Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2016

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Preface

In March 2016 the Yale National Initiative to strengthen teaching in public schools® accepted public school teachers from sixteen school districts in eight states and the District of Columbia to participate in six national seminars held at Yale University. The Initiative is a long-term endeavor to influence public policy on teacher professional development, in part by establishing exemplary Teachers Institutes for high-need schools in states around the country.

Teachers Institutes are educational partnerships between universities and school districts designed to strengthen teaching and learning in a community's high-poverty, high-minority public schools. Evaluations have shown that the Institute approach exemplifies the characteristics of high-quality teacher professional development, enhances teacher quality in the ways known to improve student achievement, and encourages participants to remain in teaching in their schools.

Forty of the teachers, named Yale National Fellows, are from school districts that are planning or exploring the establishment of a new Teachers Institute for the Bay Area, CA; Chicago, IL; the Diné Nation, AZ and NM; the District of Columbia; Pittsburgh, PA; Richmond, VA; San José, CA; and Tulsa, OK. Other National Fellows come from existing Teachers Institutes located in New Castle County, DE; New Haven, CT; and Philadelphia, PA. Overall, nearly two thirds of the teachers were participating as National Fellows for the first time.

The National Fellows attended an Organizational Session of the seminars held in New Haven on April 29-30. The seminars reconvened during a ten-day Intensive Session from July 11-22 and concluded in mid-August when the Fellows submitted their completed curriculum units. The six seminars were:

- "Contemporary American Indian History," led by Ned Blackhawk, Professor of History and American Studies;
- "Energy Sciences," led by Gary W. Brudvig, Professor of Chemistry;
- "Why Literature Matters," led by Janice Carlisle, Professor of English;
- "The Number Line in the Common Core," led by Roger E. Howe, Professor of Mathematics;
- " 'Over the Rainbow': Fantasy Lands, Dream Worlds, and Magic Kingdoms," led by Joseph R. Roach, Sterling Professor of English and Professor of African American Studies, of American Studies, and of Theater Studies; and
- "Making Sense of Evolution," led by Paul E. Turner, Professor of Ecology and Evolutionary Biology.

The purposes of the program are to provide public school teachers deeper knowledge of the subjects they teach and first-hand experience with the Teachers Institute approach. This heightens their leadership in an existing Teachers Institute or prepares them to lead the development of a new Teachers Institute. Each teacher writes a curriculum unit to teach his or her students about the seminar subject and to share with other teachers in their school district and, over the Internet, with teachers anywhere. The curriculum units contain five elements: content objectives, teaching strategies, examples of classroom activities, lists of resources for teachers and students, and an appendix on the district academic standards the unit implements. In these ways the curriculum units assist teachers in engaging and educating the students in their school courses.

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

The Yale-New Haven Teachers Institute® is a permanently endowed unit of Yale University, which undertook the National Initiative in 2004.

James R. Vivian

New Haven
August 2016

I. Contemporary American Indian History

Introduction

The ten curriculum units that comprise this volume, Contemporary American Indian history, range widely across the scholarly landscape of Native American Studies. Together they collectively provide various ways of teaching, contemplating, and engaging the subject of American Indians and U.S. history. Each draws upon published scholarly works and uses their respective findings to explore more focused areas of interest, nearly all of which are connected to concerns that have emerged from years of classroom instruction. Several draw upon primary sources from the early twentieth century. Others draw upon existing textbooks and/or curricular standards to expose the limits of current pedagogical approaches to both U.S. history and American literary study, while others discuss ways of incorporating Native American history into diverse classroom environments.

Drawing upon a range of approaches to the field, this Institute seminar focused upon the contemporary political history of American Indians within the United States, beginning with two prominent texts about the various forms of urban as well as reservation activism that helped to determine the course of post-WWII American law and policy. Fellows in the course engaged legal and policy questions, particularly those relating to the Termination policies and practices of the United Government. Officially declared as U.S. national policy in 1953, the process of "terminating" American Indian tribes' unique political, sovereign status under federal Indian law and policy took nearly a generation to reverse. Surveying the many activists, leaders, and community members engaged in challenging these processes characterized our first sessions together, while subsequent seminars explored the more contemporary concerns of Indian history. Ranging from discussions of museum studies to readings about the changing economic history of Native America in the 1970s and 1980s, these sessions helped to extend the themes from the earlier discussions into more contemporary eras. Several American Indian documentaries, films, novels, and photographic works helped to deepen our discussions. Such works included Sherman Alexie's *The Absolutely True Diary of a Part-Time Indian*, selections from Louise Erdrich's *The Round House*; Chris Eyre's *Smoke Signals* and *Skins*, Mary Kathryn Nagle's *Sliver of a Full Moon*, the photography of Horace Poolaw, and the 12 short films made about Great Lakes Indian life and culture, *The Ways.Org*. Such works helped to provide insights into the more experiential nature of Native American history as well as expose some of the challenges of contemporary Native American policy formation in modern America.

Such discussions occurred in seminars held largely in the Native American Cultural Center at Yale. Visits to museums also helped to deepen the class experience, including visits to the Yale University Art Gallery as well as an all-day field trip to the Mashantucket Pequot Museum and Research Center, the world's largest tribal museum.

The Pequot Museum visit included presentations about Native food sovereignty from regional tribal members as well as visits to the museum's extensive permanent exhibitions and film screenings.

Each fellow teaches in a range of school districts, ranging from Tulsa to San Jose, and including other metropolitan school districts, such as Chicago, Philadelphia, Washington D.C., Richmond, and Pittsburg. Accordingly, fellows brought unique and varied perspectives to the relative familiarity or lack thereof of Native American history within their existing classrooms, schools, and districts. All of the units are geared towards either high school or advanced middle grade students.

Danielle Greene's "The Constitutional Crisis of Cherokee Removal" surveys the changing legal dimensions of federal Indian law and policy in the early Republic. This unit connects with common core themes of emphasis found in the state of Virginia's curricular codes and explores the varying aspects of Andrew Jackson's failures to follow the U.S. Supreme Court's rulings in favor of the Cherokee Nation.

Jo Anne Flory's "Rewriting the Narrative of American History: American Indian Identity and the Process of Recovery" examines sets works about Indian history and by American Indian authors. It uses three particular works to explore the historical eras surrounding their production and connects several of them with the historical development of Oklahoma, particularly the expansion of Tulsa where she teaches.

Ludy Aguada's "Dreaming from the Margins, Living in the In-Between: Identity, Culture, and the Power of Voice" compares contemporary Native American works of fiction by Louise Erdrich and Sherman Alexie. It connects important themes within each text with the changing nature of American Indian law and policy, identifying the legal themes such animating fictional accounts.

Travis Bouldin's "Interpreting Movements of American Indian Activism" overviews four varying activist movements for Indian rights. It particularly compares and contrasts the American Indian Movement and the National Congress of American Indians and their respective and often differing approaches to the policies of Termination and Relocation. He links such activist histories with efforts to pedagogical efforts within his 8th-grade classroom in American history.

Patricia LeAnn Hodge's "Relationships of African Americans and Creeks in Oklahoma to 1936" focuses on the changing forms of membership and recognition within American Indian communities in Oklahoma, particularly within the Creek Nation and its shifting and increasingly racialized forms of citizenry and recognition. Such racial formations in the early twentieth century were new to the Creek communities, particularly regarding their long-standing relationships with both Free Black communities and Afro-Creek members within the Nation. She traces this complex history through the early twentieth

century processes of statehood and to the New Deal, exposing new ways that the federal government eventually came to legislate such forms of membership and recognition. Tara Ann Carter's "First and Second Wave Native American Literature" explores distinctive phases of American Indian literary production. In a generally recognized period of cultural and creative production termed by one scholar "The Native American Renaissance" authors such as N. Scott Momaday, James Welch, and Leslie Marmon Silko all explored individuals coming to terms with and/or struggling to find appropriate forms of cultural identity within an increasingly modernizing American society. Her project continues such analysis into the twenty-first century and locates in particular Sherman Alexie's work in more ambiguous and ambivalent ways, in what she terms "second wave" forms of literary expression.

Ashley Pate's "The Menominee Journey to Self Determination" provides an in-depth assessment of one tribal communities' efforts to ward off the legal challenges of Termination and to have their sovereign status with the federal government "restored," in a process known as restoration. Identifying how Menominee leaders, such as Ada Deer, navigated the challenging legal and political channels of both Wisconsin and Washington, D.C., her unit identifies under-recognized forms of civil rights activism and struggles for political justice within rural, reservation areas.

Michael McCellan's "Agents of Change: How American Indians Helped Change the World in Only Seven Years" assess the Seven Year's War of the Eighteenth Century. Examining how American Indian diplomacy and affairs shaped the evolving conflict between France and England in the imperial struggle for supremacy in eastern North America, his unit exposes the centrality of Indigenous peoples, politics, and power to the composition of Revolutionary America.

Barbara Prillaman's "Indian Boarding Schools: A Case Study of Assimilation, Resistance, and Resilience" provides an overview of the varied ways that U.S. policy targeted American Indian children and education. Showing both the detrimental and resilient forms of adaptation initiated by Native peoples in the face of such forms of assimilation, she provides a series of sociological approaches to understanding and/or re-casting understandings of American assimilation more broadly.

Ned Blackhawk

Synopses of the Curriculum Units

16.01.01
Dreaming from the Margins, Living in the In-Between: Identity, Culture, and the Power of Voice, by Ludy Aguada

This unit was developed for use in an Advanced Placement English Literature or Language classroom. While one may not think contemporary American Indian history belongs in an AP English classroom, if carefully crafted, it can work. The skills on which both English exams focus—the ways authors of non-fiction and of imaginative literature use language to achieve a particular end—can be taught using historical documents in conjunction with and to frame Louise Erdrich's *The Round House* and Sherman Alexie's *The Absolutely True Diary of a Part-Time Indian*, the anchor texts for this unit. Students will develop close reading skills by analyzing laws, policies, and Supreme Court cases that established the unique relationship between Native nations and the federal government, and shaped policies on Native sovereignty and self-determination. They will examine how narrative voice and point of view portray identity and culture. Finally, they will explore how visual images convey voice in *Dreaming in Indian: Contemporary Native American Voices*. In their culminating project, students will choose one piece from *Dreaming* to "mimic" in a piece about their own sense of identity.

(Developed for AP English Literature and Composition, grades 11-12; recommended for English 3, grade 11, and English 4, grade 12)

16.01.02
Interpreting Moments of American Indian Activism, by Travis Bouldin

Throughout the Americas, American Indians have suffered many cruelties as a result of the arrival of Europeans. American Indians have been captured as slaves, homelands have been looted and pillaged, and they have been forced to leave the territories American Indians have held for centuries. While there were instances of cooperation during the colonial period, the policy of removal was an incredible force that proved to be disastrous for many tribes. American laws and policies led to a series of rebellions, battles, and massacres that resulted in division and mistrust between American Indian tribes and the federal government. These same policies continue to divide and lead to mistrust between the groups today.

