywood: Using Film Adaptation to Analyze Ophelia and Gertrude, by Kristen S. Kurzawski

After teaching English literature to high school students for ten years I have realized that film adaptations of literature can make an incredible difference to a student's basic comprehension of literature and aid in his/her analysis. However, I also realize that adaptations create a specific interpretation of a text. The students come to see this adaptation as the definitive interpretation of a piece of writing. I have had trouble helping students see that a director is doing the same thing as a reader of a text. The director is interpreting the text and transforming that text into a visual form. Students do this naturally. They have been programmed by modern society to think in pictures and sound bites. They are bombarded by sensory stimuli. I have noticed that students discuss literature in visual terms, and they respond well to visual writers. Therefore, I see the

need for a unit that engages students while teaching them that film is a powerful interpretive tool, one that offers an interpretation, but not necessarily a definitive one.

With these things in mind I decided to create a unit which uses various interpretations of William Shakepeare's *Hamlet* to initiate the students into film analysis as well as aid their analysis of a staged text. Specifically this unit asks students to examine clips from Grigori Kozintsev's *Hamlet* (1964), Franco Zeffirelli's *Hamlet* (1990), and Michael Almereyda's *Hamlet* (2000). These directors have adapted Shakespeare's work in three distinctly different ways that allow for a myriad of discussion opportunities, but my unit will focus our analysis on the opening scenes of the films and the portrayal of Ophelia and Gertrude within the films. I believe discussion of the adaptations will lead to interesting interpretations of the text as well as a new found way to examine film and Shakespeare.

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

2007.01.03
Macbeth and Issues of Gender, by Deborah Samuel

William Shakespeare's *Macbeth* is both the author's shortest and bloodiest play. It is therefore a natural choice for high school students. Plays are meant to be performed and not merely read, as is usually the case in the high school classroom. Therefore, it is a happy occurrence that instructors may now use video recordings, audio recordings, and DVDs to bring the performance element into the classroom. But performance on film was not Shakespeare's medium. On stage, the audience gets to look where it wants. The actors get to say their lines without fear of winding up on the cutting floor. When we switch from a play to a film, the director is king, and we now have possibly quite a different experience.

The artistry of cinema and the difficult task of taking a stage play and reinterpreting it for a different medium offer students and teachers a plethora of interesting, and sometimes controversial choices to examine. The intention of this curriculum unit is to examine four screen adaptations of *Macbeth* and to use them to enrich the classroom discussion of *Macbeth*. These adaptations include Orson Welles' *Macbeth* (1948), Akira Kurasawa's *Throne of Blood* (1957), Roman Polanski's *Macbeth* (1971), and Men of Respect(1990). Each director has his own approach, visible in camera angles, lighting, sound, casting, omission and inclusion of Shakespeare's lines, and the addition of scenes never written by Shakespeare. We will examine *Macbeth* through the questions it raises about the nature of men and women. How are the witches and Lady Macbeth depicted? Who do they cast? How are they dressed? How do they sound and move? Students will view selected scenes of the women in *Macbeth* to enrich their discussions of Shakespeare's apparent attitudes. What is Shakespeare's original intent, and do the directors aim to be faithful to this, or do they alter the meaning of the play as written to suit a contemporary audience or personal

point of view? Extensive background information as well as lesson plans meant to address these issues in the classroom are included.

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

2007.01.04
Modernizing Shakespeare: Finding Contemporary Themes from Othello, by Thomas Vari

This unit's ultimate purpose is to teach research skills, and is intended for tenth graders. The selections used to meet this purpose are Shakespeare's *Othello* and adaptations of this play. In fact, a portion of this unit's focus is *adaptation* itself. Students will realize that Shakespeare's play is actually an adaptation of an Italian writer's short story. The play, *Othello*, is used as a backdrop for the lessons herein and the unit uses the themes from this play to hook students prior to reading Shakespearean language. The unit uses film to engage students as well as to provide a basis for the questioning strategies. These concepts and theories can be used to teach film, adaptation, Shakespeare plays, and research skills. In this unit, my students look at modern film to see that Shakespeare's themes can be applied to their own lives and situations. They also see that Shakespeare adapted his work from another writer's. And, finally, they use this background knowledge about the power of adaptation and the influence of Shakespeare to research other adaptations of *Othello* and write a documented research report about an adaptation they've found on their own.

(Developed for English, grade 10; recommended for English, grades 9-12)

2007.01.05
War of the Worlds-Multimedia Adaptations, by Claudia Miller

Film as an instructional genre fits well into my full-inclusion, differentiated-instruction classroom sessions at Alameda Middle School in Santa Fe, New Mexico. The promise that many of my special needs students hold truly blossoms when they are afforded a new learning tool and a creative means for assessing what they've learned. My current unit will look at H. G. Wells' famous 1898 text, *The War of the Worlds*, and the societal times during which it was written. We will listen to the 1938 Halloween Eve radio broadcast of Orson Welles' Mercury Theatre adaptation of the text which managed to petrify the nation. Students will be the judges of how the political times in America set the scene for their gullibility. Two very different cinematic versions of *The War of the Worlds* were released in 1953 and 2005. We'll view them in their entirety. A fourth medium, periodicals, will allow students to read journalistic reports of the fallout from the radio broadcast and reviews of the book, the broadcast, and the two movies.

All necessary background research will be included in this unit for my teaching colleagues. An annotated book bibliography will aid in your selecting which texts you may want to peruse. I afford a selection of teaching strategies and lesson plans which you can accommodate to a vast heterogeneous population of students. They correlate with the content standards for all states. Lastly, assessment techniques will be included for teacher perusal as a measurable means of student success.

(Developed for Language Arts, grade 8; recommended for Language Arts and Social Studies, Interdisciplinary Unit with Language Arts)

2007.01.06
The Color Purple's Three-Fold Adaptation: Examining Protagonists and Media through a Self-Reflective, Critical Lens, by Ané Ebie-Mouton

This curriculum unit serves a two-fold purpose. It will first examine the intertwining lives of season-three *American Idol* winner, Fantasia Barrino, and the female protagonist Celie in Alice Walker's Pulitzer Prize winning novel, *The Color Purple*, including its film adaptation. The three categories for examination of these two characters will be Self-Esteem, Generational Curses, and Illumination of the Gift. The second section will involve a critical examination of the book and its adaptation into a film and musical, in tandem with the passion all three mediums have evoked. This passion has come in the form of controversy and love, which made these mediums the subject of much criticism. The predominantly African-American fifth grade demographic I impact will benefit from the first part of this study through creating real-world implications of these intertwining lives with their own. The second part of this unit will develop the skills of in-depth analysis that will eqiup them to begin examining various mediums of storytelling through a critical lens.

2007.01.07
Blade Runner Redux: Teaching a Sci-Fi Meta-Art Classic, by Clary Carleton

This curriculum unit provides a guide to teaching Philip K. Dick's *Do Androids Dream of Electric Sheep?* and the film adaptation, Ridley Scott's *Blade Runner*. Both texts explore ethical and philosophical ideas related to artificial intelligence. Because the unit is intended for a mixed-level, mixed-grade English class, it could be adapted to a variety of teaching settings. For English teachers unfamiliar with these works, the unit articulates a rationale for teaching by enhancing students' critical thinking, close reading, oral language, and writing skills.

Unlike other adaptation histories, it is the achievement of the film that has inspired a reassessment of the novel. The unit will approach the film as an artistic accomplishment in its own right, rather than as a mere supplement to the novel. Students will explore

issues surrounding the idea of adaptation itself, empowering them to consider how and why stories change, and the impact of the medium through which they are conveyed.

Through a variety of activities, students will focus on characterization, theme, and allusions in both the novel and the film. They will also explore *film noir* and the elements of cinema, helping them elaborate upon ideas in the novel. Overall, this unit aims to show students how these two texts work together as one "meta-art" classic.

(Developed for English, grades 9-12; recommended for English, grades 9-12)

2007.01.08
Spanish Cultures Through Film and Literature, by Maria Cardalliaguet Gómez-Málaga

"Spanish Cultures Through Film and Literature" is designed to expose Spanish I and II students to a multi-disciplinary unit that uses exceptional literary pieces and their filmic adaptations as vehicles to explore culture in context, since cultural understanding is crucial when learning a foreign language. Through this unit students will acquire a deep understanding of the history, literature, art and music of two Spanish speaking countries: Spain and Colombia. By doing so, students will also start thinking about global consciousness and the importance of embracing global understanding.

Students will learn to analyze films in order to understand them as works of art with a complex structure and many different layers of meaning and film techniques. My intention is that at the end of this curriculum unit students will be able to discern the difference between a shot and a scene, a flashback and a flashforward, voice-over and voice-off, mise-en-scéne and editing, etc.

Finally, This unit will also help me to implement the five-goal areas the National Standards of Foreign Language Learning called the *Five C's of Foreign Language Education*: communication, cultures, connections (among disciplines), comparisons (between cultures) and communities. My students will understand and interpret spoken and written language; they will demonstrate an understanding of the traditions, products (texts and films) and perspectives of the Spanish cultures; they will reinforce and expand their knowledge of other areas of study (literature and film studies) through Spanish, and they will be able to compare the textual sources and their adaptations to film.

The unit is recommended for Spanish students with a lower-intermediate level, but it could be used on upper level courses with proper modifications.

(Developed for Spanish I and II, grades 9-12; recommended for Spanish I, II, and III, grades 9-12)

2007.01.09
Spanish Cultures Through Film and Literature, by Sharon Ponder

"And we have decided to move into our house because my father, my father, he earned it for us, brick by brick."

Walter Lee

When Walter Lee presents the question to mama, "Why did you move here to Chicago forty years ago from the south?" mama explains, "I guess I came here to make a better life for me and my family." This will serve as the springboard for introducing the Great Black Migration and the artistic expressions it occasioned in poetry and drama. Since my eighth grade students live in Chicago, we will examine jobs, housing and educational opportunities, organizational support systems and poetic protest.

Lorraine Hansberry's *A Raisin in the Sun* sets the stage for examining conflicts and themes that arise from these historical and social events. Almost fifty years ago a young African American woman wrote the play Raisin in the Sun describing some of the conflicts faced by a family struggling to achieve the American Dream. Have the Dreams of African American's dried up like *a Raisin in the Sun*? The poet Langston Hughes asks this very compelling question: "what happens to a dream deferred?" As a writer Lorraine Hansberry uses the plot of her play to explore the overarching theme of fulfilling one's dreams which reverberates in each of her characters.

"Does a play or film reflect society's cultural, social or political views or visa-versa?" In this unit students will examine, identify, interpret, and constructively critique recurring themes in the play and film. As a Nationally Board Certified Teacher in the field of Middle Childhood Generalist, I have the richness of integrating curriculum across content areas. Excerpts from the play and poetry will be used to emphasize various themes that students can also identify through film analysis, making real life connections in the process.

(Developed for Language, Visual and Performance Arts, and Social Studies, grades 7-10; recommended for Language, Visual and Performance Arts, and Social Studies, grades 7-10)

2007.01.10
Political Socialization: Finding Ourselves in Film, by Jeffrey Joyce

This unit deals with films, among other major media types, and the sway they might have on one's political ideals. More pointedly, the unit asks that my Advanced Placement American Government students remember and research their own histories to determine the political pressures that have been exerted on them over the course of many years.

Indeed, I want them to think about how they have had to adapt to their political climate given the media barrage that has been a near constant in their lives and then how the media has had an effect on their political thoughts and feelings.

The process is referred to as political socialization, or the ways that people become their political selves. Most often political scientists give primary weight in this matter to family. But as times have changed and children expose themselves to, and are often manipulated by, multiple forms of media, it is worth asking whether or not their political opinions are in many ways a byproduct of the materials they consume. Therefore, this unit emphasizes the role that film has played in my students' political development.

This unit includes the study of political ideologies first and then uses film analysis to find political rhetoric in popular media. The unit then poses the question to students: have the films you have digested changed you, politically? The overarching goal is to have students learn not only to appropriately define general political ideologies in context, but to apply their understanding to their own lives and then, through some self-discovery, pinpoint the origins of their own political belief system.

(Developed for AP Government and Politics, grade 12; recommended for AP Government and Politics, grade 12)

II. Across the Curriculum with Detective Fiction for Young People and Adults

Introduction

In introducing "Across the Curriculum with Detective Fiction for Young People and Adults," I have no temptation to change the title of the seminar. All the authors in this volume took very seriously the selling point of the seminar, which was that detective fiction is not only fun to read—which makes it great for reluctant readers—but sets more parts of the brain to work than nearly any other kind of fiction that gets assigned. The curriculum units written for this seminar could certainly be arranged in more than one way. Three units each, for example, focus on Walter Mosley and Arthur Conan Doyle, respectively, and there are other patterns too among the authors chosen, but it just didn't seem as close to what really was on all the fellows' minds to arrange them this way. Their main concern, as was likewise the case in my children's literature seminar last summer, was just getting their students to the point where they're willing to read by drawing on various parts of the school curriculum, not just the standard "English" rubric. I've ordered the table of contents, therefore, around different angles of approach to this objective: 1) Reluctant readers (two units); 2) logical reasoning (two units); 3) creative writing (one units); ethnicity, identity, and community ethics (four units).

Jessica Colbert has the daunting task of teaching slow readers and bright students who are maladjusted, all in the same middle school classroom. For the purpose she has chosen one novel, Walter Mosley's *Devil in a Blue Dress*. While this novel is meant for adults, it is technically—according to word-scanning techniques—written at the fourth or fifth grade level, and Colbert means to exploit this range of appeals while preparing reading and even audio exercises that suit her students' range of abilities. **Cathy Kinzler** is a school librarian who spends time in the library encouraging groups of reluctant readers. She has chosen a short novel for adolescents about a teenage fratricide that a friend of both brothers is reluctant to bear witness to for a variety of reasons. (Reluctance to "snitch" was on several teachers' minds, and this a theme Kinzler shares with Shaub.'s unit described below.)

Two teachers took a special interest in the potential of detective fiction for enhancing skills in logical and inferential reasoning. **Ella Boyd** is a seventh grade science teacher whose first task is to teach students who have had no exposure to science something about the scientific method, especially the difference between inductive and deductive reasoning. Her main commitment is to science, of course, but she intends to introduce both some three-minute mystery problems for younger readers by Donald Sobol and some Sherlock Holmes stories to illustrate her lessons, and to do some across-the-curriculum teaching while she's at it. **Mary Lou Narowski** will also use Sherlock Holmes as her main vehicle, but her focus apart from reading, and to enliven reading, is the encouragement of students to invent their own games of detection, at three different

levels of sophistication according to their respective talents. The guidelines for these exercises, and their payoff, constitute the unit's unique contribution.

As a teacher of creative writing, **Deborah Dabbs** had worked reluctantly with the curricular directive from on high to get her students writing narratives on the "epic" model—whatever "epic" in this context might be supposed to mean. Not surprisingly, she leapt at the chance to use detective fiction for this same purpose, and she has written a unit using a variety of short detective stories together with Christie's *Murder of Roger Ackroyd* as models both for free composition and for exercises such as rewriting outcomes and writing plausible first sentences.

Bonnee Breese hopes to teach primarily African-American high school students lessons across the curriculum in identity, community ethics, and understanding historical context by using a sequence of novels by Walter Mosley, Barbara Neely, and Chester Himes. Historical specificity can be taught through Mosley's sequence of Easy Rawlins novels from postwar into the Watts years and through Himes's late Harlem Renaissance ethos, while Neely focuses not only racism but infra-racial tensions, especially in *Blanche Among the Talented Tenth*. **Laura Zoladz** uses Mosely, Neely, Tony Hillerman, and Sharyn McCrumb to reinforce a high school curriculum in American literature that is meant to examine such topics as the American Dream. She sees these authors as offering excellent ways to imbue such topics with nuanced skepticism—especially nuanced in the case of Hillerman. **William Lewis** too is interested in a writer about Native American matters, the Wyoming-based Craig Johnson, but the novel he chooses for his unit entails the visit of Johnson's detectives to Philadelphia, where Lewis teaches. Hence his unit is simultaneously an introduction to the form of detective fiction and an examination of Philadelphia as neighborhood and familiar backdrop. Finally, **Christine Shaub** teaches vocational-technical students a course that prepares them for paralegal work. She is concerned that their views of snitching can scarcely allow them to be objective in their chosen field, so she has decided to stage a series of pointed conversations about the social circumstances of witnesses and the withholding of evidence, using a sequence of young adult novels that focus this issue as starting points for discussion.

How to "hook" students on reading? These units offer nine very promising possibilities.

Paul H. Fry

Synopses of the Curriculum Units

2007.02.01
Using Walter Mosley Detective Novels (Devil in a Blue Dress) to Motivate Reluctant High School Readers, by Jessica Colbert

This curriculum unit will focus on the writings of Walter Mosley. It will center on the whole class reading of *Devil in a Blue Dress*, with the possibility of exploring other Easy Rawlins stories and/or other detective fiction written by African American authors. This unit will be implemented in a mixed grade level (9-12) special education resource English class in a low-income high school. Included in the class are students with learning and/or emotional disabilities as determined by a psychological report and Individualized Education Plan (IEP). It is my opinion that this unit can be modified and adapted for a regular education classroom as well. Included in this unit is a section for an activity used as an extension for my population of students with learning disabilities. This activity includes examining the notion of double-consciousness in *Devil in a Blue Dress* and subsequent Easy Rawlins novels. This portion of the unit would be very appropriate for any regular or honors education class.

(Developed for English-Learning Support, grades 9-12; recommended for English, grades 9-12)

2007.02.02
Using a Mystery Novel to Encourage Pleasure Reading and Imaginative Thinking, by Cathy Kinzler

This unit is designed to promote reading for pleasure and the use of higher order thinking skills in middle school reluctant readers, particularly seventh and eighth graders. I use one mystery novel, *Blood Trail* by Nancy Springer, but the activities could be adapted for other literature. The mystery genre is a great choice for engaging students who do not enjoy reading because it capitalizes on the current popularity of television programs dealing with crime solving. Mysteries provide a perfect opportunity to grab students' attention. Trying to solve the "whodunit?" can pull them into the print world of the characters' emotions and quandaries, making them experience questions like "Shall I 'snitch' on a friend?" This novel is excellent for my purposes because it is short and written at about a fifth-sixth grade level, allowing students to become personally involved in a story involving the murder of a high school boy by his twin brother and the ethical situations surrounding it. Activities include using oral language skills and graphic organizers, writing expository and persuasive narratives, working with elements of a story, summarizing, predicting, and higher order thinking skills such as inferential and imaginative thinking. An extensive list of mystery novels is included.

(Developed for English, grade 7; recommended for Reading and English Language Arts, grades 7-8)

2007.02.03
Using Detective Fiction to Reinforce Problem Solving Strategies and the Scientific Method, by Ella Boyd

This unit, "Using Detective Fiction to Reinforce Problem Solving Strategies and the Scientific Method," is meant to be used in a middle school science classroom. It is a unit designed for integration of the science and language arts curricula. The focus for this particular unit is a short story by Sir Arthur Conan Doyle, but greater participation from the language arts teacher would allow the use of a full novel. The unit will focus primarily on observation and inference skills, the basic kinds of skills needed for critical thinking in science. Science should be taught as a process, not memorization of facts, and the use of detective fiction will help to accomplish that goal. The classroom activities include a series of activities to practice observation skills, to practice making inferences, and then to apply those skills to solve a short mystery story. The difference between inductive and deductive reasoning is discussed, especially the way Sherlock Holmes uses those skills for solving crimes.

(Developed for General Science, grade 7; recommended for General Science, grades 6-8)

2007.02.04
D. I. E., by Mary Lou Narowski

This unit combines the use of **mystery board games** to grip my students in ways that will really stimulate them and hold their interest, with negotiation of a labyrinth of intrigue found in detective fiction. I have chosen **eleven mystery stories**, one of which is in film version, by Sir Arthur Conan Doyle, as I feel that these stories are accessible to my students in terms of appropriateness and reading ability. Added to this is the complement of their personal voices expressed in an expository writing (crime) journal. These mystery stories will engage students while producing and reinforcing emergent literacy abilities, all while following the detective in the whodunit, what happened world of secrecy and suspense. These stories will help in the development of logic, reasoning, and higher order critical thinking as they struggle to find the explanation of the crime. The basic literary elements inherent in any story will also be reinforced. Finally, the **invention of group mystery games** will provide ample room for innovation and creativity as the students proceed from playing the marketed game of *Clue, Master Detective*, with their own cast of characters, creating their own reading level version of a crime game.

(Developed for Language Arts, grades 7-8; recommended for English Language Arts, grades 7-9)

2007.02.05
Uncloaking the Clues: Details, Daggers, and Detection, by Deborah Dabbs

As it has become increasingly obvious over the years, educators do not operate in a vacuum. We are, to a degree, dependent upon the efforts and cooperation of our colleagues. Therefore, this curriculum unit seeks to use the study of the detective genre to develop and hone students' problem solving skills. By using the conventions and tenets associated with detective fiction, the students will write stories in this genre. Because this course of study calls for the students to encode as they write, their use of the tenets of detective fiction will aid them in learning to decode in other areas, specifically academic areas which require the use of problem solving skills. This will occur because the study of this genre highlights the fact that the key to acquiring all of the necessary ingredients to solve a detective mystery is an attention to detail. Therefore, through their writing of stories which require that their detectives use this skill as they endeavor to solve crimes, the students will hone their own abilities to detect details and uncover clues which allow them to glean the understanding necessary to solve problems presented. Their mastery of the skills necessary to write detective fiction will enable them to develop and use critical thinking skills, thus fostering higher order learning.

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

2007.02.06
Crime Fiction Investigation: "Socially Correct or Not, Let Me Tell You Who Did It", by Bonnee Breese Bentum

This curriculum unit investigates the detective novel series of three African-American writers, Walter Mosley's Easy Rawlins series, Barbara Neely's Blanche series, and finally Chester Himes' Coffin Ed and Grave Digger series. The focus of the unit takes students through a curriculum study in giving them familiarity with African-American writers who have contributed exceptional mystery writing to the literary canon. This unit, more specifically, is intended to have students explore issues of race, economic status, community, social structure, good versus evil, and gender in the creation of a story that uses the principles of the crime fiction genre. Furthermore, this unit will be evidence for students to understand how close the connections are between literature and history. The unit allows students to read and write about their own societal issues in a way that is accessible and entertaining. This curriculum unit is intended for use in the high school English Language Arts classroom.