In 1968, The American Indian Movement (AIM) was founded in an attempt to encourage self-determination for all Indian tribes. This American Indian civil rights group used a variety of tactics to meet their intended goal, which includes protests, demonstrations, and the seizing of federal property. The American Indian Movement is analyzed through four prominent events that united tribes and brought national attention to the

movement. The methods of AIM were often viewed as controversial as the protest and demonstrations were not always peaceful or legal. In fact, three of the four movements involved the seizing and destruction of federal property.

In Washington, D.C., the impact of rapid gentrification can be felt in many communities. The city approves permits for companies to rebuild and revitalize impoverished areas throughout the city. The fair housing agreement states that residents will be able to return to the respective areas after construction. In addition, the fair housing agreement indicates that a particular number of new units will be reserved for former residents at a subsidized cost. In many cases, residents do not return due to contractual technicalities. For example, rent may be at a subsidized rate, but parking and trash removal fees will cost hundreds of dollars each month. Many residents are unable to pay the new fees, thus are unable to return.

In this unit, students will have an opportunity to study the contemporary American Indian movement following the American Indian Movement (AIM). Students will analyze the successes and failures of the movement through collaborative discussions and seminars. In addition, students will analyze the effectiveness of AIM strategies in the fight for tribal sovereignty and the enforcement of treaties using primary and secondary sources. Ultimately, students will walk away with the tools and skills needed to take intake informed action in their own communities and nationally.

(Developed for World History I, grade 9; recommended for American History, grade 8, and U. S. History, grade 11)

16.01.03
First and Second Wave Native American Literature, by Tara Ann Carter

This unit analyzes the two novels, *Ceremony* by Leslie Marmon Silko and *Winter in the Blood* by James Welch, comparatively with the contemporary text; Sherman Alexie's *The Absolutely True-Diary of a Part Time Indian*. These texts will collectively suggest that Contemporary American Indian literature spans identifiable waves: A First Wave is the return to reservation life and tradition, ceremony and ritual of tribal peoples; a Second Wave acknowledges the struggle of identity in America, but also asserts the need for life and interaction outside of the reservation as means to complete one's identity. The First Wave finds and satisfies a deficiency of identity; the second signals a need for integrated experience to fully form that same identity. Students will complete reading analysis and other formative assessments during their reading of these novels which will help them connect the historical themes introduced at the beginning of the unit. This unit combines visual and textual narratives as response to the racialized public misunderstandings about American Indian life and identity in our contemporary era.

(Developed for English 1, grade 9; recommended for English, American History, and Native American Studies, grades 9-12)

16.01.04
Rewriting the Narrative of American History: American Indian Identity and the Process of Recovery, by Jo Flory

This unit centers around the study of American Indian history and federal Indian policy through the study of three central texts: Tulsa: From Creek Town to Oil Capital by Angie Debo, Custer Died for Your Sins by Vine Deloria, Jr., and Winter in the Blood by James Welch. These three texts (two non-fiction and one fiction), are tied together thematically in how they each respond to a particular crisis in American Indian history, and both loss and recovery of cultural identity. These books each respond to a particular crisis of misunderstanding in American Indian history. Students will explore the primary concerns of each text, and how they are conveyed through the author's rhetorical choices (their particular context, purpose, topic, audience and voice).

Activities include a research project focused on Tulsa's early Creek history, analysis of non-print texts (comparing and contrasting photographic representations of American Indians from different time periods), and writing "Where I'm From" poems.

This unit was written for 11th grade English Language and Composition students, but it would also be well suited for any 11th or 12th grade American Literature or American Studies class.

(Developed for AP English Language and Composition, grade 11; recommended for American Literature/English and American Studies/History, grades 11-12, and AP English Language and Composition, grades 11-12)

16.01.05
The Constitutional Crisis of Indian Removal, by Danielle Greene

The following curriculum unit focuses on the hypocrisy laden in the federal government's dealings with Indian Nations and tribal removal. Using the five fundamental political principles that inform the US Constitution, the lesson investigates how a theory of a concept (the five fundamental political principles) relates to its real-life application (Indian Removal) is an essential one to understanding the true functions of government. Living in a society increasingly at political odds with itself, it is essential that students understand the limitations of our democratic republic, and how the interpretation of the Constitution is at the whim of whomever is reading it. Ultimately, students will investigate and analyze the manner in which American Indians are governed to determine whether this minority group's rights were and are currently violated under the Constitution. Students will analyze in-depth whether or not the system checks and

balances set up by the US Constitution, given President Jackson's abuse of power, is effective and sustainable. Students will be charged with speaking out and engaging in civil action in instances where the application of the Constitution is not living up to its fundamental political principles. Students will question whether the actual document of the Constitution is the source of injustice or whether it is the people who are carrying it out that are the problem. Finally, students will be able to answer the following questions: 1) What are the constitutional origins of Federal Indian law and policy? 2) How did Andrew Jackson's Indian Removal Act and Marshall's Indian Law Trilogy landmark cases shape Indian Land law? 3) If recognized as distinct according to the Constitution and by Marshall, how does the United States' presently deal with Indian Nations? The students will write a culminating essay answering the questions of "Are the fundamental political principles, on which our Constitution was founded, afforded to American Indians in the United States? Why or why not? What does it for further American Indian/US relations? Create possible legislative solutions that could help solve our broken relationship?"

(Developed for Civics and Economics, grade 8; recommended for Civics and Economics, grade 8)

16.01.06
Relationships of African Americans and Creeks in Oklahoma to 1936, by Patricia Hodge

Most Oklahomans would say they have Native American heritage, including those at my inner-city three-quarter African-American populated high school. Last year, I asked my students how many had Native ancestors. Close to 70 percent said they did. However, when I asked how many have a CDIB card (proof of Indian blood) or a tribal membership card, less than 10 percent said yes. Why then do we self-identify? Is identification the same as having blood quantum and how does that work with the few that have actual citizenship in an American Indian tribe? The relationship of the Creeks with African-Americans is a long and intricate one, but I think it is a good window into understanding a lot of the relationships seen across the country. The complications of tribal citizenship, blood quantum, ethnic identity and tribal self-determination are a microcosm of what happened in the larger history of the United States, including the larger issues of slavery, removal, reservations, allotment, termination, citizenship, Jim Crow laws and the exclusion of Creek Freedmen. This unit will look at the relationships between African-Americans and the Muscogee Creek up to the time of Indian New Deal in 1936.

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

16.01.07
Agents of Change: How American Indians Helped Change the World in Only Seven Years, by Michael McClellan

The Seven Years' War, (French and Indian War), had far-reaching implications. As the first of the world wars, it was perhaps more important than the Revolutionary War. Contrary to depictions across academia and the media, the Indians were certainly not menacing savages, nor helpless victims cowering anxiously on the sidelines. The Seven Years' War, fought in the mid-eighteenth century on virtually every continent, started and ended in the interior of North America. From the first battle at Fort Duquesne to the final shots of Pontiac's War near Detroit, Indians were central to the story, politically and militarily. Early contact, characterized by energetic diplomatic and trade relations described pre-war relations and attitudes. The war and its aftermath then set the stage as England's victory brought tremendous change, not just to European geopolitics, but also in the form of tremendous debt and violent outbreaks of Indian resistance. Britain responded by bringing an end to salutary neglect to exert greater control over the colonists in terms of taxes and a standing army in the colonies. Since either of these were requested by the colonists, the seeds of revolution were sown. And in a revenge-minded France, America will find a very willing ally.

(Developed for U. S. History, grade 8; recommended for U. S. History, grade 11)

16.01.08
The Menominee Journey to Self Determination, by Ashley Pate

The strategies employed during this unit will lead students to research and analyze the Menominee tribe, who are considered the oldest continuous residents of Wisconsin, in an effort to answer the Essential Question: How did the Menominee tribe achieve tribal sovereignty? In order to accomplish this, students will read and engage with a number of text and multimedia sources to uncover how major government agencies and legislation impacted the tribe throughout its history, especially the Termination Act of 1954. The Menominee's rich history and legacy of self-sufficiency caused the US government to see them as ideal candidates for this policy. Though termination caused devastating effects, the Menominee tribe was able to collectively exercise their rights to end termination, achieve restoration and reestablish themselves as a sovereign nation.

(Developed for U. S History, grade 7; recommended for U. S. History, grades 6-11)

16.01.09
Indian Boarding Schools: A Case Study of Assimilation, Resistance, and Resilience, by Barbara Prillaman

In this unit, high school students will delve into the sociological concept of assimilation through the case study of Indian boarding schools. Students will understand that assimilation occurs through a variety of means – voluntary and/or forced and that social and cultural differences between racial and ethnic groups "disappear" when one group is absorbed into another group's culture and social networks or when two groups merge to form a new, blended culture. Through the use of primary and secondary sources text sets, students will be able to answer the following questions categorized into three themes – assimilation, resistance, and resilience: What is assimilation and its variety of terms and how are these sociological concepts related to Native American people? How was assimilation used as a discrimination tool against Native American people? How have Native American people resisted these assimilation attempts? and How have Native American people demonstrated their resilience to these assimilation policies over time? Common Core Standards are addressed, as students will need to evaluate and synthesize these multiple sources to answer the above questions individually. Collaboratively, they will create dramatic readings to share with the school community.

(Developed for Dual Enrollment [DTCC] Sociology, grades 11-12; recommended for Sociology/U.S. History, grades 10-12)

16.01.10
Code-Switching: From Indian Boarding Schools to Urban Classrooms, by Stephanie Zavacky

In this unit, I question the practice of requiring students to culturally and linguistically code-switch in urban classrooms as a form of assimilation. Students will examine the detrimental effects and legacy of American Indian boarding schools, particularly at the Carlisle Indian School run by Richard Henry Pratt. Students will analyze the recent efforts of tribal schools to infuse and encourage culture in their students' educational experience at the Rough Rock Community School and the Oneida Nation High School. Students will also examine the need for American Indians to code-switch when attending a non-reservation school using the novel, *The Absolutely True Story of a Part-Time Indian* by Sherman Alexie. Students will make observations about when and where they must code-switch to "fit in." To conclude, students will participate in the current debate surrounding student use of slang and African American English (formerly known as Ebonics) in the urban classroom.

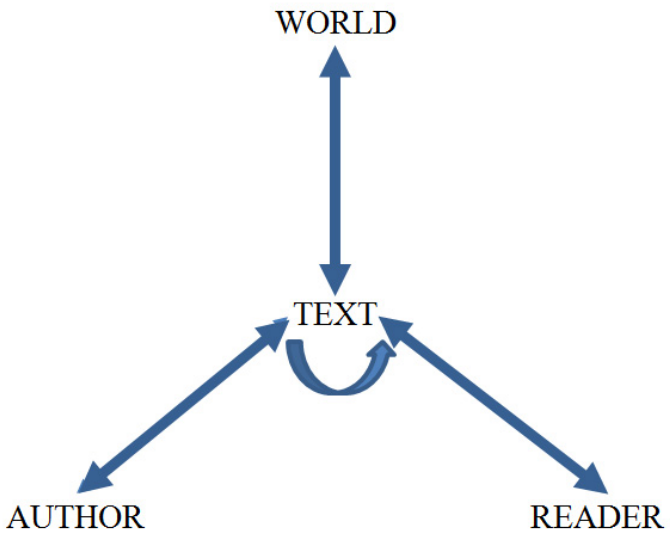
(Developed for Civics, grade 9; recommended for U. S. History, U. S. Government, Sociology, and English/Literature, grades 9-12)

II. Why Literature Matters

Introduction

Does literature matter? Instead of framing the question that the fellows and I were addressing this summer in such a blunt way, one that almost seems to invite a negative answer, we began with the assumption that literature does matter.[1] If that is the case, the only questions remaining – and they are enormously complex and challenging questions – are those of why, and how, and to whom.