(Developed for English Language Arts, grades 9 and 12; recommended for English Language Arts, African American History, and African American Literature, grades 9-12)

2007.02.07
Beyond Criminal Justice: Investigating Social Issues through Detective Fiction, by Laura Sturgeon

Detective fiction, a genre often considered solely for entertainment, abounds with good writing and trenchant social criticism; it is also a treasure trove of high interest literature, accessible for students of all backgrounds and levels. In this particular unit, I target 11th grade American Literature students who attend a Vocational-Technical High School in New Castle County, Delaware. The unit revolves around four novels: Walter Mosley's *Devil in a Blue Dress*, Barbara Neely's *Blanche among the Talented Tenth,* Sharyn McCrumb's *If I'd Killed Him When I Met Him*, and Tony Hillerman's *A Thief of Time*. It also includes stories by Dorothy Sayers and Raymond Chandler in order to familiarize students with the genre's traditional conventions so that they will better understand how the novelists subvert or alter these conventions for purposes which include social criticism and the creation of an aesthetic that is true to each author's social and cultural identity. The novels deal with themes of identity, social class, race, ethnicity, gender, assimilation, and discrimination, while containing complex protagonists and intricate plots; hence they can be used to study characters and to analyze the structure and conventions of plot and narrative. Meanwhile, students will enjoy the challenge of beating the protagonists to the solution of the mystery.

(Developed for American Literature, grade 11; recommended for English, grade 11)

2007.02.08
More Than Just Whodunit - Using a Mystery Story to Motivate Tenth-Grade Students to Read, by William Lewis

This curriculum unit would be useful to high school teachers of English or social studies in the tenth, eleventh, and twelfth grades. There are possibilities of examining the Cheyenne Indian culture, the Lenape Indians, many aspects of Philadelphia, including its neighborhoods, its historical institutions, its cultural and governmental institutions, as well as its wealth of public art in the form of its parks, fountains and sculptures all in the context of an enjoyable mystery story.

(Developed for English, grade 10; recommended for English and Social Studies, grades 10-12)

2007.02.09
Police Investigative Challenges: To Snitch or Not to Snitch, That is the Unanswered Question, by Christine Shaub

Police investigations are challenged without a cooperative witness. To snitch or not to snitch is a question the witness to a criminal offense must answer. This unit was devised

so students could learn more about the challenges of solving crimes when there is an uncooperative witness. Those persons who do come forth may be "tagged" as a snitch. This is an ethical dilemma for students if ever faced with such a situation.

Through crime fiction, students will look at the meticulous work of crime detectives. When a witness withholds information, the detective must utilize clues from the crime scene, and beyond, to put together pieces of the puzzle. Using crime fiction to teach about witness intimidation will give the students an opportunity to walk in the shoes of the detective and better understand investigative challenges.

Students will create a mystery skit, a mock trial, a new courtroom design, and an informative witness brochure. Students will have a better understanding of police procedures in relation to solving crime, witness intimidation, witness protection, police corruption, as well as the social and cultural implications of the snitching phenomenon.

(Developed for Introduction to Criminal Justice and Legal Administrative Assistant Career Program, grades 9-12; recommended for grades 8-12)

III. Maps and Mapmaking

Introduction

What is a map? How is it that we visualize our world in a two-dimensional form? How is it that we understand the social meanings of maps so clearly that we can call for a "road map for peace" or talk about a mental "map"?

Humankind has invented maps time and again, from ancient China to Babylonia to ancient Mexico. Conquerors created maps as their tools, from the European "scramble" for Africa to the westward charting of Americans during the 19th century. Maps that are unique works of beauty have been painted to adorn the walls of kings and popes; maps have been printed by the million to stuff into the glove compartments of our cars. The past ten years have seen an explosion of new kinds of mapping, from Mapquest to Googlearth to the GPS devices that guide cars and nuclear warheads. Where will maps go next?

The seemingly visual map may nevertheless provoke the written word, from the maps of Tolkien's trilogy to the map of Treasure Island. The drive to complete the idea of the complete map has led humans to explore the ends of the earth, from the North and South Poles to remote islands to the sources of the Nile and Amazon, and, most recently, to send satellites far into space. Yet no map can ever be complete—and in one respect or another, no map can ever be completely accurate.

In this seminar, we looked at some of the earliest efforts to create a two-dimensional rendering of the earth, along with the development of the instruments that would make such renderings possible. At the same time, the social meanings of maps and mapping always stayed in the foreground of our considerations. We spent two sessions outdoors learning the most basic principles of map survey, first by measuring strides while holding a compass; the second by using tape, compass, and level. Seminar participants worked in teams, learning to stride, measure, and orient. This practical knowledge—and a little geometry—gave all members of the seminar some basic understandings and hands-on experience of maps as they have been made before the age of satellites and GPS.

Fellows of the seminar developed units that emphasized geography and history, both in westward expansion of the United States and in units that addressed focused, historical phenomena, from the Underground Railroad and the migration northward of African-Americans in the 20th century. Fellows took advantage of US Census data to explore the mapping of poverty, both in general and with attention to specific urban and rural locations. Others took the map and made it central to literature and writing, making map study both a part of understanding a particular work and using the map as the point of

departure for expository writing. Art teachers explored the graphic possibilities of the map; they also used the map as the point of departure for the teaching of perspective drawing and rendering; the map also was taken as the underpinning for art history survey.

In the end, all units found ways to address the map metaphorically as well. In this, the seminar shared a "mental map" in recognizing relationships between tangible, visual images and notions of order and coherence that pervade our constructions of the world.

Mary E. Miller

Synopses of the Curriculum Units

2007.03.01
The Underground Railroad and the Geography of Freedom: Using Slave Narratives and Negro Spirituals as Maps, by Sheila Carter-Jones

This unit gives a theoretical and historical basis for the inclusion of the African American voice in the reporting of the history of slavery in America. Students will participate in creative dramatics activities as ways of understanding real events in the lives of enslaved Africans in America and the function of the Underground Railroad. They will also refine and broaden their understanding of important human qualities: courage, perseverance, respect for the dignity of human life and the concept of freedom-as justice. Intellectually, they will have the opportunity to engage concrete stimuli with an imaginative response, increase their ability to be intellectual risk-takers, and generate optional ways to think, feel, and do and to solve problems.

Through writing and map making/reading/interpreting skills students will have the opportunity to identify and come to terms with some of their own feelings, perspectives and understandings of slavery and the physical and psychic geography of plantation life. Using literary devices to engage real people in history as literary characters, all students will learn historical truths and understand how they each are a part of and not apart from American history. Let me add here that the following lessons provide learning activities for the eighth grade but can be adapted in small ways to be suitable learning activities for any grade level.

(Developed for Communications, History, and Community, grades 6-12; recommended for Communications and History, grades 4-12)

2007.03.02
Mapping Change: How Colonialism Changed a Man, His Community, and His Culture, by Anne Marie Esposito

To appreciate and value a culture an individual needs to experience it and that is what Chinua Achebe allows a reader to do in his novel, *Things Fall Apart*. This unit helps students see how a Eurocentric view of the world and its peoples allowed European nations to systematically expand their influence and control in Africa even though it was populated by many tribes who had an established and civilized way of life. Through their study of various European maps, students will learn that maps have a purpose and point of view. Often the maps we have been shown support a belief that Africa was in need of European governance and that the European powers were on a humanitarian mission to save the people of Africa. After examining these maps students will know that maps can alter the way someone or someplace is perceived since maps can reveal as well as hide information. As they read *Things Fall Apart*, students will learn, as Achehe intended, that

the people of Africa had a rich and sophisticated tribal society worthy of recognition and respect. Through Okonkwo, students will uncover the traditions and values of Igbo society and its rich oral traditions.

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

2007.03.03
Maps and Mapmaking for the Artist, by Elizabeth Lasure

As I read the outline for this seminar I was immediately struck by the similarities of the challenges of the early explorers/mapmakers and that of art making. The world for them must have appeared both exhilarating and intimidating. The risk these early explorers took combined a spirit of adventure, a knowledge (limited as it was) or sense of place and a great deal of courage and conviction. I believe the nature of art making to be similar.

No doubt, art making is hard. To be inspired, to create innovative marks on a page, and to confront personal censure are difficult challenges for artists and teachers alike.

Through a series of 'personal geographies' - or works of art that map their past and future lives- students will explore the history of maps and mapmaking. What ways do we use maps? How do they define their subject? How do they define what is not know or cannot be seen? How do they lie? These questions will help students consider the content of the maps they study, as well as the potential expressive qualities of the map as a medium in art making. Maps have their own inherent visual qualities of tone, value, and density. Maps also make use of such dominant elements as line and color. Maps make use of both the literal and conceptual make-up of a work of art.

(Developed for Studio Art, grades 10-12; recommended for Studio Art, grades 10-12)

2007.03.04
The Beautiful Art of Map Making, by Mayra Muller-Schmidt

The mind's eye that humans have is a very special ability that rarely is mentioned. Humans are able to see and take measurement of land, and convert it in their minds as line and contours. The idea of a map and then drawing it according to scale is part of a very special ability. It is called *spatial reasoning*. How does one develop this? Obviously, abstract thinking is involved. Understanding a map has its spatial or visual requirements. It is a cognitive and abstract thought. You see flat yet think in round terms. Illustrated maps can summon visions of ancient places, treasure maps and top secret places. Maps are everywhere. Indeed, maps are an integral part of common daily life.

The middle school child is at the point of expanding his visual sense of spatial reasoning. To think of angles, transparency, parallels, and the like makes an introduction to abstract

thought, geometry, algebra, and other concepts easier to grasp. That also leads to being able to display an understanding of patterns and relationships. So what does that have to do with making and learning about maps? Map-making is one of the oldest and least talked about skills. Additionally, the beauty of mapmaking is rarely presented as an art skill. The knowledge of using the compass, charting, measuring and all other tools of the trade must be understood by the map-maker. My unit will provide discussion, research, writing, science, geography, history and art to surround the students with ways in which to enrich their spatial reasoning skills.

(Developed for Fine Arts, grade 6, and History, grades 6-8; recommended for Geography, Fine Arts, History, and Mathematics, grades 6-10)

2007.03.05
Mapping + Episodic Short Short Stories = Classroom Writing Success, by Janelle Price

The creation of their own personal life story map is the guide for students in developing a writing portfolio of three to five episodic short short stories, a sub-genre of short stories using only 500 to 1,000 words. The students begin the unit through the exploration of cartography, centering on the decorative mappae mundi and portolan charts of the Medieval period. The short short story sub-genre is simultaneously introduced through classic and modern examples. The unit shifts to a writing focus with exercises that illustrate the specific characteristics of the sub-genre, but can be used for any story writing. These exercises include: the development of a motif, use of tension, dialogue, story prompts, and revision cues. Included in the unit are assignment sheets, rubrics, a brief early history of cartography with a vocabulary list, and suggested maps and short short stories to use in the classroom.