All our discussions focused on these three queries – to whom, why, and how? We began our reading with a collection of twentieth-century children's stories, then went on to classic texts by such nineteenth- and twentieth-century British and American writers as Brontë and Faulkner, along with the work of a variety of literary theorists; and we ended by reading a selection of multicultural texts.[2] To give some structure to our inquiries, we adopted a version of the device that M. H. Abrams used in *The Mirror and the Lamp* to illustrate the various ways in which a work of literature can be approached, each of the coordinates indicating a traditional school of literary criticism.[3]



Because the fellows and I were primarily concerned with meeting the demands of teaching, the effect of a text on its readers was the relation that we considered in all our discussions. Next in terms of its role during our meetings was the relation between text and world, both the world of our students and the historical world in which a work of literature was originally created. The curved line pays tribute to the continuingly important New Critical conception, now identified with close reading, that the relations

that matter most are the connections of the parts of the text to each other and to its whole. Many of the units produced in this seminar treat the work of a single author, but when we looked at that coordinate, we tended to pay attention to an author's surrogate, the persona of the Dickens or Whitman or Dickinson that seemed to be addressing us from a text, even when, as in the case of Ishmael of *Moby-Dick*, the voice of the story was that of one of its characters. What this triangular device leaves out – and fortuitously so, I think – is the relation between teacher and text: it goes without saying, though we said it often, that another of the guiding assumptions of the seminar was that what students can come to know is more important than what the teacher already knows.

Although Abrams's mnemonic device might seem both reductive and mechanical, it actually encouraged probing and profound discussions of literature and all the issues that it raises: race, status, family, identity, inequality, even life and death. The practical value of this model was also made clear in the curriculum units that emerged from this seminar, each of which asserts the value of literature by giving priority to one of the coordinates in our device and by exploring its implications for the other possible relations to a text.

Prioritizing the author of a text, as Debra Titus and Kathleen Radebaugh do, turns out to emphasize the status of that text as literary art and the student as a writer of potentially significant and complex texts. Deb plans to focus on the craft involved in three novels by Sharon Flake, an African-American local author, with her fifth graders in the historic Hill District of Pittsburgh. Once students surmount the challenge of reading for craft, they will be able to "translate" what they learn "to their own writing." Moreover, in Deb's words, they will be able to use "what they have learned to face any other challenge" in their educations and beyond. Kathleen boldly and even courageously decided to teach the poetry and prose of William Butler Yeats to eighth-grade students. By focusing on Yeats the man and the pain of unrequited love and the impulse toward rebellion in both his life and his art, she hopes to make connections between a twentieth-century author and school-aged children in Philadelphia. Like Deb's, Kathleen's students will learn not only how to appreciate the craft of Yeats's poetry but also how to use his literary techniques in the poems that they write for their portfolios: if "Yeats used metaphor and symbolism and varied the length and stanza structure of his poems," then students will show their understanding of those features by incorporating them into their own verse. In her unit Kathleen writes feelingly of the "lack of expression" and the "lack of poetry" in the texts that her students have previously produced in her classes, even when the subject that they were studying, such as "the engineering process," was full of "beauty and chaos." By reading Yeats's poetry, her students, Kathleen predicts, will learn how to express what they feel in poetic form.

Similarly, Carla Jones and Amandeep Khosa are using works by a single author to respond to their students' needs. Carla hopes that literature will help her students imagine a future for themselves. For her, this has been a particularly urgent aim ever since, in response to a challenge that she had set her students, one of them, "an 8-year-old

boy," said that "he didn't know how to set goals for his life because he was going to be dead at 18." To address such pessimism, pessimism perhaps more than justified, Carla is turning, like Deb and Kathleen, to the work of one author, in this case Booker T. Washington's *Up from Slavery*. Even those in primary school, Carla believes, can find inspiration and encouragement by reading excerpts from a difficult text that introduces them to a "positive role model," a man who was capable of rising above his "dismal circumstances." Carla, like Deb and Kathleen, then turns her students into authors by asking them to "write and publish a family story of perseverance." By having her students locate in their own genealogies analogues to Booker T. Washington, she hopes to extend the lessons she teaches beyond the classroom to the parents of her students: "In this unit I want to provide a space in which families can share their family stories and therefore empower themselves and others by hearing about the resilience of their families." Aman finds in A. A. Milne's *Winnie-the-Pooh* a text as demanding as *Up from Slavery*, but it is one that will be used to encourage even third-grade students to appreciate the virtues of empathy and to discover different modes of problem solving. Drawn to *Winnie-the-Pooh* by its delightful humor and enduring charm, Aman also sees in this book a repository of skills crucial to both her students' social and intellectual growth. As Aman concludes, "through an imaginative text like *Winnie-the-Pooh*, students develop a higher level of thinking that in turn helps them go from factual to metacognitive knowledge and apply the examples from the book to their daily lives." In all four of the units that I have so far described, the focus on an author begins and ends in understandings of what students most need to learn.

In the same way that Carla is bringing the past into relation with her students' present, Tim Smith and Maureen Becker and Sara Stillman have created units that will bring the past alive. Tim, who teaches eighth-grade United States history, makes primary in his unit the connection between text and world so that his students will develop "a greater understanding of the complexities of the issue of slavery" by reading excerpts from a slave narrative, specifically Frederick Douglass's *Autobiography,* and the novel that, to a great extent, was written in response to it, Harriet Beecher Stowe's *Uncle Tom's Cabin*. Literary works like these, Tim believes, will help students move beyond simply saying that enslavement was "socially and morally abhorrent" so that they can have frank discussions in which "they argue and validate [that] claim in a more substantial way" than they would if they were reading "a textbook alone." Maureen counters conventional feminist readings of Tennessee Williams's *A Streetcar Named Desire* by also giving priority to the world in which Williams wrote. Nominating Blanche, instead of Stella or Stanley, as the main character of the play, Maureen proposes that if her IB students pay attention to "post-war American values," they will recognize that Blanche represents an "empowered woman" who is so unsuited to that culture that her fate involves being raped and going insane. Blanche also serves as a counterpoint to Williams's practice as a playwright: as Maureen explains, "While we read a play about a main character who is immersed in an ever-disintegrating fantasy world and who even rejects realism in favor of magic, the work itself is upsetting when one considers its all-too-real social and

cultural commentary . . . . The observations that Williams makes about the domestic life of a post-war working-class couple are astutely realistic and brutally, unapologetically honest." Finally, Maureen also explains that what her unit can give her students is the opportunity to reach their own judgments about *A Streetcar Named Desire* by opening out subtle and sophisticated possibilities of interpretation that earlier readings have ignored. Sara offers her students the same opportunities, but she does so in a teaching situation unlike Maureen's IB class and with a work of literature that is even more canonical than Williams's play: Shakespeare's *Romeo and Juliet*. Because every student in Sara's ninth- and tenth-grade Visual Arts class is an English Language Learner, she will work with an adaptation of the play written by her fellow teachers, along with "the No Fear Shakespeare Graphic Novel *Romeo and Juliet*, Dire Straits' song *Romeo and Juliet,* Baz Luhrmann's film *Romeo + Juliet*, as well as the paper cut artwork by Elsa Mora." This diverse material will allow Sara to explore with her students the intricacies of metaphoric expression in both word and image – a subject often deemed too demanding for ELLs. Like Kathleen and Deb, Sara puts the creative talents of her students at the center of her pedagogy: "As an Arts educator, I do not want my students to simply be consumers of culture; I want them to be contributors as well. Therefore my challenge is greater than teaching my students to understand the metaphors they read, hear, and see; I must help them to think metaphorically."

Last but certainly not least, Robert Schwartz and Mark Holston make their priority the needs and interests of their students as readers. Both have chosen to introduce them to what are now known as culturally relevant texts: in Robert's case, a variety of works from the Harlem Renaissance to the Civil Rights Movement, to be followed by James McBride's *The Color of Water*; in Mark's case, a memoir by a Vietnamese-American, Andrew Pham's *Catfish and Mandala*. These pieces of literature are culturally relevant because they speak to the experience of those whom Mark calls "hyphenated Americans" – African-Americans and Vietnamese- Americans. Yet, as Robert points out, "A story about race is a human story, as are stories about struggle, oppression, triumph, identity, family, and survival"; and that point, he believes, can be made with "any literature that is accessible, concise, appealing, relevant, and visceral." Not surprisingly, then, both these fellows find particularly significant how these texts represent the difficulties of defining one's identity. Robert's goal is to have his students discover the joy of reading literature while they also discover themselves in what they read. Mark has a comparable goal: he wants his students to become "excited by what they read . . . and possibly even develop an understanding of the value of literature and become passionate, life-long readers." As he says, "Pham's prose is challenging and full of rich examples of literary writing that make it ideal for practicing analysis," although "it is still accessible to students at most reading levels." Like Deb, Mark has chosen to have his students read the work of a local author, his school being close to the town in which Pham was raised; and like Robert, Mark has chosen literature that helps students find their places in relation to a dauntingly powerful dominant culture. For Mark and Robert, as for all their colleagues in this

seminar, the lessons taught by works of literature are lessons that begin in the classroom and extend out into the world in which their students live.

These curriculum units emerged from seminar discussions that had many remarkable moments: among them were Mark's demonstration of what he calls the "circle of empathy"; Robert's identification of a physical "stir" that one feels when reading great literature; Sara's proof that we all could come up with a drawing that represented a metaphor; the exercise that Tim used to show us the deeply personal ways in which we read literature by asking us to identify our equivalent to Ishmael's recourse to the sea; and our communal response to the news that one of the fellows, Victoria Parrish, would not be able to complete the seminar. The most remarkable event, however, may have occurred during the hour when Jessica Zelenski, a teacher of English at Hillhouse High School in New Haven, visited our seminar.

Jessica's approach to teaching has been given quite a bit of publicity because David Denby featured it in his 2016 book, *Lit Up*; and we were eager to share with her our reactions to his characterization of her teaching and her students. Yet we were all so taken by her extraordinary commitment to those students, her willingness to use any method that she could think of to engage them in what they read, and her ability to honor the individuality of each of the tenth-graders in her classroom that Denby's account quickly faded into the background. Told that the topic of our seminar was "Why Literature Matters," Jessica – without any preparation and without any hesitation – listed many answers to the implied question in that title, ending with the goal of giving her students a sense that they are part of a bigger world than the relatively narrow one that they already know. At the end of Jessica's visit, Deb offered an eloquent tribute to the kind of model that she provides for every teacher – a tribute with which we could all agree.

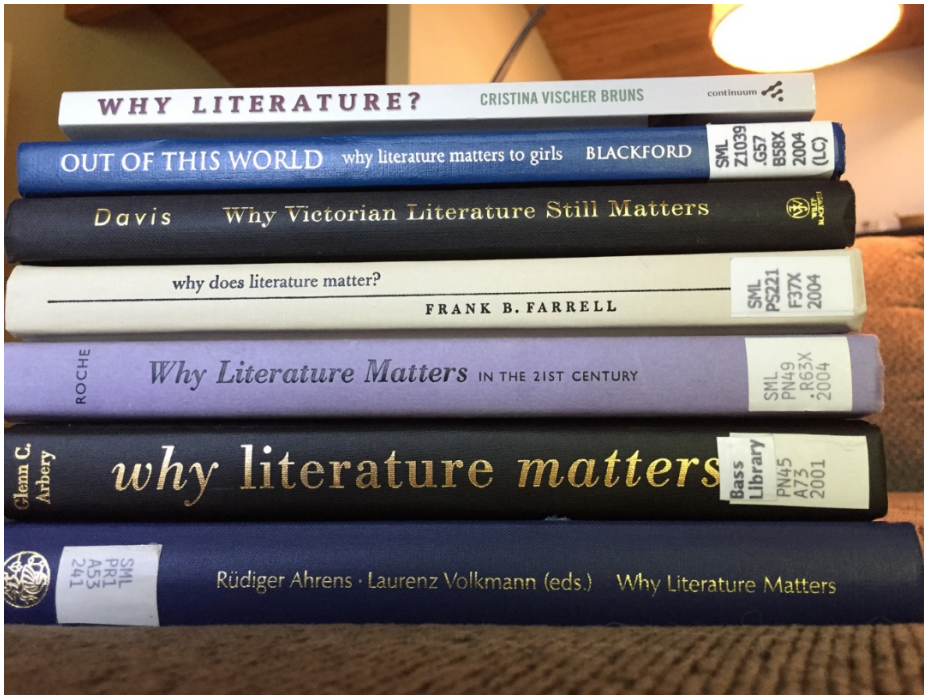
Charles Dickens hoped that his fiction would bring his readers together – as if they were all gathered around the warmth of a sitting-room fireplace – so that they could unite in a common undertaking, one that would allow them to share vicariously the same feelings, desires, expectations, and satisfactions. For Dickens, this was an important ethical matter, a way of defining his work as a social good. When I think back on the seminar that the fellows and I participated in and the literature that we read and the conversations that we had, I am moved to suggest that in a classroom at Yale in the summer of 2016 we embodied Dickens's ideal. We had the advantage of being in each other's presence – not something that Dickens's widely spread and diverse audience could manage, except when he was giving public recitations of his work. Like his readers, however, we came together from afar, from Tulsa and Berkeley and Richmond and New Haven, as people facing different challenges in the classroom, having had different previous experiences of reading, and having come from very different backgrounds; and our discussions led to remarkable revelations that we shared many of the same concerns and hopes and values. In sitting in that room together, we proved, day after day, how moved we could

be as we recognized the connections that reading a work of literature had created among us. So I can now answer the more skeptical form of the question that we could have pursued: Does literature matter? Yes, it does. And for the gift of that certainty, I will remain deeply grateful to the fellows with whom I had the honor of working in this seminar.

Janice Carlisle

Endnotes

1. There are so many books with the titles that are various combinations of the two words Literature and Matters, that I was able to photograph a pile of them as an illustration to the talk I gave for all the fellows in the 2016 Yale National Initiative:



2. When in our last meeting I raised the issue of my discomfort with the way in which the readings of our seminar could be construed as a marginalization of the works by African-American, Latina, and Asian-American writers, the fellows explained how they solved that problem by arranging their syllabi according to theme rather than according to chronology.

3. *The Mirror and the Lamp: Romantic Theory and the Critical Tradition* (Oxford: Oxford University Press, 1953), 6.

Synopses of the Curriculum Units

16.02.01
Reading for Craft through an Author Study, by Debra Titus

Why did the author choose to write this way? How can I use what the author wrote to sharpen my skills in writing? These are some of the questions that a student in elementary school may not ask. Students need to be shown how to transform their thinking into that of a writer. Students should be able to identify the craft of an author and know how to use methods to shape their own thinking and writing.

The unit focuses on reading for craft through an author study of a local author, in particular, Sharon Flake, of Pittsburgh, PA. Students review three novels from the author in an effort to indicate occurrences of particular uses of style, such as: language, voice, and description. Students analyze the craft of the author by noting comparisons across the novels to get a better grasp of the methods consistently used by the author. The unit is intended for fourth-grade students in an English Language Arts classroom. The unit can be adapted for varying grade levels with differing contents. When students are thinking like an author, they will develop a system for finding out why an author writes in a particular fashion, and then can students truly read for craft.

(Developed for English Language Arts, grade 4; recommended for English, grade 10)

16.02.02
William Butler Yeats Meets an Eighth Grader from West Philadelphia, by Kathleen Radebaugh

Poets are a dying breed; poets are becoming extinct in our society, especially in the classroom. Students do not often pause and express their internal conflicts or responses to beauty in the form of stanza and meter. Often our students develop informational or analytical essays to achieve understanding and meet the needs of the writing portfolios. Our students need to process and express their interpretations into poetic form. Our students need poetry just as much as poetry needs an audience of young, ambitious thinkers and advocates for change.

The purpose of this unit is for students to write two to three poems about unrequited love or rebellion. Students will close read five to six poems by William Butler Yeats, a 20th-century Irish poet, with the New Critical approach followed by historical and biographical contextualization. Yeats was conflicted about the Irish nationalist movement for independence and wrote about his broken heart for his country and first love, Maud Gonne. This unit uses selected poems and prose pieces by Yeats to develop a connection with students living in Philadelphia that many of Yeats' struggles during his adolescence and young adulthood mirror conflicts experienced today by them today.

(Developed for English Language Arts, grade 8; recommended for English Language Arts, grade 7)

16.02.03
Connecting it All: How Connecting Students to a Text Increases Motivation to Read, by Carla Jones

Students want to feel connected to a text. They want to read books that reflect them and their cultures. So many times classroom libraries are filled with books of mainstream culture. What effect does that have on the children? It is important for students to see themselves in the text. Students can begin to develop their identity as they read books that reflect them.

In this unit, students will participate in activities that will help them connect to the text. After reading about the life of Booker T. Washington, a comparison organizer may be used by students to visibly show the similarities and differences. Students will examine how his determination to accomplish his goals allowed him to go from being a slave to the Founder of a University. Since Washington is an example of how to set goals, students will use his model to set and accomplish their own goals.

The complex text, *Up From Slavery,* in this unit can be used at any grade; however, the activities were written with primary students in mind. Students of any culture can benefit from the lessons taught by Washington's life. The lessons in this unit transcend ELA and connect multiple discipline areas.

(Developed for ELA/Social Studies, grade 3; recommended for ELA/Social Studies, grades 3-5)

16.02.04
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Learning Social Skills and Problem Solving with Winnie-the-Pooh, by Amandeep Khosa

The goal of this unit is to develop social skills such as communicating respectfully, thinking logically, rather than emotionally, and developing values like respect and empathy, through classic imaginative literature. Students will explore these themes through the characters' point of view and their choices. For this unit I will use a popular children's classic, *Winnie-the-Pooh,* written by A. A. Milne.

This unit was written with primary students in mind, but it can be modified and adapted across grade levels. Teachers can modify the strategies and activities according to their class situation. This unit can also be adapted across the curriculum to connect to the

requirements of the other subject areas, such as science and history. Through the humorous tales of *Winnie-the-Pooh*, the students not only learn problem solving through the actions and decisions of the characters, but also get a glimpse of a different culture, time period, and usage of language.

(Developed for English Language Arts and Science, grade 3; recommended for English Language Arts and Science, grades 1-5)

16.02.05
Decimal Expansion: An Address System for All Numbers, by Jung Lee

The goal of this unit is for middle school students to acknowledge the number line as a measuring device rather than a counting tool. As the number line shows the relationship of number placements in different base-ten scales, students can demonstrate that every rational number has its place on the number lines by doing decimal expansions. During the course of studying decimal expansions, students will see that the set of real numbers with terminating or repeating decimal expansions precisely finds their address on the number line. Decimals should not be treated as an isolated mathematical concept, but identified as a precise system to locate a number on the number line with its unique address. The metric system will be implemented as an extension of base-ten scales and students will be able to use the number lines with millimeter, centimeter, decimeter, and meter markings to measure line segments to the nearest tenth of a centimeter, a tenth of a decimeter, and a tenth of a meter. Presenting the metric system in scientific notations and relating it to the number line in a multiplication of tens; 1000, 100, 10, and 1 or 1, 0.1, 0.01, and 0.001 will be used as a form of formative assessment of the unit study.

(Developed for General Math, grade 8; recommended for General Math, Pre-Algebra, and Algebra, grades 7-9)

16.02.06
Creating Connections to Tennessee Williams' A Streetcar Named Desire, by Maureen Becker

Many students come into my English classes afraid to participate for fear saying something wrong; there is also consistently a group of students who will either parrot my connections and assertions or those found on a study-helper website such as SparkNotes or Shmoop. Students need to develop the skill of original thought based upon critical analysis of text, and literature classes offer access to developing that skill. Students enter their classes with a wide variety of experiences that influence their reading of texts, and these connections can be used to make connections when they are grounded by textual evidence.

In order to help students develop their ability to form and express their own original analysis of text, this unit uses Tennessee Williams' *A Streetcar Named Desire* (1947) and two of the more common critical analyses of this play to invite students to challenge such analyses of the work and assert commentaries that are authentic.

This unit was written with an audience of twelfth-grade IB literature students in mind; however, it can be modified to work for students as young as ninth grade as long as the teacher is comfortable with discussing the mature, sexual content of the play. The suggested activities are flexible enough to be easily modified to fit the needs of student group in the secondary setting.

(Developed for IB Language A: Literature Year 2, grade 12; recommended for English, grades 9-12)

16.02.07
Using Art-Based Research to Explore Metaphors in Romeo and Juliet with English Language Learners, by Sara Stillman

Bringing literature into the classroom for adolescent English Language Learners poses challenges for both teachers and students. For teachers, knowing how to adapt language to make learning accessible for students can often result in limiting learning experiences. For students, barriers to understanding language can lead to frustration and withdrawal from interacting with challenging texts. This unit uses the Visual Arts to empower students to analyze adaptations of Shakespeare's *Romeo and Juliet* with a focus on visual and verbal metaphors. Using Art-Based Research teachers of both English and Art can imbed artmaking and English language concepts to reach a broad range of learners.