(Developed for English IV, grade 12; recommended for English, grades 10-12)

2007.03.06
The Rhetoric of Maps and the Westward Expansion of the United States, by Ralph Russo

The acquisition of new territories by the United States between 1783 and 1850 expanded the nation's borders to the Mississippi, then to the Rocky Mountains, and finally to the Southwest and West Coast. A pageant of now famous historical figures, as well as, lesser known, and unknown persons, pushed the frontier further westward through politics, diplomacy, squatting, courage, good fortune, warfare and, at times, apparent thievery. However, of all the tools at the disposal of politicians, patriots, explorers, adventurers, businessmen, and speculators, the map, above all things, legitimized westward expansion and symbolically made these gains manifest. With all of its rhetorical powers, lies, and limitations, the map became the concrete embodiment of the notion of Manifest Destiny.

This unit is created to incorporate the rhetoric of maps, 18th and 19th surveying and mapmaking techniques, and the historical events that lead to the westward expansion of the United States into the United States history curriculum at Wilbur Cross High School, a comprehensive urban high school in New Haven, Connecticut. While it is specifically designed to target student needs in my 10th grade United States History I class, it should be easily adapted to work with students in grades 7-12. The unit includes background information on events such as the Mason Dixon Line, the Land Ordinance of 1785, and the Lewis and Clark Expedition. It also contains reference to numerous map collections and authoritative works. Most importantly I believe my unit features an instructional, yet fun, map practicum where students will use period mapmaking tools and techniques (compass, striding, and Gunter's chain) to measure, scale and draw space around our school.

(Developed for U.S. History I, grade 10; recommended for History and Social Studies, grades 7-12)

2007.03.07
Santa Fe and the World: Maps and Mapmaking of People, Places and Poverty, by Meredith Tilp

In a world of constant overstimulation, how do we get a student's attention and hold it? How does the teacher compete in the multi-dimensional world of iPhones, Ipods, and text messaging? How do we utilize multi-media teaching in assisting students to grasp complicated concepts? Like the early explorer who made maps as he/she entered unknown territories, the modern teacher can use maps to explicate concepts and make them visually available to students.

Maps, in so far as they use color and symbols, size and shape, are student attention grabbers. Historical maps, political maps and tourist maps all have a point-of-view. Data maps pretend to be representative yet they are distinctly biased. Maps of poverty average incomes to provide a synopsis of events, lives and 'a snapshots of facts.' They require critical thinking, analysis and imagination—powerful teaching tools.

Even more powerful is the hands-on process of mapmaking - because it engages students in research that allows them to experience information viscerally instead of in the abstract. Students will learn to make their own maps in which their local world is the center.

(Developed for U.S. History, grade 11, and U.S. Government and Economics, grade 12; recommended for U.S. History, Geography, U.S. Government and Economics, and Civics, grades 11-12)

2007.03.08
Portraits of Places: Maps and Art from the European City View to the Aboriginal Dreamtime Paintings, by Kimberly Towne

This curriculum unit is designed for middle school students but could easily be adapted to upper elementary and high school students. The students will explore the viewer's relationship to place by exploring perspective in some depth. In short, we will look at perspective, both technically and metaphorically. The students will be introduced to basic linear perspective techniques and how artists use the various techniques to depict a 3D effect on a 2D surface. They will be expected to be able to describe and use a variety of techniques, including position, size, overlapping, detail, and atmospheric perspective. We will then focus on perspective from four main points of view: worm's eye view, human's eye view, bird's eye view and satellite view. The students will explore a variety of maps and landscapes from different times and different places. City maps from the Renaissance period will be a major focus, as will the landscape paintings of the Australian Aboriginals. The realistic, bird's eye view of the Renaissance city maps will be contrasted with the symbolic, satellite views in Aboriginal art. Students will ultimately have a much deeper understanding of perspective, both visually and cognitively.

(Developed for Art, grade 6; recommended for Art, grades 5-9)

2007.03.09
Mapping the Great Migration 1916-1930: African American Movement from the South to the North, by Stephanie Felder

Why study the Great Migration of 1916-1930? Philadelphia is a city that is more than fifty-percent African American. Many of the people that live in the city today have origins in other parts of the country and the world. Historically, as a city located in a border state during slavery, Philadelphia has a long history of being a home for free African Americans. Throughout history, people have migrated to and emigrated from places. Migration is nothing new but the time period of 1916-1930 brought about a movement of African Americans from the South that has not been duplicated since. As a mandated part of the Philadelphia High School curriculum, African American history is a vital part of the education that my students receive. Students today do not seem to inquire about the social, economic and political aspects of society. This curriculum unit will give them an historical perspective about one group of people in American society. I hope that students learn to be inquisitive about their own past and well as that of others. In doing so, I want my students to gain the analysis and inquiry skills needed to be successful in today's educational climate and society as a whole. In this curriculum unit I will utilize the geographic themes of location, place, human- environment interactions, movement and regions. I will also turn to the social studies themes of culture; time, continuity and change; people, places and environments; individual development and identity; individuals, groups and institutions; power, governance and authority; production,

distribution and consumption; science, technology and society; and global interactions. I will use these themes to examine and explore migration. My purpose in using the themes of geography is to help students understand the absolute and relative position of a place on Earth's surface, how physical and human characteristics define and distinguish a place, how humans modify and adapt to natural settings, how people, ideas and material move between and among locations, and how an area displays unity in terms of physical and human characteristics. These social studies themes will provide the framework for the standards that will be addressed in this unit. Having studied maps and map making from an artistic, historical and practical perspective, I endeavor to have students gain not only a historical perspective of "The Great Migration" and also a practical understanding of maps and map making. I plan to do this through giving students the opportunity to study about geography, which is sorely lacking in the high school curriculum, but also to drive the study of geography by analyzing and examining a historical event that is relevant to our coursework, our local community and many of their cultures.

The unit will span the course of a semester as students study various topics in an African American History course designed for high school students. The grade level is primarily eleventh. The unit will consist of six lessons of history and geography.
(Developed for African American History, grade 11; recommended for American History, African American History, and American Literature, grades 9-12)

IV. Latino Cultures and Communities

Introduction

This 2007 national seminar gathered talented and energetic teachers to discuss the history and culture of Latinos in the United States. Aware that communities from Maine to Hawaii are now home to tens of thousands of residents who trace their family histories to Mexico, Puerto Rico, and other parts of Latin America, we attempted together to historicize recent trends—the "Latinization" of the United States—and to find ways to integrate Latinos more fully in school curricula.

Fellows first read, and seemed to enjoy, Juan González's *Harvest of Empire*, a book of popular history that describes how Latin Americans have been incorporated, by migration and other processes, into the United States. That reading prompted many good seminar discussions about the 19th and 20th century past, about the influence of the U.S. in the Western hemisphere, and about the possible connections between histories of migrant Puerto Ricans and Mexicans. From that point forward, we took on questions about citizenship, about race and racism, and about community politics, beginning a set of conversations that defined our seminar meetings face-to-face, and that guided a number of Fellows' units in subsequent weeks.

Along the way we also had a number of stimulating discussions of broad interest to seminar participants. We considered the past and present struggles of Latino kids in U.S. schools, as well as teachers and administrators, in the writing of Ernesto Galarza, historian Virginia Sánchez-Korrol, and social scientists such as Stephanie Bohon. We talked about the differences between the Latino neighborhoods, workplaces, and leisure practices in established communities such as Philadelphia and Santa Fe, and those which newly-arrived populations have created in Richmond and Charlotte. We studied educational trends in Latino communities nationwide, exploring rates of literacy, high school graduation, and college matriculation. We considered works of fiction and memoirs by Latino authors, including Sandra Cisneros's *House on Mango Street*—which a number of the participants had already used in their own teaching, although in many different ways—and Junot Díaz's *Drown*, an account of life in both the Dominican Republic and the New York City area. We tackled short stories, paying particular attention to the ways in which authors narrate their arrivals in the United States, and how they explain cultural change and continuity among Spanish-speakers. We watched several films and music videos, listened to corridos and salsa tracks, read a history of Latin music in the United States, and analyzed a late-19th century cookbook written by a Mexican American woman in California. Fellows analyzed the art of the Chicano movement, and they talked about the ways in which recent Guatemalan migrants to the South connect Central American indigenous histories to the contemporary United States. In our final session we considered the contemporary immigration debate, and how

proposals aimed at border enforcement, new guest worker systems, or an easier path to naturalization might soon reshape the 21st-century United States.

These interesting and wide-ranging discussions helped guide Fellows as they wrote fascinating units intended for a wide range of students. Samuel Reed put together an exciting approach to introducing his mostly African American middle school students to Philadelphia's Latino communities, and to salsa and other Caribbean musical traditions, through various writing and performance projects, and a pen pal program with a school that boasts a large Latino population. Sara Thomas created a unit that guides high school art students in New Haven to consider how Latino artists, and others, have adapted the historical figure of La Malinche, and the Vírgen de Guadalupe, and that then encourages them to make their own adaptation of a familiar image or icon. Nicole Schubert responded to the growing number of Latin American immigrants in her North Carolina community to design a middle school unit about Mexican immigration that focuses on immigrants' personal narratives. Raymond Theilacker developed a unit meant to guide his eleventh and twelfth grade Delaware students through several genres of Latino literature, to teach something about Puerto Rican and Mexican American history, and to prompt discussions about literary analysis and identity formation. Yvette Carter of Richmond designed an approach to the popular children's song "Bate, Bate, Chocolate" which she hopes will inspire her primary school music classes to sing, learn about rhythm, and write short essays. Paulina Salvador developed a unit for her bilingual education classroom that will guide her Latino fifth grade students in Santa Fe towards new types of readings, and that will help them better understand their own families and communities. Finally, Kathy Zimbaldi of Houston assembled a unit about Cuba, Puerto Rico, and the Dominican Republic for English-language learners in her Houston primary school, a unit that relies upon recently-published picture books to encourage a love of reading, to improve general literacy, and to provide Mexican-origin children some basic information about the Caribbean.

Taken together, these units offer a number of exciting ways to bring Latino content into classrooms throughout the United States.

Stephen J. Pitti

Synopses of the Curriculum Units

2007.04.01
Boricua, Morena: Latin-Caribbean American and African American Cultural Connections En ciudad de Filadelfia, by Samuel Reed

This unit draws upon social studies, performing arts and literature to show the interconnections between Latino and African-American cultures. It is intended for middle grade students (grades 6th-8th) at a predominately African American school. The unit involves an inquiry process where students learn about Latino culture while also learning about their selves. The films *Mad Hot Ballroom* and *West Side Story* will serve as anchors for exploring how Latin-Caribbean culture interrelates with African American culture. Students will conduct their own inquiry, using the essential question "what cultural connections do Puerto Ricans and Dominicans share with African Americans?" Concurrently, students will explore and analyze popular Latin Caribbean dance movements, music, bilingual poetry, historical and current events to uncover the connections Puerto Ricans, Dominicans and African Americans share. To enhance the inquiry process, students will participate in a pen-pal exchange with sixth and seventh grade students at the Hon. Luís Muñoz Marín School, a predominately Latino school located in the Central East Region of the School District of Philadelphia. To culminate this unit, students will present multi-media renditions of what they learned about the connections between Latin-Caribbean and African American cultures.

(Recommended for Social Studies and Literacy, grades 6-8.)

2007.04.02
Examining Mexican Immigration Thru First Person Point-of-view, by Nicole Schubert

This unit examines the struggles Mexican immigrants have faced in the U.S., comparing the conflicts faced by migrant laborers in the early 20th century to those plaguing present-day Mexican immigrants. I am an 8th grade language arts teacher and will be using non-fiction texts as well other first-person perspective texts to teach this concept. Since Charlotte, North Carolina has seen an enormous increase in the number or Latino, specifically Mexican, immigrants during the past fifteen years it is important for my students to learn about the new face of Charlotte. Instead of teaching the strategies for reading non-fiction by using many unrelated topics, I decided to use news articles, editorials, political cartoons, first-person narratives, *corridos*, a film, short stories and a novel that address the issues surrounding Mexican immigration to the U.S. In order to teach the components of a news article, editorial and feature story I have selected six texts the students will read in order to identify the features of each as well as compare and contrast the information about important issues like border control, the 700 mile

fence, family conflicts involved with immigrating, legal versus illegal immigration, and many other issues surrounding this controversial and significant topic.

(Developed for Language Arts, grade 8; recommended for Language Arts, grades 7-8, and English, grades 9-10)

2007.04.03
Context Clues: The Appropriation of Malinche and the Virgin of Guadalupe, by Sara Thomas

As an urban teacher I have had to find ways incorporate reading and writing across the disciplines within my art curriculum. I have decided to do this through art analysis, followed later by art creation. Students will be looking at icons, analyzing them, placing them in context, determining how context changes the analysis, and then creating their own icon within a specific context. First I will show students a set of images of the Virgin of Guadalupe focusing on analysis, supporting their interpretation with information from the artwork. The second set of images we view will be of Malinche and we will focus on the importance of understanding context. I will use these two different Mexican icons whom artists have represented in a variety of different ways, to teach students these skills. As a culminating activity I would like students to choose an icon that is interesting to them, and then choose a context in which they would like to appropriate that icon. They will need to determine how they would like the viewer to see that icon differently, and what symbols they are going to use to express that idea, using the examples we have viewed as an inspiration for process.

(Developed for AP Art, grades 11-12, and Introduction to Art, grades 9-10; recommended for AP Art, grades 11-12, and Introduction to Art, grades 9-10)

2007.04.04
I Know You Are, but What Am I? A Latino Literature Unit, by Raymond Theilacker

This curriculum unit immerses students in several genres of Latino literature with the dual purposes of exposing eleventh or twelfth grade students to a selection of Latino literature, and of raising multicultural awareness and appreciation. The goal is to feature Latino issues in the literature so that Latino students enjoy familiar models, while non-Latino students gain cultural knowledge and appreciation. Students work in groups with self-described immigrant characteristics which they have detailed in an identity profile; then they respond to the reading and film assignments according to these profiles. There is accompanying study of literary devices, while students learn to create identity profiles based on their invented immigration status, in a sustained role-playing activity.

Implementation of the unit spans a 5 to 7 day period in a block schedule, but is fully adaptable to a school year structured in two semesters, spanning a 2 to 3 week period, on a standard forty-minute class schedule. The lessons are designed for collaborative teamwork, and for direct instruction toward literary analysis and personal expressive writing. By the conclusion of the unit, students have information from the reading, and from periodic journaling activities that enable them to respond to a personal essay prompt. The personal essay serves as the summative assessment in this unit.

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

2007.04.05
Latino Children's Folk Music: A Series of Thematic Writing Exercises, by Yvette Carter

As a music educator for pre-Kindergarten through fifth grade, I value the study of music and the opportunities it provides for subject integration. I teach music in a way that embodies the beginning studies of the elements of music and includes interdisciplinary experiences with mathematics, history, science, reading, visual arts, and writing. Consciously or unconsciously, music is usually taught in a way that includes reading song lyrics, using mathematical skills in assigning and counting note values, and exploring the science of vocal and instrumental sounds through the study of vibrations. As a result, students are able to experience music in a variety of ways. My goal is to teach a unit that will use "chocolate" as a motivational theme for writing, a task that is not often favorably approached by elementary students. My theme is inspired by the Latino folk song, "Bate, Bate Chocolate." This song serves as the core of my unit.

Music is a language with universal appeal. It can be written down or passed from one person to another. As songs and chants move orally from one generation to another, they often carry with them cultural traditions and customs. "Bate, Bate Chocolate" embodies a rich cultural history that includes both the historical significance of the Aztec Empire and the history of chocolate. These nuances allow for the integration of both history and writing with music.

I have attempted to address not only the needs of music teachers, but also the needs of second through fifth grade classroom teachers by designing this unit in a way that can be adapted to explore exciting, age-appropriate themes for writing within any subject area. Teachers can select themes from sources within their areas of expertise and create the desire for writing that students seek.

(Developed for General Music and Music, grade 5; recommended for General Music, Music, English, and Writing, grade 5)

2007.04.06
La voz y la vida: Literacy and Identity in Young Latino Immigrant Students, by Paulina Salvador

Recent immigration from Mexico and Central America has profoundly changed the cultural landscape of the United States. My fifth grade bilingual classroom is a microcosm of the Latino immigrant community residing in Santa Fe, New Mexico. My students represent the social, political, economic and educational needs of this burgeoning Latino immigrant community which is largely concentrated in one area of the city. This nine-week curricular unit explores best practices for literacy development, incorporating progressive teaching strategies for English language learners. It also aims to create a learning environment that is challenging and culturally inclusive. Throughout the teaching-learning process students will have several opportunities to interact with literature and reflect on their ethnic and bicultural identities. Memoirs, narratives, poetry, and oral histories of immigrant Latinos are incorporated to reveal the parallels that the students may find with their own experiences. Students will also consider the history of immigration, in general, and of Latinos in the United States. As culminating writing activities, students will write an oral history of a recent immigrant whom they know well. Using the oral history as a primary source, they will create an illustrated third person memoir picture book.

(Developed for Elementary Bilingual Education, grade 5; recommended for Elementary and Middle School grades 5-8)

2007.04.07
Cuéntame Una Historia, Por Favor! (Tell Me A Story, Please!), by Kathy Zimbaldi

This unit is written with the transitional ESL student in mind. While the target group is at 4th grade level, it is flexible enough to be used with various ages of ELL's who are transitioning to total English instruction .Its goal is broad and inclusive; each activity is designed to promote English language skills in the four language arts strands of reading, writing, listening and speaking. In this unit, I chose to introduce my students to the 3 Caribbean islands of Cuba, The Dominican Republic, and Puerto Rico through the reading of the folktales common to each island. While my primary goal was language acquisition, my secondary goal was cultural. My students, all of Mexican extraction, lack information about Hispanic people with whom they share a mother tongue. Because these islands together account for the largest number after Mexico) of migrants in the U.S., I hope to broaden their perspectives about the Hispanic /American immigrant experience and increase their understanding of the Latino presence in the U.S.

(Developed for ESL Transitional, grade 4; recommended for ESL Transitional, grades 4-6)

V. Renewable Energy

Introduction

With concerns about the impact on the environment of our current use of fossil fuels and our national energy security, renewable 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 renewable energy. The aim for this seminar was to discuss the science related to current sources of energy and potential future sources of energy, with a focus on renewable 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 renewable energy.

The book by David Walker entitled "Energy, Plants and Man" was used as the primary text for the seminar. A special issue of *Scientific American* on "Energy's Future Beyond Carbon" (September 2006) served as a supplementary "text". The first week of the seminar focused on photosynthesis. The seminar began with a discussion of how plants use light to convert carbon dioxide and water into sugar and oxygen gas. This was followed by 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 diffractions glasses and a spectrophotometer aided these discussions. Plant pigments were discussed next, together with demonstrations on light absorption/emission by pigments extracted from plants and algae, and on pigment separation by using paper chromatography. The process of carbon fixation was discussed and was "photographically" illustrated by making starch pictures on geranium leaves (although this demonstration was not as successful as I had hoped). In the second week of the seminar, we delved into various forms of energy, including wind, geothermal, solar, and nuclear. A highlight of the week was the production of biodiesel fuel from cooking oil that culminated in the combustion of biodiesel fuel in an oil furnace burner. The seminar ended with 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 children can read, textbooks that the teachers can use, demonstration sourcebooks, suppliers of equipment, useful computer software, and addresses of sites on the world wide web. Several of the Fellows developed units around a theme or activity related to photosynthesis, including a remarkable 3D model-based unit on the fundamental processes of photosynthesis. Other units are related to sources of renewable energy for the future, such as wind and solar energy, as well as the impact of our energy use on the planet Earth. The units include a number of excellent activities that will engage the students' interest and teach them about renewable energy.

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 "Renewable Energy" into the classroom.

Gary Brudvig

Synopses of the Curriculum Units

2007.05.01
Petroleum: Our Best Transportation Option?, by Justin Benz

This is a unit designed for a high school environmental technology program. This unit explores the carbon cycle almost in a "cradle to grave" sense, starting with plants fixing carbon using solar radiation during the process of photosynthesis, tracking inputs from anthropogenic sources (most notably transportation), exploring the global fluxes of carbon and cycling into the carbon sinks and quantifying how carbon is sequestered by our oceans and our terrestrial systems. Students research alternatives to current transportation fuels to determine the best options for transportation in order to lower the carbon output of our transportation sector. Students gain field experience when they run biometry measurements on local woodland and then calculate the amount of carbon the woodland can sequester. Students use molecular models to understand hydrocarbons and the chemistry of the products made out of them as well as the process of combustion. Using the new knowledge gained from the unit, the students gain an appreciation for conserving our petroleum resource as feed stock for products instead of burning it all as a fuel.

(Developed for Environmental Landscape Technology, grade 10; recommended for Environmental Science, Agriscience, and Natural Resources, grades 9-12)

2007.05.02
Solar energy: Using Carbon Dioxide from the Atmosphere to Produce a Viable Fuel Source, by Emily Betts

In the time of dire predictions about climate change, there are questions we must ask about renewable technologies. Which technology can shift our carbon-based economy to one that reduces carbon dioxide in the environment? How will we meet energy demands, and do we actually have the technology to do so? Teaching students about renewable energy is crucial to help them understand the potential and reality of these energies in their lives.

Solar energy may hold the greatest potential for replacing fossil fuels as our primary energy source, since enough energy from the sun strikes the Earth in one hour to supply all the energy consumed by humans in one year. My curriculum unit focuses on the biological sources of solar energy including biomass, which incorporates solar energy through photosynthesis and is then burned or converted into fuel. While biomass is a renewable technology, use of biomass is not always a benefit to the environment. Combustion of biomass does release carbon dioxide, and the growing and transport of biomass is also a emissions concern.

Students need to have knowledge and experience with the new renewable technologies so that they will be more likely to incorporate viable technologies into their lives.