(Developed for Visual Arts, grade 10; recommended for Visual Arts, English Language Arts, English Language Learners/English as a Second Language, and Special Education, grades 7-12)

16.02.08
Reading One Another: Fostering Passion and Identity Growth through African-American Literature, by Robert Schwartz

Finding ways to encourage reading is an obstacle in education, as is utilizing pedagogy to build character. There is stiff competition for young learners' attention in the forms of modern media, and many distracted students in the classroom. To meet these challenges, we will explore engaging texts that are simple but not simplistic, both accessible *and* challenging. We focus on African-American literature of the Harlem Renaissance, the Civil Rights Movement, and finally James McBride's *The Color of Water,* a consistently enjoyable, compelling work that students often love. At the same time, we look at

evidence proving how important it is to read literature, and different strategies to encourage students to read.

The essential idea is that the words speak for themselves. Non-readers cannot become readers unless they are provided with something they will enjoy as freely as their mobile apps. These stories of personal journeys and identity aim to do just that. It is intended for 11th or 12th graders in an urban school district. However, while the grade level is recommended, the literature contained herein is relatable, erudite, accessible, and relevant for students of any background.

(Developed for English 4/Senior Level English, grade 12; recommended for English 3/Junior Level English, grade 11)

16.02.09
Who Am I?: Culturally Relevant Text and American Identity, by Mark Holston

Students' aversion to reading often stems from not seeing themselves or their experiences represented in the curriculum; they feel disconnected or disengaged from what is being taught, and this disconnect is profound for students of color. When students can see themselves in the literature they are reading, the literature can be an opportunity to explore their own identity, and explore and understand who they are.

Centering on the culturally relevant text *Catfish and Mandala*, by Andrew Pham, this unit hopes to address the universal theme of selfhood, more specifically, self-identity in the context of American identity. The unit gives students an opportunity to discover their own views of where they fit in as Americans and how these relate to the ethnic and racial cultures that they come from. At the same time, this unit will use Pham's rich prose to develop the skills of analytical reading and writing.

The text *Catfish and Mandala* would be appropriate for students in ninth to twelfth grade. Although designed for 11th grade students, this curriculum unit can be adapted for teaching an appropriate grade level text, and the activities can be modified to match student's grade levels and academic abilities.

(Developed for English 3, grade 11; recommended for English courses, grades 9-12)

III. "Over the Rainbow": Fantasy Lands, Dream Worlds, and Magic Kingdoms

Introduction

Literature, film, and popular culture abound with utopias and otherwise wonderful but impossible places. Based on imaginative journeys to three of them—Oz, Never Land, and a Wood near Athens—"Over the Rainbow" explored some of the greatest geographies of wishful thinking ever fancied. In a context created by related critical essays, three popular works and their spinoffs were central to the seminar: *The Wonderful Wizard of Oz* by L. Frank Baum and its cinematic and stage versions, including *The Wizard of Oz* (MGM, 1939) and *The Wiz* (1978); J. M. Barrie's *Peter Pan; or, The Boy Who Wouldn't Grow Up* and its variants, including *Peter Pan* (Disney, 1953); and William Shakespeare's *A Midsummer Night's Dream*. Branching out in different directions from these fantastic realms, participating Fellows created Curriculum Units that feature their own dream worlds based on original works and adaptations drawn from different media and genres. Along the way, they develop various strategies for inspiring magical thinking in their students. As is the case with almost every invocation of a utopia, however, each of their dream worlds casts the shadow of a dystopia as well. The Fellows allow that dreams and nightmares, like fantasy and reality, can stand opposed and still change places.

One recurring and troubling theme of our unit-preparations and seminar discussions was our collective sense of the overall flattening of the imaginative lives of school children today. Fellows reported variants of this systemic phenomenon across the country, across the grades, and across the subjects. The hyper-availability of formulaic and repetitive amusements through mediated communication came up repeatedly as a manifestation of the problem, and it was also identified generally as a probable cause of it. But we concluded that media-saturation is but one symptom among others of the intensifying pressures of the real world on childhood. Reality today includes the increasingly urgent summons of the here and now on the attention of students, especially those enrolled in high-need public schools. Krista Waldron, from the Phoenix Rising Alternative Day School, Tulsa, framed the issue clearly in her unit, meditating on a quotation from the late Mohammed Ali:

For several days after Mohammed Ali's recent death, I found and heard Ali maxims everywhere. Because one fraction of my mind is always percolating something for my seminar or unit, this one stayed with me: 'The man who has no imagination has no wings.' I thought about how rich his imagination must have been. Then I thought about how grounded in reality my students are. Burdened with it, really. Their lives are so survival-oriented and rooted in immediacy and basic needs that the imaginative realms are lost to them. Units that have come from previous seminars have ambitiously addressed issues of social justice or the effects of trauma on literacy and writing skill—

the realities of my classroom. But what if Ali is right? If not cultivating one's imagination is equal to sentencing him or her to a life of predictability—which in the case of many of my students is one of recidivism and prison or blue collar jobs that make ends meet at best. Can the ability to suspend one's belief in fiction transfer to one's life, goals, dreams?

Citing Samuel Taylor Coleridge's famous phrase—"that willing suspension of disbelief for the moment which constitutes poetic faith"—Waldron builds her unit, "Magical Multi-Culti Yellow Brick Realism," around L. Frank Baum's *The Wonderful Wizard of Oz,* Gabriel García Márquez's short story *A Very Old Man with Enormous Wings,* Octavia Butler's short story *Bloodchild*, and *The Subtlety,* an art installation piece by Kara Walker. The Walker piece, a colossal bandana-topped sphinx made of sugar, is titled in full "The Subtlety; or, the Marvelous Sugar Baby." Walker installed it in the old Domino Sugar Factory in Brooklyn. It is the most provocative work by one of America's most thought-provoking artists, and it creates an environment of richly imaginative meanings—a dream world—for interpretation and discussion. Topics include but are not limited to the very real histories that "The Subtlety" embodies and symbolizes, but also the constructed-ness of those realities. Waldon's students will then be challenged to create their own installation, drawing on their imaginations under the inspiringly open-ended guidance of "magical realism."

In a similar vein, "Afirmando Nuestra Identidad (Affirming Our Identity): Exploring Dream Worlds and Storytelling through Alebrijes" by Mary Carmen Moreno of the Tarkington School of Excellence, Chicago, takes up the popular art of Mexico, in particular the vibrantly colored sculptures known as "alebrijes," to explore the intersection of visual art and literary narrative. Her objective is to "welcome my bilingual students into a world that they construct from both ideological and mythological spaces informed by language, culture, and art." In this world, her students "will engage with tales that span geographical spaces, and in particular visit their ancestral lands of Mexico through the written and oral word, through the visual landscape of el arte popular Mexicano, and the dreamworlds of alebrijes." In the end, the Mexico Moreno seeks to bring into her classroom is no less real because it has been made more magical in the minds of her students, many of whom still call it "home" even though they have never been there. But this reality is aspirational, expansive rather than reductive; it is tangible and verifiable; but, at the same time, it is not inevitable. It is a reality that must be imagined, disbelief suspended, in order to be perceived and properly understood.

Our seminar discussed possible techniques whereby this kind of creative imagination might be stimulated into fullness of being, and the curriculum units reflect the variety of these discussions. In "Stick to Your Story: Fleshing Out Existing Narrative Structures," Tharish R. Harris of Boushall Middle School, Richmond, sets out her plan for empowering her students by teaching them the techniques of storytelling derived from theories of narrative such as Vladimir Propp's *Morphology of the Folktale* (1968) and

Peter Brooks's *Reading for the Plot: Design and Intention in Narrative* (1984) . She writes: "Technology and social media have dulled my students' imaginations. They are so hyper-engaged with immediacy—the 'here and now' of shared experiences—that they do not have time to reflect on the past, much less look forward or *elsewhere* into the realm of imagination." Narrative, Harris argues, imparts the importance of *before* and *after* by disclosing the meaning of passing through the present from a beginning to an end. "Narratology" is a fancy way of saying that we know that stories are told in certain ways wherever they are told, using and re-using certain techniques, leaving room for idiosyncrasy and innovation but disclosing clear patterns of meaning-making. Corrina Christmas, of Andrew Jackson Elementary School, Tulsa, in "Getting Graphic about Writing" thus proposes to use the word-and-image techniques divulged by Scott McCloud's *Understanding Comics: The Invisible Art* to teach her student to read—and also write—comic books and graphic novels.

Another recurring discussion in seminar was the mixed blessing of the emphasis on non-fiction reading and writing in Common Core Standards. In "Easing on Down the Road: Teaching Students to Critically Read and Write Fantasy Lands," Brandon Barr of Mark Twain Elementary School, Chicago, addresses this issue head-on: "While the standards represent a major effort to bring rigor to language arts instruction, I believe the narrow focus on one approach to understanding and engaging with text is short-sighted and harms literacy instruction. Reflecting on the experience of the *Over the Rainbow* seminar, a key element that propelled conversation was not only reading *The Wizard of Oz*, *Peter Pan*, and *A Midsummer Night's Dream*, but also reflecting on what critics had to say about each text and its derivative texts." Using accessible excerpts from critical analyses of the dream-world texts he assigns, Barr will help English teachers willingly suspend their disbelief in Common Core while empowering his students' imaginations for the truths that only fiction can relate. Easing on down another stretch of the same road, Jennifer Giarrusso, of Taylor Allderdice High School, Pittsburgh, in "Seeking a Home: *The Wiz* and the Black Arts Movement," began her critical and historical inquiry with a non-fiction Twitter feed from "Feminista Jones," responding to the NBC TV revival of *The Wiz* in December, 2015, and quoting the lyrics:

> What would I do
>
> If I could reach inside of me
>
> And to know how it feels
>
> To say I like what I see.

The Tweet explicitly linked *The Wiz* to the Black Arts and Black Power movements of the 1960s and 1970s. Giarrusso well understands the problematic nature of such a linkage (the creative team for the production of both the musical and the film was all white), but

she develops it nevertheless to explore the idea of 'home" on the cusp of the separatist-integrationist debate in American racial politics, which remain as rich a source for fantasy and non-fiction texts, sometimes confused for one another, as can be imagined. Bringing related issues up to the moment in popular culture, Sydney Hunt Coffin, of Edison/Fareira High School, Philadelphia, addresses the problematic portrayal of black and Puerto Rican identities through the hip-hop swagger of Lin-Manuel Miranda's *Hamilton* in "Dreaming on Imaginary Stages and Writing Imaginative Scripts: The Magical '*If*' Fulfilled, in *Hamilton*."

As the enormous impact of *Hamilton* shows, notions of fantasy land and home land remain creatively interrelated in the American imagination, but not in the American imagination alone. Priya Talreja, from Pioneer High School, San José School District, in "Unraveling the Dream World Stereotype of the Arab People," unravels the Orientalist fantasy at the heart of T.E. Lawrence's role in the Arab Revolt during World War I, focusing on the dream-world vision of Lawrence's *Seven Pillars of Wisdom.* "The unit's essential question ," she writes, "is the following: *How are stereotypes used to diminish the contributions of colonized people?*" Here the dialectic of dream world and historical fact reaches back into the past to illuminate how the reality of the present carries the burden of fantasy from long ago. But dream worlds empower more dreamers than they disempower. Tiffany Tracy, of the Ganado Elementary School, Diné Nation, in "Journey to the Sun: Reclaiming Self-Esteem through Culture and History," claims the historical truth of Navajo creation stories embodied in the adventures of the Warrior Twins, Monster Slayer and Child-born-for-Water. Her students will learn that monsters still need slaying, in their dreams and for real.