(Developed for Biology, grades 9-10, and Environmental Science, grades 9-12; recommended for Life Science and Environmental Science, grades 6-8, and Earth Science and Biology, grades 9-12)

2007.05.03
Environmentalists and Chemists Unite: A Chemistry Class for our Changing World, by Cherisse Campbell

When taken out of context, the standard high school chemistry curriculum can be seen as an obscure chain of unrelated factoids. This curriculum unit will address several standards-based curriculum components by situating them within the context of a topic that has been receiving significant attention in the popular media, the need for alternative energy sources. The unit has four parts, each offering a method of addressing traditional chemistry content through engaging connections and activities. Although the theme of the unit is centered on alternative energy sources, it is intended to address content required in the chemistry curriculum, including atomic inventory, classification of matter, balancing equations, naming covalent compounds, moles, stoichiometry and heat capacity. This will be accomplished through the use of literature and lab experiments such as the synthesis of biodiesel. The lessons presented in this unit are not intended to serve as the sole reinforcement for the chemistry content covered, but to serve as a unifying theme throughout a course that is commonly characterized by content that appears unrelated and irrelevant to students.

(Developed for Chemistry, grade 11; recommended for Chemistry, High School grades)

2007.05.04
Catch the Wind, by Jeffrey Davis

This curriculum unit teaches students about their responsibility and potential as stewards of the Earth via a study of renewable energy with an emphasis on wind power.

The unit is written for a fifth/sixth grade class and can be modified to use in younger or older students. Though addressing local issues in New Mexico, environmental concerns in any region can be addressed though the methods in this unit.

The unit is conceived as a longitudinal project with most of it being completed in one quarter and some parts extending throughout the year. There are three major sections that overlap during the unit. Students will learn about energy, global warming, and renewable energy (emphasis on wind power), culminating in the construction of a wind turbine model. Student learning about energy issues and debate will underpin the second major

part—presenting a case to waive county height restrictions for the construction wind turbine on the school campus. The third part of the unit concerns the weather and will continue throughout the year. Students will learn the fundamentals of weather and weather forecasting (e.g., patterns, fronts). Students will track and report the weather to the school each morning.

(Developed for Science and Social Studies, grade 5; recommended for Science, grades 5-7)

2007.05.05
Stylin' Your Ride: A Student's Guide to Designing Green Vehicles, by Jennifer Esty

This unit is designed to introduce students to various sources of energy for vehicles. It will explore the technology currently available for vehicular transportation and the technologies that are being developed for future use in vehicles.

The unit is written for a ninth grade integrated science (sometimes called Phy/Chem) class. In our school system, that means that we cover primarily physical sciences in this class. This unit is intended to address three of the science standards we are supposed to cover: the use of fossil fuels and other technologies in the generation of electricity, the chemistry of hydrocarbon combustion, and the environmental impact of human transportation choices.

This unit is broken into three major sections. In the first section, past and current, commonly available transportation technology options are discussed. The second section looks to the future where transportation technologies that are being developed and perfected today are discussed. The final section of this unit is the project that the students will produce based on the information presented in the first two sections of this unit.

(Developed for General Science, grade 9; recommended for General Science, grade 9, and Environmental Science, High School grades)

2007.05.06
The Power of the Sun, by Danielle Gothie

The curriculum unit, "The Power of the Sun" is designed to be taught to sixth grade students during their science period. The focus of the unit is on solar energy and covers elements of Earth and Space Science, Life science, and Physical science. This unit is designed to provide students will a broad understanding of global warming and the need for alternative and renewable energy production. A majority of the activities in this unit are investigative and hands-on. The primary focus of the investigations will be for the students to understand processes of scientific investigations and use inquiry and scientific methods to develop questions, design and conduct experiments using appropriate

technologies. The culminating activity will be the design and construction of a model solar car.

(Developed for Science, grade 6; recommended for Science, grades 5-7)

2007.05.07
Solar Energy -- Architectural Alternatives for Home Building, by Georgia Redonet

"The will to act—that's a renewable resource—let's do it."

Al Gore, February 25, 2007

Former vice president, Al Gore, made the above statement when accepting an Academy Award for his documentary *An Inconvenient Truth*. It is a point well taken. Humans posses the energy and ability to affect change and that energy is a limitless renewable resource. Whether our ideas are big or small, they can all add up to a change in how we live that can improve the world in which we live. The issue of global warming bypasses any questions as to how much petroleum energy is left for the world to use. CO2 emissions must be reduced and every individual can play a role in that reduction. This curriculum unit will focus on architectural alternatives in home construction using solar energy. Our studies will culminate with a look at Earthships. These homes present what appears to be the most all-inclusive use of alternative applications using solar energy. The main purpose of this unit is to use architecture to introduce my students to the topic of renewable and alternative energy, which is quickly becoming a part of our mainstream dialogue.

(Developed for Texas History, grade 7; recommended for Science and History, grades K-12, and Architecture, Construction, and Engineering, High School Grades)

2007.05.08
Modeling Photosynthesis, by Connie Wood

The main goal of this unit is to create a way to teach a rather complex process—photosynthesis—using a three-dimensional approach that provides students with a concrete way of understanding this very difficult topic. This unit was designed with upper level Biology classes, like Advanced Placement and International Baccalaureate, in mind. Even these students have difficulty understanding things that happen at the molecular level. Included in this unit is a summary of the most current information we have about photosynthesis. Using this information, I have put together instructions for building and using a model of a chloroplast, to teach, and to help students make connections between the molecular process and what they are observing in the lab. There are also activities that help students enter into the molecular realm of photosynthesis through role-playing. Once they can visualize the invisible, students will have a better basis for the formation of

hypotheses and conclusions in inquiry labs. Based on the model and role-playing, students could then develop their own simple models for demonstrating the variations in photosynthesis by C4 and CAM plants.

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

VI. Keeping the Meaning in Mathematics: The Craft of Word Problems

Introduction

Symbolic notation is an important source of power for mathematics. This specialized writing system compresses large amounts of information into compact, easily manipulated form. For the knowledgeable user, this notation is a versatile problem solving tool. However, from the educational point of view, this power does not come for free: teachers must work hard to help students keep the symbolism invested with meaning. If a student cannot interpret and work with the symbols in meaningful ways, his only option is to try to manipulate them according to formal rules. Frequently the rules become too complex to cope with, and the student completely loses touch with mathematics.

Word problems can help students stay in touch. Dealing with a word problem requires translating its verbal statements into symbolic ones, manipulating the symbols to solve equations, then translating back to answer the question posed in the problem. This process requires students to assign meaning to symbols, thereby keeping students tied to mathematics. Thus, word problems should not be thought of as a separate topic in the curriculum. They have a central role to play in mathematics education.

From this point of view, the avoidance of word problems so common in our math instruction is a prime symptom of the deficits of mathematics education in the U.S.

The seminar on *The Art and Craft of Word Problems* was devoted to remedying this deficit, at least in the classrooms of the seminar Fellows. Each fellow has written a curriculum unit centered around word problems. Word problems are not simply a prominent feature in these units, they are dealt with in a systematic way intended to give students an overall understanding of how to approach word problems in the relevant subject area. More broadly, the goal is to instill a habit of careful reading and interpretation.

George Polya, in his often cited writings on problem solving, listed four key steps for dealing with any problem:

Understand the problem.
Make a plan.
Carry out the plan.
Look back.

Of these steps, the first is by far the most important. Students who learn to read mathematics words problems and interpret them carefully develop skills that will help them in all mathematics courses, and far beyond mathematics.

The most frequently proffered advice for understanding word problems is to learn the vocabulary. Each mathematical operation has a variety of words or phrases which invoke it; addition is suggested by "in all", "all together', "sum", "more than", "added to'" and so forth. The sound advice to know the words involved in problem statements is unfortunately frequently taken to extremes, resulting in the "key word" approach: decide what operation to perform by identifying a word associated to one of the operations. However, this approach has serious shortcomings. It is easy to write word problems with a phrase such as "more than," or "the sum of", but which require subtraction for their solution. There is no substitute for careful reading and understanding. Particularly with multistep problems, ability to read and understand and translate into mathematics is essential, since the proliferation of possible problem types easily outstrips efforts at classification. Unfortunately, the national aversion to word problems severely curtails the extent and variety of multistep problems our students see, thereby limiting their experience and ability in applying mathematics.

The units prepared for this seminar promote understanding word problems, not only one by one, but through comparison. Because they will see and compare a variety of word problems, students will get a feel for the kinds of issues that can arise, and for some possible responses. The phrase used in the seminar for this comparative study was "exploring the problem territory". As students work on the problems assembled for these units, they should also gain some familiarity with the problem territory, and, hopefully, will feel somewhat more at home in it.

The grade levels taught by seminar fellows ranged from primary to high school. Accordingly, their seminar units cover a range of topics. At the primary level, the units by Tanya Shannon, Huwerl Thornton and Nancy Wasser deal with addition and subtraction. All these units ensure variety in their problems by drawing on the taxonomy developed by T. Carpenter et al, in the book {\it Children's Mathematics} This book makes the point that, although addition problems tend to be relatively easy for children to conceptualize, the operation of subtraction has many faces, some of which are much harder for children to deal with than others. The standard "take away" scenario is the simplest to deal with. If students are presented only with take away problems, they will not develop a robust concept of how subtraction gets used. These units will ensure a wider experience with the subtraction operation.

In addition to their common reliance on the Carpenter et al. taxonomy, the units have further individual foci. Tanya Shannon has varied the complexity of the numbers in her problems, and sometimes expresses them in numerals, and sometimes with words.

Huwerl Thornton has adapted strategies originally devised to teach reading for use with his word problems. Nancy Wasser has created a bilingual set of problems, and has incorporated problems to help students grasp the structure of the decimal place value system for writing numbers.

At a slightly higher grade level, Valerie Schwartz has developed a suite of problems designed to take students from single step problems to multistep problems incorporating both addition/subtraction and multiplication/division. Her unit also undertakes to teach the use of Singapore bar models. This highly effective method for representing problems graphically enables elementary students to solve many problems that in the U.S. are considered part of algebra.

Karlene McGowen takes a language arts perspective in her unit. She seeks to approach mathematics word problems in a multidisciplinary way, by using story books and a "problem of the week" theme to get students to analyze the language in word problems in greater depth than standard instruction affords.

Moving beyond elementary school, Jill Smith's unit treats the issue of proportion in several important settings, including the analysis of unit rates, the geometric topic of scaling, and the use of percents. Moses Jackson focuses on percents, and investigates a range of problems using the "three piece percent formula". He shows how to apply this formula in a wide variety of settings. Angel Johnson has created a unit to introduce her students to algebraic notation. She develops parallel lessons, first treating numerical expressions of several levels of complexity, and then progressing through the same stages with symbolic expressions. Part of the work of this unit is for students to translate words into expressions and expressions into words - to be able to read expressions. This makes explicit the task that is implicit in standard word problems, and provides extra practice with this important skill.

The topic featured in the units of Patricia Marasco, Paula Shaffer-Roche and Tyler Willoughby is linear equations, in one or two variables. Each of these units deals with several types of problems and works to help students see the similarities and differences between the types. The problems vary in complexity, from problems that could be dealt with readily by standard arithmetic methods to problems that require the full apparatus of elimination. Paula Shaffer-Roche has paid particular attention to this progression of complexity. She discusses a technique, known as *false position*, that enables students to approach many varieties of problems, including mixture problems, interest rate problems and combined sales problems, using arithmetic reasoning. Each writer has an individual approach to the subject. This gives the reader a three-fold opportunity to enrich his/her own ideas about motivating this topic and the possibility of further enrichment through comparing the units.