Joseph Roach

Synopses of the Curriculum Units

16.03.01
Magical Multi-Culti Yellow Brick Road Realism: Using Imagination to Find Reality, by Krista Waldron

My alternative high school students' lives are so survival-oriented and rooted in immediacy and basic needs that the imaginative realms seem lost to them. This unit includes research into this problem and some practices specific to at-risk students that address it. We will read works that will de-familiarize students, creating a space where stories and writing are fresh and approachable. The texts are L. Frank Baum's *The Wonderful Wizard of Oz,* Gabriel García Márquez's short story *A Very Old Man with Enormous Wings,* Octavia Butler's short story *Bloodchild*, and *The Subtlety or the Marvelous Sugar Baby,* an art installation piece by Kara Walker. Butler's and Walker's works will be more appropriate for older or mature high school students, but for younger students they could be substituted. My students tend to be struggling readers, so work throughout the unit will include appropriate reading strategies with an emphasis on visualizing the fiction texts. Other activities will encourage creative thinking about text. The two final products are a creative writing piece, which asks students to use many of the literacy skills acquired in the unit, and an art installation piece.

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

16.03.02
Afirmando Nuestra Identidad (Affirming Our Identity): Exploring Dream Worlds and Storytelling through Alebrijes, by Mary Moreno

Art and stories are two powerful vehicles for transmitting culture and traditions in ways that affirm students' identity and inspire them to dream.

Using a biliteracy framework, this unit leads students on a journey to explore stories across multiple genres and visual artwork that introduce or develop their understanding of Mexican cultural traditions, family history, geographical landscapes, and the art of imagination to inspire individual stories featuring alebrijes—brightly-colored, fantastical, animal-like sculptures that emerged from the dreams of an artist and evolved into one of the most unique examples of arte popular Mexicano.

This unit is designed for 2nd grade emergent bilingual students of Mexican origin who are learning to read and write in both Spanish and English. Activities and strategies integrate the visual arts to facilitate a deeper critical lens that extends their level of analysis of traditional literature as critical thinkers and storytellers.

(Developed for Language Arts/Bilingual Education, grade 2; recommended for Language Arts/General Education,grades 1-3, and Arts Education, grades K-3)

16.03.03
Stick to Your Story: Fleshing out Existing Narrative Structures, by Tharish Harris

My students struggle with writing every year, most start with little or no pre-reading skills and are reluctant to write at all. When they do enjoy writing they only want to write about crime and violence.

In an effort to get my students excited about writing we will be incorporating graphic novels into our read-aloud time and learn to use some techniques that I have read about in Scott McCloud's *Understanding Comic Books: The Invisible Art*. This will make writing more exciting for my students.

This is a unit written for 1st grade but could be modified for second or third grade. It addresses reading and writing standards by teaching students to make comic books. Students will be learning everything they need to know about how to make a great visual character, an inviting setting, and a plot in their story done in a graphic novel or comic book fashion. They will learn about how to make their characters run and jump on pages, how to make them scream or whisper, and even how to show them how to make their character jump off the page in the comic book.

(Developed for English/Language Arts, grade 7; recommended for English/Language Arts, grades 5-11)

16.03.04
French History in Your City: San Jose, California - the Pellier Brothers, by Glenn Davis

“French History in Your City” is a unit on local, public history, which explores how the French arrived, specifically, in San Jose and what they did to contribute to society. It includes struggles and victories for the new immigrants. With a bit of research on immigrants in your area, it can easily be applied to other neighborhoods, cities, counties, etc., in which the French, or other ethnic groups, settled.

The unit is student-centered, focusing on their research using the internet, learning first about the migration of the French language from a small area in Western Europe, to all corners of the globe, including North America, California, and finally, San Jose. Their research includes visiting local history libraries, where they can find primary source materials, museums, and places of interest where the immigrant is memorialized, such as a small park and a cemetery.

The unit will empower students to be historical researchers, thinkers and writers. From a few words on a tombstone, students will dig deep in their research, taking them back to France, where they will make discoveries about the origins of the immigrant. It will open up the area of genealogy, as they research the family.

(Developed for French III, grades 11-12, and AP French Language and Culture, grade 10; recommended for French III-AP/World Languages, Spanish III-AP/World Language, Vietnamese II-III/World Languages, and German II-III/World Language, grades 10-12)

16.03.05
Easing on Down the Road: Reading Critically, Writing Fantastically, by Brandon Barr

Critically reading and discussing literature from multiple angles is something that many middle school students do not do in English Language Arts classes. The Common Core State Standards call for students to engage in close reading of text, but narrowly focusing on close reading limits student capacity to think abstractly and critically about what they read. Students need to learn that there are more than one narrow lens for unpacking meaning from a text.

In order to deepen student understanding so that they approach a piece of fiction more critically, students will be introduced to five critical literary lenses that can be used to explore fiction: history/author's biography, New Critical (close reading), Feminist, Reader-Response mythological/archetypal/symbolic. These different angles will be explored by reading modified critical readings that apply to *The Wizard of Oz* and *Anthem*, two works that contain fantasyland settings that will be studied in the unit. As students learn the conventions of fantasylands and the structure of a narrative, they will learn and play some insider secrets to do some creative writing of their own.

This unit is intended for sixth grade students that are at or above grade level. Students are not generally introduced to literary criticism in middle school, so it could easily be scaffolded higher to introduce the concept to older students. Teachers looking for ideas or resources for how to get students thinking about and writing their own fantasylands may also benefit from this unit. The assessment is also flexible enough that it could be easily used in many different English Language Arts classes.

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

16.03.06
Seeking a Home: The Wiz and the Black Arts Movement, by Jennifer Mazzocco

High school students are often asked to discuss race, but these conversations only superficially deal with the way that the American black artistic community has used art, literature and music not only to explore and create a cultural identity, but also find a cultural home in one that is majority white. The Black Arts Movement, an artistic parallel to the political Black Power Movement, is well-suited to allowing students to think critically about black identity, black pride and how a cultural minority navigates its situation in a white, mainstream culture.

The centerpiece of this unit is the 1978 film *The Wiz*. Students will question what influence, if any, the Black Arts Movement had on the creation and interpretation of the film. Alongside Black Arts Movement poetry, nonfiction essays by black writers from the late 20th century and a Radiolab podcast called "Debatable," students will examine the ways that Black Arts Movement writers used their politics and art to search for a home and the influence of that movement on later black work. This unit is intended for English Language Arts, grades 9-12.

(Developed for English I CAS and English I PSP, grade 9; recommended for English, grades 9-12)

16.03.07
Dreaming on Imaginary Stages and Writing Imaginative Scripts: The Magical "If" Fulfilled, in "Hamilton", by Sydney Coffin

Just as Constantin Stanislavski, founder of "The Method", claimed that "Not a step should be taken on a stage without the cooperation of the imagination", we should encourage our own students to locate their imaginations at the center of the work to create historical as well as creative writing. In this unit, high school English and Poetry students are led in an exploration of the play Hamilton and its creative possibilities by teaching deconstructive analysis through close readings, the challenges of American social and political perspectives today, as well as creative writing exercises leading to a stage performance.

(Developed for Poetry, grades 10-12; recommended for English and Social Studies, grades 7-12)

16.03.08
Unraveling the Dream World Stereotype of the Arab People, by Priya Talreja

There is no such thing as an unbiased history. Because of this we need to teach historical thinking in the classroom to help students recognize bias that influence the way historical information is recorded and remembered. This unit is situated in the tenth grade World History classroom.

At the heart of this lesson is the book by T.E. Lawrence, *Seven Pillars of Wisdom.* This unit gives students the opportunity to see the challenges with an unreliable primary source such as this book. Students also study parts of the film *Lawrence of Arabia*, which solidifies the dream world stereotype of the Arab people that Lawrence developed. Students analyze Lawrence and his views about the Middle East by studying his personal life and the events of World War I and imperialism. Using this information students connected Lawrence's views to the theory of Edward Said's Orientalist. Students use both primary and secondary sources to help evaluate the following essential question: *How are stereotypes used to diminish the contributions of colonized people?*

(Developed for World History/Imperialism and WWI, grade 10; recommended for World History/Imperialism and WWI, grade 10, and Geography and World Cultures/Middle East, grade 9)

16.03.09
Journey to the Sun: Reclaiming Imagination and Self-esteem through Culture and History, by Tiffany Tracy

"Journey to the Sun: Reclaiming Imagination and Self-esteem through Culture and History" is a unit that is meant to bring a sense of cultural pride through the introduction the Warrior Twins, or Hero Twins, known as Monster Slayer and Child Born-for-Water. Many students living on the Din4 Nation face many obstacles in life, and they are so set in reality that they lack imagination. The quickest escape for most children today is a pre-imagined world that doesn't challenge them to create something new. Everything is already visualized for them. My goal is to bring into the classroom the oral narratives that define our people. Din4 teachers, and teachers across the United States, can stimulate the imagination with tales of man-eating monsters, talking animals, arrows made of lightning. These tales teach us to practice to be better, listen to others, receive advice from elders, and remain cautious and brave when faced with challenges. For our Native children, and children of color across America, it is important to provide alternative narratives that show integrity and resilience. It is time to let them see themselves as warriors, suspend their disbelief, and be the storytellers themselves.

(Developed for Reading and Writing, grades K-8; recommended for Reading and Writing, grade 9)

IV. Energy Sciences

Introduction

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

My own interest in science stems from my hands-on experiences as a child. Therefore, many demonstrations were included in this seminar – at least one demonstration, and frequently 2-3, in each seminar meeting. These demonstrations were chosen so that they could actively involve the students and at the same time illustrate the scientific principles related to energy.

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

The curriculum units developed from this seminar are suitable for elementary to middle school to high school students. In all of the units, the science content is integrated with language arts, mathematics and social studies to provide a balanced program that meets the literacy requirements of the school system. The Fellows have prepared extensive lists of materials that can be used in the classroom or as resources. These materials include books that the students can read, textbooks that the teachers can use, demonstration sourcebooks, suppliers of equipment and many addresses of sites on the world wide web. Several of the Fellows developed units around a theme or activity related to energy, including units on growing plants, biodiesel production, building an electrical motor, making dye-sensitized solar cells, and an innovative unit on building a contraption to cook food and make potable water in the event of a power outage. Other units are related to comparisons of current sources of energy based on fossil fuels with the renewable energy sources, analyses of carbon footprints, and air pollution. Information on the responsible use of current sources of energy to lower our carbon footprint, as well as the impact of our energy use on the planet Earth, is also provided in many of the curriculum units. The units include a number of excellent activities that will engage the students' interest and teach them about energy sciences.