The most advanced topic treated in these units is quadratic equations, the theme of Nancy Rudolph's contribution. She has assembled a substantial collection of problems based on quadratic equations. They deal with projectile motion and several aspects of geometry. She includes problems to advance her laudable "personal mission" of having students understand the important topic of the behavior of area under scaling. Her problems deal both with direct issues - evaluating, finding roots and finding extrema of various quadratic functions - and with inverse issues - finding a quadratic function satisfying specified conditions. The variety of the problems she presents should help her readers explore the problem territory of this key topic in algebra.

Roger Howe

Synopses of the Curriculum Units

2007.06.01
Teaching Addition and Subtraction Word Problems to Children, by Tanya Shannon

Many students have difficulties when attempting to solve word problems. Many reasons are given for the students' lack of success in word problems. These reasons include students' lack of exposure to life outside of television and their neighborhoods, minimal reading skills, and difficulty in comprehension skills. I do not dispute these reasons for students' failure, but I propose that there is a way to ensure that problem solving permeates the mathematics classroom while simultaneously maintaining student interest. This unit will help teachers that are looking to implement strategies that will change the way that students read and understand addition and subtraction word problems. Additionally, it will help teachers to learn the various methods that they can use in order to develop meaningful word problems for all of their students. Although it was written for second grade, these strategies and accompanying appendix of word problems are adaptable for grades one through four.

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

2007.06.02
Crafting Word Problems Even a Child Can Do, by Huwerl Thornton, Jr.

This unit covers the structure of addition and subtraction math word problems. It analyzes the different ways that addition and subtraction word problems can be created. The unit looks at how word problems strike fear in the hearts of many people and how teachers can help their students to develop ways to attack word problems. This in turn will hopefully help students develop a love for word problems. More importantly, the unit helps teachers realize that the creation of word problems is something that should be done with great care and should be created with a specific objective to be taught.

The second part of the unit looks at how to use reading strategies to help students solve word problems. It explores the use of making connections, asking questions, visualization, determining importance, inferring and predicting, and synthesizing. The unit focuses on a modified KWL chart called KWC. The KWC and using reading strategies to help solve word problems comes from Arthur Hyde's book Comprehending Math: Adapting Reading Strategies to Teach Mathematics, K-6. The lessons in the unit are about teaching the KWC to the class to use as a strategy and tool to solve word problems.

2007.06.03
A = C - B: Subtraction is the Cousin of Addition, by Nancy Wasser

This unit explores the process of subtraction through the study of word problems. It begins by providing a presentation of the decimal number system and base-ten operations as a scaffolding to support cognitive understanding of subtraction as the inverse process of addition. It teaches *composing* and *decomposing* of tens as opposed to the more traditional method of carrying and borrowing. It presents lessons treating various subtraction situations including: take-away, difference, and comparison and part-whole relations, especially missing addend problems. Students learn to identify key elements of problems, formulate conjectures and work in groups to problem solve. Lessons teach students to identify the unknown in a word problem. They also teach subtracting across zeroes and present mental math techniques.

The unit is written for a fourth grade bilingual English/Spanish class, therefore the word problems are in one or the other language; however, it could easily be adapted for a monolingual English fourth grade class. Taxonomies are included which provide useful nomenclature and methodologies for problem solving. An appendix of word problems, in English and Spanish, is provided as well, along with an annotated bibliography.

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

2007.06.04
Word Problems in Picture Books: Literature as a Source of Math Word Problems, by Karlene McGowen

This curriculum unit will look at math word problems from a language arts point of view. Many times students are able to do the math computation but get stumped by the wording in the problem. This unit can show them how to read the problem the same way they might read a novel or a non-fiction passage, they will then have greater success at solving the word problem correctly.

The unit is divided into two sections; however these two sections are designed to be used together. The first section involves the use of math picture books. Look at these picture story books as one giant word problem. By beginning with these books we can show the students that a word problem is simply a story that involves math. The second section of the unit involves the collaboration of efforts between the Language Arts teachers and the Math teachers. Call it Word Problem(s) of the Week. The students will receive a word problem on Monday or day one. The students take the problem to the Reading teacher, English teacher and then Math teacher over the course of a couple of days. Each teacher helps the students with a different aspect of reading and solving the problem. In merging these two sections, it would be ideal to use the word problems created specifically for the

picture books as problems of the week. Although the unit utilizes picture books, the word problems are leveled for middle school students.

(Developed for Reading, grade 8; recommended for Mathematics, Reading, and English, grades 6-8)

2007.06.05
Dr. Word Problem - Solving Word Problems with the Four Operations Using Singapore Bar Models, by Valerie Schwarz

Dr. Word Problem is a unit designed to examine the structure of word problems involving the four operations of arithmetic. This unit focuses on teaching a strategy that is a visual approach to solving word problems. The students will be exposed to Singapore bar models as a technique to aid in understanding and solving problems. Students are taught how to represent word problems by drawing a Singapore bar model. The unit explores the bar models beginning with basic addition facts. The unit progresses to subtraction, multiplication, division, and multi-step problems. A key aspect of this unit is connecting the four operations. By developing children's understanding of the relationships that the four operations share, children will also build a stronger foundation that will invaluable, especially as the multi-step problem domain is investigated. The unit also addresses common pitfalls and limited strategies to problem solving. Dr. Word Problem aspires to overcome these pitfalls by developing arithmetical understanding. This unit can also be adapted to work with word problems dealing with fractions and decimals. The models can also be used to solve algebra problems without using algebra.

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

2007.06.06
Percents in Real Life Situations, by Moses Jackson

This unit, Percent in Real Life Situations, uses the concepts of percents to teach 9th grade students of the School District of Philadelphia how to solve word problems. It presents a template that can be used to translate percent word problems, in all forms, into mathematical sentences.

The unit is intended to be taught in four weeks with a focus on how to help students analyze open ended questions and Critical Response Problems (CRP) that are usually a component of regular Standardized State Tests. The template deals with a manipulation of the statement, "percent times whole equals part". Hopefully, math teachers will find this unit helpful as an added resource for their classrooms and lesson plans.

(Developed for Mathematics, grade 9; recommended for Mathematics and World Problems, grades 9-10)

2007.06.07
Linear Expressions and Evaluations, by Angel Johnson

As we continue to use mathematics as a tool to model physical or real world phenomena, more complex situations will be represented by word problems. As a global society, educators and students must become extremely comfortable in incorporating, using, and solving word problems. This three-week unit is designed to introduce Algebra 9th grade students to the language of mathematics and show them how to model situations symbolically—known as concise representation. The unit develops algebraic concepts through the use of everyday arithmetic situations. Students learn that, through the rules of addition, subtraction, multiplication and division, and procedures for finding the unknown values, they can systematically translate concrete situations into algebraic expressions and manipulate and evaluate those expressions to arrive at a solution. Specifically, students learn what expressions say, and how to translate back and forth between verbal formulations and symbolic ones. Students will develop notational representation (numerical and algebraic), simplify expressions, and apply these skills for reinforcement. Students will also have an opportunity to review, identify and apply the associative, commutative, distributive, and identity properties. Some relevant vocabulary words are: additive identity, algebraic expression, associative property, coefficient, commutative property, distributive property, factors, like terms, multiplicative identity, order of operations, product, and variables.

(Developed for Algebra I, grade 9; recommended for Algebra I, grade 9)

2007.06.08
The Art of Solving Word Problems by Using Proportions, by Jill Smith

The Art of Solving Word Problems by Using Proportions focuses on the struggles that multi-level students face preparing to correctly solve a word problem. In the North Carolina curriculum, a major objective in seventh grade math is solving problems by using proportions. In this unit, my main focus is on word problems that involve unit rates, percents and similar figures/models. Most students at varying levels struggle with setting up a proportion when given a word problem. Students tend to have the knowledge to solve proportions by cross multiplying, but their application is sometimes faulty. This unit assists this issue by breaking down the problems into different difficulty levels and subject matter. Included in the unit, there are also lessons, activities and sample problems that involve real life situations to help students further grasp the concept. It also emphasizes repetition of the basics by completing several problems that contain the same scenario yet have a changing variable. The unit I have written will give students a better understanding and higher confidence level of a major objective and help them to be more successful.

(Developed for Mathematics, grade 7; recommended for Mathematics Proportions and Science Proportions, grade 7)

2007.06.09
Word Problems: Looking for the Similarities in Problems to Help Categorize and Solve Them, by Patricia Marasco

This unit is written for freshman, ages 13/14. The purpose of this unit is to supply students with the basic tools and ideas they will need to begin their study of linear equations. I will help students go from simple to more complex problems by having them recognize the similarities and differences between problems. I believe that once a student can recognize and categorize the given problems, they will then feel confident enough to attempt to solve these and the more complex problems we will study later in the year. This is just another way of saying we are going to categorize or group problems. It is important for students to recognize what red flags there are in each problem that categorizes a problem as such, by identifying the subtle differences or similarities. I will also spend some time going over the language of word problems. I believe that there is a tendency of teachers not to explain key conventions and assumptions. I have found that going over the language is beneficial for two reasons. The first reason is that it clarifies the meaning of the terms. The second reason is that it sends a message to the students that it is OK to ask if they don't understand. How can they answer the question if they don't know what they are being asked? This unit is designed to help my students recognize various problems and use several different tools to derive an answer that makes sense. In addition, I hope to add some fun to their math experience.

(Developed for Algebra I, grade 9; recommended for Algebra I, grade 9)

2007.06.10
Assisting the Transition from English to Mathematical Language, by Paula Shaffer-Roche

This unit maintains a focus on various strategies and approaches to implementing word problems. For example, the lessons utilize mental math and tables to help aid to the mathematical thinking involved in problem solving. Furthermore, the lessons emphasize starting with simple mathematical language, then completing more complex problems. The goal is to build a strong problem solving foundation. The lessons are built around the idea that math is similar to learning a foreign language. Hence, students have to be prepared to handle mathematics with the idea in mind that with more exposure the language becomes much easier to translate. The unit seeks to illustrate methods that help address the difficulties that mathematical language presents to students. Classroom activities will analyze meaning in word problems in order to arrive at the correct answer. My goal for this unit is to have students be able to attack word problems without fear and

frustration. I hope the strategies explored here inspire educators to analyze word problems with their students more easily and effectively.

(Developed for Algebra I, grade 9; recommended for Algebra I, grade 9)

2007.06.11
Applying System of Equations to Real-World Scenarios: A Practical Curriculum, by Tyler Willoughby

Word problems are a problem. The objective for this curriculum unit is to show students the multiple ways that system of equations can be used to solve real-world problems. In order for students to be engaged and interested in learning, they need to see the real-world practicality behind the math concept being learned. Without a lot of practice, System of Equations can be difficult for students to compute correctly and efficiently. Therefore, in order to capture the attention and interest of our students, I will first identify a variety of system of equations and then explain how to solve each using three different methods. Utilizing the substitution method, addition/subtraction elimination and multiplication/elimination methods, we will review how to solve a system of equations.

Then I will combine the distance (d = rt) and interest (I = prt) formulas together with a system of equations and demonstrate how to solve real-world scenarios and exciting problems. I will also provide practical examples to problems involving wind and water currents, chemistry problems involving mixtures and solutions, more interest problems involving the time value of money, and other practical examples that involve systems of equations.

(Developed for Algebra, grade 8; recommended for Algebra, grades 8-10, and Algebra II, grades 10-12)

2007.06.12
Quadratic Equations in Word Problems Students Can Relate To, by Nancy Rudolph

This unit is based on a collection of quadratic word problems that are intended to be relevant to teenagers, and are organized differently from traditional math textbooks. Progressing through the problems, students' quadratic-solving skills should improve, and they should gain a better understanding of how each small change affects the solution and/or the choice of solution method. The unit begins with projectile motion problems that relate to sports since most teenagers can relate to them, and because the parabolic path of objects in flight, as a function of time, is visually represented by the graph of the quadratic function. They move on to geometry problems where they will gain much-needed practice in setting up and solving area and volume equations based on information given in word problems. And finally, they study the effects of dilations

(changes in scale factor) on area. While the dilation problems are written specifically for vocational students, many of them address interests of typical high school students. The unit assumes students are able to find x-intercepts and coordinates of the vertex of a quadratic function by factoring, using the Quadratic Formula, or examining a graph or table on a graphing calculator.

(Developed for Integrated Math III, grades 10-11; recommended for Algebra I and Algebra II, grades 9-12)

VII. The Science and Technology of Space

Introduction

The title of this seminar was sufficiently broad to encompass topics ranging from Astronomy, to Astrophysics, Solar System, Physics, Mathematics, History of Space Exploration, to Life in the Universe. The curriculum units developed reflected such a variety of topics, as well as a variety of grade levels targeted.

The unifying thread of each curriculum unit was that Space played a role in the advances of the topics addressed. For example, two of the units address the topic of the origin of the chemical elements following vastly different teaching techniques. Although the primary relevant field is Nuclear Astrophysics, the space program was critical in separating the role of primordial nucleosynthesis from that of stellar nucleosynthesis in building up the elements found in the Universe. Similarly, many of the basic properties of the objects in the Solar System, addressed by several curriculum units, were only established with the help of space probes. Also, the search for life outside planet Earth, currently apparently dominated by radio astronomy, does in fact rely fundamentally on the space program, both for the in-situ search for primitive living organisms within the Solar System, as well as for the search of Earth-like planets around stars within our galactic neighborhood. Finally, many of the basic principles of Mechanics can be illustrated by events and devices used in the space program, such as micro-gravity, the rocket effect, etc.

To evaluate the objectives and topics of each curriculum unit and assess its relevance to your own teaching, it is necessary to examine the synopsis of each unit individually. There you will find sufficient information to address the level of the targeted students, as well as the key elements of local and/or national standards that the unit addresses.

It has been a prevalent feeling of most Fellows of this seminar that astronomical and space topics are great motivators for students who do not typically see the relevance of Physics, Mathematics, Chemistry or other sciences to their own lives. In these units you see one or more of these sciences at work, demonstrating that they are not merely abstract manipulations without a point. This compendium of units, as well as those corresponding to similar seminars, should assist science teachers to convey to their students why the effort required to master these subjects is a worthwhile undertaking.

Sabatino Sofia

Synopses of Curriculum Units

2007.07.01
The Origin of the Elements, by Stuart Surrey

In general, most high school chemistry courses around the country teach students about the elements from an organizational point of view. That is, the elements are taught in conjunction with the development of the periodic table. Students learn about the arrangement of the elements based on increasing atomic numbers, similar chemical and physical properties, as well as trends within the periodic table. Whereas most high school chemistry textbooks briefly mention the occurrence and/or abundance of specific elements on Earth or in the atmosphere, they rarely give any insight into the actual origin of the elements. Therefore, the aim of this curriculum unit is to present the students with a basic understanding of how and where the elements were formed prior to discussing the periodic table. This will include current information on Big Bang or primordial, stellar, and supernova nucleosynthsis. In doing so, the students will study the history of the Big Bang theory and stellar evolution as a means of understanding the origin of the elements as well as stimulating interest in astronomy and cosmology.

(Developed for Chemistry, grade 11; recommended for Chemistry, grade 11)

2007.07.02
Beyond The Atom: Interpreting the Origin of the Elements, by Ram Bhagat

Beyond the Atom: Interpreting the Origin of the Elements is an imaginative approach to teach students about the birth of matter. In technical terms, this approach combines the principles of Aesthetic Education, Science Education, Emotional Intelligence and Multicultural Education. Put simply, this method integrates the Performing Arts—specifically Drumming, Dance, and Drama—into the Chemistry curriculum. Beyond the Atom is an interdisciplinary unit with an emphasis on Reading Across the Curriculum. Consequently, students will read Charles A. Cerami's biography on Benjamin Banneker and interpret the impact of African Astronomy on contemporary American society through dance. In addition, Beyond the Atom addresses the issue of "Science Literacy" in the United States. My overall goal is to motivate urban minority youth, especially African American male adolescents (AAma), to develop creative problem-solving skills and enhance their intellectual, social and emotional abilities. The federal imperative to "Leave No Child Behind" combined with mandatory End-of-Course testing on the state level places AAma at a tremendous risk for poor academic and social performance. This unit recommends an African-centered pedagogy to address these disparities. Researchers have found that infusing Arts Education across the curriculum in an urban setting enhances the learning experience of all students.

(Developed for Chemistry, Atomic Structure and Periodic Table, grades 10-12; recommended for Chemistry, Atomic Structure and Periodic Table, grades 9-12)

2007.07.03
Are We Alone?, by Eric Laurenson

"Are we Alone in the Universe?" This question has been pondered for much of human history, but scientific, technological advances in Astronomy have added a tremendous amount of data to the discussion. Ever since the famous Drake equation was proposed in 1965, scientists have attempted to predict the likelihood of intelligent extraterrestrial life. It is my goal in this unit to explore the current data that exists regarding the requirements for life, the probability that such life could find a suitable existence elsewhere in the Universe and the physics required to detect it.

The debate ranges from those that claim that intelligent life is very rare to those scientists who believe that intelligent life is pervasive throughout the Universe. I will be considering the factors that are postulated to be prerequisites for life, the history of life on our planet that has resulted in our own existence and the relative significance of this fact, the scientific data that allows us to predict the probabilities of life elsewhere in the Universe and the reliability of these claims. I will be considering all of these issues in light of the physics involved in searching for extraterrestrial life. I intend to teach this unit in physics classes to explore probabilities in scientific claims. Using all of this information it is my intention to present a scientific discourse about the relative likelihood that intelligent life exists elsewhere in the Universe.

(Developed for AP Physics, grade 12, and Honors Physics and General Physics, grades 11-12; recommended for AP Physics, grade 12, and Honors Physics and General Physics, grades 11-12)

2007.07.04
The Integration of Space Technology into the Physics Classroom, by Debra Semmler

I have developed a curriculum unit that includes space science and technology as a unifying theme throughout the study of introductory physics. The purpose of the unit is two fold. First, so often the study of physics appears to be a series of mathematical manipulations with little connection to understanding how and why the Universe works, which is the true study of science. I believe the integration of space science will ignite interest and allow students to recognize that the study of physics is not just formula manipulations but has implications beyond solving the daily homework problems. The second purpose is that the students we teach will be part of the decision-making for the future, and need a basic understanding of physical principles of the Universe to make informed decisions, not only about space travel, but about energy resources and the

environment. I believe that including the science of space in my curriculum will motivate and inspire students to have a richer understanding of the concepts of physics. The unit includes problem sets, class discussions, presentations and demonstrations, and an inquiry design cycle experiment on rocket science.

(Developed for Honors Physics I, grades 10-12; recommended for Physics, grades 10-12)

2007.07.05
Traveling the Solar System through Literature, by Lori Paderewski

Third and fourth grade teachers will love this unit on Space, covering in depth, the Sun, Moon, and Earth system. Science and space exploration is constantly being improved and updated so we can get a better understanding of the areas, which are outside of Earth's realm. Just as space is huge, so is the number of concepts that need to be taught in order for students to gain a basic understanding of the topic. According to the Delaware State Science Coalition, there are two essential questions, which need to be addressed in order for the students to be able to build upon the grade four expectations. Those questions are: What predictable, observable patterns occur because of the interaction between the Earth, Moon and Sun? and How has technology expanded our knowledge of the Earth, Moon and Sun system? Both of these questions will be answered and expanded upon in this Unit. However, the Unit will also cover other basics of astronomy that will help us give a better foundation for when the students advance on to the upper grades. Therefore, the purpose for this Unit will be for students to learn about the relationships between the Earth, Moon and Sun.

(Developed for Elementary Science, grade 3; recommended for Elementary Science, grade 3)

2007.07.06
Space Illustrated: There and Back, by Barbara Natale

This unit "Space Illustrated: There and Back" will provide students in grade four with an exciting opportunity to explore the Solar System. During the lessons, students will come to the realization that Space and the technology of Space is an interesting subject, one that they may determine to be a future career. I have planned the lessons to embrace content material with several hands on activities. One, students will make a rocket ship and launch it into "Space". Students will shrink down the Planets with objects and make an imaginary Solar System on the school playground. Two, students will participate in an imaginary space trip, conduct an interview and publish a space magazine. This magazine, called "Space Illustrated" will include an interview with an astronaut and pictures. This magazine will be theirs to keep and enjoy. The class will share their magazine at Davis Street Interdistrict Magnet School's publishing party in May.

Any teacher, regular or special education, can utilize any or all of this unit, modified or used as it is written. These lessons allow teachers and students the opportunity to work together to better understand the mysteries of outer space. Fourth graders are at a very impressionable age, and maybe one of the lessons in this unit will inspire them to become an Astronaut and travel to a galaxy far, far away.

(Developed for Science, grade 4; recommended for Science, grade 4)

2007.07.07
The Science and Technology of the Apollo Space Program, by Francisca Rebullida

The science and technology of the Apollo Space Program is a curriculum unit written for second language learners in the fifth grade. The unit could be adapted for mainstreamed fifth graders too. You can integrate English as a Second Language Instruction with science/reading using the literature approach. Are you ready to travel historically to the Moon with the astronauts? I am about to take you to the Moon with the former astronauts of the manned Apollo Space Program. As we travel you will learn about the six Apollo Missions that took twelve astronauts to explore the Moon and the other six astronauts who piloted the Command Module and returned safely to Earth. We will learn how the astronauts explored the Moon and helped the scientists with their experiments of the lunar samples. The unit will provide you information on the technology that allows humans to work on the Moon's environment. We will also read about space exploration, how 400,000 people landed Apollo 11 on the Moon, and the first Hispanic woman astronaut.

You will learn how to become an astronaut, how astronauts live in space, and try space food. We will sing spacey songs, read and write out- of -this world spacey stories. To blast off, tap into students' prior knowledge such as space, weightlessness- zero *g*, microgravity, Newton' three laws and address misinformation that they may have about space. So put on your space suits, and "climb aboard" the spacecraft. Are you ready? Ten. . .nine. . . eight. . . seven. . . six. . . five. . . four. . . three. . . two. . . one. . . blast off!

(Developed for ESL and Science, grade 5; recommended for Science, grade 5)