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

Gary Brudvig

Synopses of the Curriculum Units

16.04.01
What is Our Energy Past, Present, and Future?, by Josh Bearman

Contrary to the commonly repeated idea that the fossil fuel economy is dead, there are ample fossil fuel resources remaining on Earth, and extraction technology is keeping pace with demand. In this curriculum unit, my goal is to provide my students with the means to research the origins of the fossil fuel and renewable resources present in Virginia, how they are extracted and used, and what could be the future of energy generation for the state.

This unit surveys the state of available energy in Virginia, looking at the formation, extraction, use and impacts of coal and natural gas, uranium mining, how energy is made in coal-fired and nuclear plants, and how the state is set up for offshore wind. Over the course of 3-4 weeks, students will research organisms of the Carboniferous period, test the energy potential of different grades of coal, visit a coal mine, visit coal-burning and nuclear power plants, and engage in a resource "Crash Debate." This unit is designed for advanced 8th grade students, but could be easily modified up or down.

(Developed for Earth Science, grade 8; recommended for Physical Science, grades 7-8)

16.04.02
The Dye-Sensitized Solar Cell, by Cristobal Carambo

This unit is designed to engage 11th grade students in the evaluation of the environmental impact of society's overdependence on fossil fuels. The unit will center on solar energy as an alternative fuel resource, and focus on the transformation of radiant energy into electrical energy that occurs within photovoltaic cells. An important aspect of the learning will be on the chemistry of these cells, how electrical energy is stored within them, and the many applications of this technology in our everyday life. The unit will unfold during the study of the periodic table and center on the physical / chemical properties of the semiconducting elements used in solar cells. Students will engage in a series of laboratory activities exploring the composition and electrical properties of various solar cells. The unit will culminate in an evaluation of select products that rely on this technology and the environmental benefits of photovoltaic cells.

(Developed for Chemistry, grade 10; recommended for Environmental Science, grades 10-11)

16.04.03
Plant, Watch, and Grow, by Jessica Johnson

This is a kindergarten unit that addresses Next Generation Science Standards on life sciences. This unit also touches on math and writing for kindergarten. My purpose in writing this unit is to help my students better understand the growth and development of plants. Students will come to understand photosynthesis in its most basic form. Student will be engaged in hands-on activities modeling the plant structure, photosynthesis, and the sun. My students will be making connections from the energy provided by the sun to the growth of plants. I will be making several connections for the students on the foods they eat coming from vegetation. Activities included in this unit are growing bean pods, a community garden, and a fruit and vegetable sampling. I will use several teaching strategies including but not limited to: journaling, listening comprehension, and class discussions. This unit will be tied back to several nonfiction texts on photosynthesis and the growth of plants. My unit on photosynthesis can easily be adapted for the early elementary grades.

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

16.04.04
Energetics of Biofuel - Investigating Alternative Energy Sources by Manufacturing Biodiesel, by Zachary Meyers

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

16.04.05
It Ain't Easy Being Green, by Patricia Moncrief

"It Ain't Easy Being Green" is a unit focused on Carbon Footprints. This unit is designed for 8th Grade Physical Science Students. Teaching Physical Science concepts can be challenging. If you are asked to teach environmental concepts, and at the same time want to stay frustration free, then this unit should put you at ease.

"Carbon Footprints" highlights the need for students to be socially responsible and reside successfully in a global community. Students will be given background information on greenhouse gases- tracing their dramatic increase since the Industrial Revolution, and will learn about fossil fuels- as to why renewable energies need to be developed and consumed.

Students will be participating in web-based interactive programs creating and measuring their respective carbon footprints. Throughout this unit students will be responsible for finding, and generating ongoing methods to reduce their "footprints". It also allows the

students to see how extremely important it is for them to be cognizant about diminishing their fossil fuel consumption, and replacing them with renewable energy resources.

The objective is to have them establish a new awareness that "footprints" need to be reduced. Controlling carbon footprints will last a lifetime…

(Developed for Physical Science, grade 8; recommended for Earth Sciences, grade 7)

16.04.06
Solar and Wind and Batteries, Oh My!, by Joseph Parrett

This is a kindergarten unit that could be adapted to other primary grades. It is an introduction to the energy sciences meant to enrich the force and motions kindergarten unit. Students will be actively engaged in STEM learning activities while learning about renewable and non-renewable sources of power. Specifically, students will be work with the sustainable energy sources of wind and solar energy. Representing non-renewable energy will be the battery, though comparisons to fossil fuels will be made. Students will work in collaborative groups in a series of hands-on experiments. They will be constructing cars out of Legos though any sort of building materials could be substituted for the Lego blocks. Once groups have studied cars powered by battery, wind, and solar they will compare and contrast their different vehicles and choose their "ultimate car". They will also justify their reasoning for the choice using facts from their observations. This activity is designed to be rigorous, relevant and highly engaging.

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

16.04.07
Náhasdzáán Nílchi Binaadohígíí - Carbon Dioxide, by Shirley Paulson

Air, like water, is essential for life. Unfortunately, in today's world, that fresh air we so desperately rely on daily is contaminated; therefore, it is not exactly fresh. Regrettably, the power of air pollution has reshaped our lives. We need an increased awareness of the air we breathe, how it affects our health and everything within the universe and how we can change our behavior to ensure that clean air is available to everyone.

Air pollution has been with us for a long time. As cities expand and population increases at an alarming rate, we realize that air pollution stems out of human activities. Burning fossil fuels (natural gases, coal and oil), factories and motor vehicles all emit harmful substances. In recent years, air pollution has reached such a critical stage where it affects the earth's atmosphere as it traps more harmful radiation from the sun. This has put stress on our planet.

The purpose of this unit is to empower students to get involved with the real problems of air pollution. We need to ensure that what we are breathing will not harm us or future generations. For this reason, students should look for "green" solutions for energy such as solar, wind power, and thermal energy. Despite the costs and challenges of renewable energy, we need to continue to look into other abundant sources of energy such as natural photosynthesis and sunlight energy.

This is a fifth grade unit. The unit plan is divided into 4 weeks commencing with building key background concepts, learning the causes and effects of air pollution, and caring about the environment. The lessons consist of extensive background information to engage students through multiple modes: reading and discussion of content topic books and articles, video viewing, group work, hands-on activities, inquiry-based learning, on-site educational experiences, participation in community events, and opinion writing.

Students will use cause and effect as they brainstorm key background concepts to build vocabulary, and design and conduct surveys. Reading of non-fiction books on air and carbon dioxide, and simple hands-on experiments, will be used to understand the basic concepts of air and carbon dioxide. Reading of informational texts about air pollution and a kinetic activity will demonstrate the importance of the respiratory system. Storytelling of Diné culture and history and a folktale story with timelines will be used to connect students to their environment. The scientific process will be used to perform inquiry-based learning; students will write an opinion composition and participate in Earth Week events for character development. Direct instruction, audio-visuals, work with a Discussion Group or a partner, Field Trips, Guided Discovery and Discussion, Inductive Inquiry, Journaling, Keyword Strategies, Note-Taking, and Scaffolding are instructional strategies incorporated into the lessons. Differentiated instruction will drive the unit to meet the needs of all learners.

(Developed for Integrated Science and Diné Culture, grade 5; recommended for Science and Diné Culture, grade 5)

16.04.08
The Future of Energy, by Jacqueline Alvarado

Energy is the number one problem that faces humanity in the next 50 years. In the event of a natural disaster and long-term energy loss, what will you do? This project-based unit, "The Future of Energy", is about world energy production, consumption, and its environmental impact. The unit begins with energy history, starting with the carbon cycle and the formation of fossil fuels and seeks to explore the human environmental impact of current usage and dependence on conventional energy. This unit will also teach students how to research alternative energies, including nuclear, geothermal, wind, and solar in order to apply this deeper knowledge gained to engage in a Socratic Seminar about the topic. The unit concludes with the students innovating a contraption to cook food and

make potable water in the event of a power outage. The unit will take place over five weeks in a sixth grade math and science classroom. It can be adapted for upper elementary through high school aged students.

Key words: fossil fuels human impact, carbon cycle, renewable energy, clean energy, science and engineering

(Developed for Science, grade 6; recommended for Science, grades 5-12)

16.04.09
Get Charged Up: The Past, Present and Future of Electricity, by Valerie Schwarz

This highly engaging curriculum unit is sure to electrify learning! The unit will begin by developing a deeper understanding of the roles Benjamin Franklin, Michael Faraday, and Thomas Edison played in modernizing the world in which we live.

Students will explore electricity through hands-on activities such as making lemon batteries, moving a ping-pong ball with static electricity, and building a motor. They will learn about circuits, current, electromagnets, motors, generators, and fuel cells. As the students work through the content, they will use their new knowledge to create a Thinglink page incorporating multi-media material designed on Glogster. The culminating activity will be an Electric Extravaganza where parents and special guests will visit the class. The students will unveil their finished product on Thinglink and make oral presentations explaining their learning. Students will also model making motors, circuits, and batteries. This curriculum unit is designed for Grade 4 but could easily be adapted to grades 5-8 physical science classes.

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

16.04.10
The Backwards and Forwards of Photosynthesis, by Larissa Spreng

The curriculum unit I plan to write will allow my middle school students to discover where the energy in fossil fuels actually comes from. Students will engage in a series of problem-based learning experiences in order to connect several large concepts including: the chemistry of photosynthesis, the role photosynthesis played in the evolution of Earth's atmosphere, fossil fuel combustion, and atmospheric chemistry. By focusing on the chemistry behind photosynthesis, middle school students will use the chemical equation for photosynthesis to learn about reactants and products in a chemical equation, balancing chemical equations, and subscripts and coefficients. Students will also able to discover where the energy in fossil fuels actually comes from by examining the photosynthesis and its reverse reaction, combustion. This chemical equation will also be used to analyze the role photosynthesis played in the evolution of the Earth's

atmosphere. Several hands-on activities will provide middle school students the opportunity to interact with photosynthesis firsthand by modeling molecular equations using toothpicks and gumdrops, watching photosynthesis occurring in spinach leaves, and testing how the color of light affects plant growth using a 5E lesson. This unit could be adapted to meet the needs of upper elementary, middle school, or even high school students.

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

V. The Number Line in the Common Core

Introduction

The number line is a central object in mathematics. It is seen in many primary classrooms, and at the other end of the spectrum of mathematical activity, forms the backdrop to many advanced mathematical constructions. It is the key link between geometry and algebra. Yet in comparison to its fundamental and central nature, it plays a remarkably small part in the mathematics curriculum. The goal of this seminar was to consider the ideas inherent to the number line and to think about ways in which it might play a larger role in mathematics instruction. I am delighted that all the Fellows, who teach in grade levels 2nd grade through high school, found creative and productive ways of using the number line in their units.

Carol Boynton plans to make a very long number line that goes to 1000, which her class will share with the whole school. They will place three-digit numbers on it, to bring out the hierarchical nature of decimal expansions – for example, in the number 642 = 600 + 40 + 2, the 600 tells you which of ten equal subintervals (of length 100) between 0 and 1000 you should look, then the 40 tells you of which of ten equal subintervals (or length 10) of the first subinterval you should look, and finally the 2 tells you at end of which of the ten unit intervals in the length 10 interval you land. Creating the full number line to 1000 will also allow her students to see how much larger 100 is than 10, and how very much larger again is 1000. This sense of the rapidity with which numbers grow with the length of their base 10 representation is important, but not easy to acquire, since the notation itself is so compact.

Kathleen Gormley and Jolene Smith will use the number line to teach fractions. It provides a valuable way to visualize all the whole number multiples of a unit fraction 1/d, as evenly spaced points, very much like the whole numbers themselves, except with closer spacing. It also provides a uniform way to think about addition, as putting bars end-to-end, that puts addition of fractions and addition of whole numbers on the same geometric footing, despite the difference in the symbolic manipulations they require. Jolene Smith's unit also connects the number line and fractions to Din´e culture, via the theme of blanket design.

The standard curriculum presents several methods for representing numbers. There is the standard base 10 place value notation for whole numbers. This is later extended to represent decimal fractions by introducing the notorious "decimal point". In between, there is the n/d notation which uses two whole numbers to represent a rational number as a fraction. In addition, the whole numbers are extended to integers by introduction of the – sign. All four of the middle grades teachers had found that these disparate symbolic representation schemes led to balkanization of their students' thinking: each class of

number as is conceived of as unrelated to the others. In addition, they sometimes do not think of fractions as numbers, but rather as a pair of numbers that are somehow associated. These Fellows had the insight that the number line offered a means for showing that all the types of numbers, despite their disparate symbolic representations, are in fact part of a common system, and all live together on the number line. Jade Lee's unit focuses on decimal expansions, and uses the number line to make visible the uniformity of the relationship between adjacent places in a base 10 number, regardless of the position of the decimal point. Jeffrey Rossiter and Aaron Bingea have created coordinated units. The first deals with placing the several types of numbers on the number line, showing how they coordinate with each other. The second uses the length model of addition and subtraction to develop a unified viewpoint toward the various symbolic procedures used to compute sums and differences. Coretta Martin's unit is conceivedin a similar spirit, with the goal of helping her algebra students achieve a stronger and more unified conception of number.

Finally, Klint Kanopka's unit focuses on the process of coordinatization: the preliminary choices, of origin and unit interval, that must be made in order to turn a line into a number line. The goal here is to give his physics students an appreciation of the coordinatization process in physics more broadly, and in particular, to help them deal with 2 and 3 dimensional spaces, and the geometry and algebra of vectors. Taken as a whole, the units demonstrate that there is potential for much greater use of the number line than is currently common, and that it can serve as a unifying feature of mathematics instruction throughout the K-12 curriculum.

Roger E. Howe

Synopses of the Curriculum Units

16.05.01
Adding and Subtracting Rational Numbers on the Number Line, by Aaron Bingea

When students are asked to operate with unfamiliar rational numbers they cling to previously learned algorithms without a conceptual understanding of what is actually happening with the numbers. Their insufficient grasp of foundational number and operation concepts are major contributors to an overall intolerance and avoidance of working on any task that contains these unfamiliar numbers. Although this issue is glaring, it is increasingly difficult to address when the middle school curriculum assumes and requires a fundamental and flexible understanding of numbers. This unit will boldly aim to formally and methodically address the fundamental issue of my students' limited number and operation sense via the use and study of the number line.

This unit is an extension and will be used in succession with Jeff Rossiter's unit, *Placing Rational Numbers on the Number Line*, which focuses on the realization and placement of rational numbers on the number line. From this prerequisite unit, students will gain a unified understanding of what rational numbers are and how they can be represented on the number line and then move on to adding and subtracting of rational numbers, the focus of this unit.

(Developed for Mathematics, grades 7-8; recommended for Mathematics, grades 7-8)

16.05.02
Using the Number Line in Second Grade, by Carol Boynton

For many second graders, the beginning of the year is a time for revisiting knowledge and skills learned in first grade. The summer months away from mathematics instruction along with little opportunity for practice and guidance sometimes means a loss of strong understanding of concepts. Addition and subtraction of numbers to 100 is a Common Core Standard for first-grade students, although many struggle with this fundamental concept even throughout second grade. This curriculum unit is designed to increase students' understanding of the number line as a tool to help them master two-digit addition and subtraction, improve their base-ten number sense and increase their fluency in mathematical operations.

(Developed for Mathematics, grade 2; recommended for Mathematics, grade 3)

16.05.03
Moving from Rods to Number Lines to Understand Fractions, by Kathleen Gormley

The Common Core standard states students should be able to understand a fraction as a number on the number line; represent fractions on a number line diagram. My intent for this unit is to shepherd fractions from an area model to the number line as I begin to explain and represent fractions as a distance or measurement. Student over generalize and pigeon hole their understanding of a fraction as a piece of something or a combination of two whole numbers instead of understanding that a fraction is a number in and of itself.

In order to gain a thorough understanding of mathematical ideas, students need to be able to make connections and integrate their learning of concepts in a variety of ways. Through the use of manipulatives, students can connect ideas to gain a deeper understanding. Student's achievement grows when they have access to manipulatives and are explicitly taught how these manipulatives can assist their learning. This unit will be infused developing number sense through the use of base ten blocks. These tools are an excellent way to bring students from whole number understanding to the understanding of fractions.

(Developed for Mathematics, grade 3; recommended for Mathematics, grades 2-5)

16.05.04
Beyond the Number Line: Coordinate Systems and Vector Arithmetic, by Klint Kanopka

Physics takes place in three-dimensional space where many fundamental quantities are represented by vectors, but instead of teaching "new math," how can the treatment of vectors be best linked to concepts already present in a student's math background? One connection for students lives in the revitalization of the long abandoned number line. Students have not dealt with them in years, but the tidy row of numbers that was pasted high on the wall in every elementary classroom forms the very foundation of a one-dimensional coordinate system. Constructing coordinate systems from nothing and then making measurements within them are the processes that allow the quantification of observations, an essential tool for any student of physics. I want my students to realize that arithmetic operations *change* things and understanding physics is understanding of stretches, sides and spins applied to objects in our world. Because of this, we will use transformations to interpret vector mathematics and, by extension, introductory physics. This is designed to be the second unit for my 11th grade General Physics and AP Physics 1 classes in a school where physics is the required science course for all juniors.
(Developed for AP Physics I and Physics, grade 11)

16.05.05
Decimal Expansion: An Address System for All Numbers, by Jung Lee

The goal of this unit is for middle school students to acknowledge the number line as a measuring device rather than a counting tool. As the number line shows the relationship of number placements in different base-ten scales, students can demonstrate that every rational number has its place on the number lines by doing decimal expansions. During the course of studying decimal expansions, students will see that the set of real numbers with terminating or repeating decimal expansions precisely finds their address on the number line. Decimals should not be treated as an isolated mathematical concept, but identified as a precise system to locate a number on the number line with its unique address. The metric system will be implemented as an extension of base-ten scales and students will be able to use the number lines with millimeter, centimeter, decimeter, and meter markings to measure line segments to the nearest tenth of a centimeter, a tenth of a decimeter, and a tenth of a meter. Presenting the metric system in scientific notations and relating it to the number line in a multiplication of tens; 1000, 100, 10, and 1 or 1, 0.1, 0.01, and 0.001 will be used as a form of formative assessment of the unit study.

(Developed for General Math, grade 8; recommended for General Math, Pre-Algebra, and Algebra, grades 7-9)

16.05.06
The Starting Line-Up: Analyzing the Number Line to Conceptualize Foundational Skills for Algebra, by Coretta Martin

This unit uses the number line to re-teach basic mathematics skills to deepen students' conceptual understanding of number conceptualization, fractions, and the addition and subtraction operations. The unit is intended to be a pre-cursor to Algebra I. Many concepts in Algebra I are connected to linear equations and models. Using a linear model to re-teach foundational skills will allow students to answer higher-level questions and explain their thinking.

The skills reinforced are all related to Common Core State Standards across all grade levels. These foundational skills are reoccurring throughout the "Creating Equations" and "Reasoning with Equations and Inequalities" standards. As teachers plan individual lessons and classroom activities, it will be important to ensure that students are being exposed to all of the Mathematical Practice Standards as well.

In this unit, a variety of teaching strategies will be employed such as the use of manipulatives and technology to gain a comprehension of the operations on the number line. The unit will also require a focus on active learning through intentional math discussions in the classroom, employing the use of Socratic Seminars. I believe that if this unit is used as an introductory unit, student will be able to connect their prior

knowledge of these skills through the study of the number line and will build a solid conceptual foundation for their continued success throughout the school year.

(Developed for Pre-Honors Algebra, grade 8; recommended for Mathematics Intervention, grades 6-8)

16.05.07
Rational Number Placement on the Number Line, by Jeffrey Rossiter

The students whom I've been teaching have always seen the various ways of writing numbers symbolically – fractions, decimals, and integers - as siloed representations of quantities with no relation between them. My unit uses Number Talks and other discussion based techniques to remedy this problem. The number line is the primary focus and is used to show that the various symbolic schemes are just ways of naming numbers. This unit is remedial in nature and can be taught as intervention as well. But because of its position at the $7^{th}/8^{th}$ grade level where students are deepening their fluency of number sense topics, this unit will set up students to be successful mathematical problems solvers in the future. This unit is intended to be taught first, with Aaron Bingea's unit titled: *Adding and Subtracting Rational Numbers on the Number Line* taught second. While my unit focuses on the foundational skill of placing various classes of numbers on the number line, Aaron's unit will deal with the operations of addition and subtraction.

(Developed for Mathematics, grade 7-8; recommended for Mathematics, 6-8)

16.05.08
Diyogi (Navajo Rug) and the Number Line, by Jolene Smith

The fraction and number concept are common difficulties students' have to learn and understand when solving fraction problems. Using hands on manipulative to help in learning the fraction concept will benefit students learning the fraction model. The manipulative; the Navajo loom and rug concept are ideal examples I will use when teaching fractions components and the number line. When analyzing a loom, measurements of fraction are used as the loom is in the process of designing. As the weaving begins, I model and inform my students of the type of patterns we will use to create the patterns while using fraction. My students begin to see they are using measurement of fractions.

The unit will cover math concepts of fraction and how to create and use fractions on a number line. I will introduce my unit on chart papers explaining the all the components of fractions. This unit will help students in enduring the understand fractions while weaving a Navajo rug. The math skills of number line and fraction will incorporate the Dine culture and language (the loom and the Navajo rug). The activities of the loom and rug

are ideal learning tools for students, parents, and educators who want their students to be engage in learning the number line and fractions while learning about the Diné's culture of weaving Navajo rugs.

(Developed for Diyogi and the Number Line, grade 5; recommended for Mathematics, 4-5)

VI. Making Sense of Evolution

Introduction

Earth is a dynamic planet, where change is perhaps the only constant in its roughly 4.5 billion-year history. This constant flux is seen in natural climate and environmental changes, as well as human activities that radically alter Earth's ecosystems. Life on Earth is also in constant flux, and evolution is the process by which organisms genetically change to keep pace with these ongoing challenges. The confusion (and controversy) over evolution concerns the study of species relatedness in the deep past, particularly the shared ancestry of humans and the rest of Earth's teeming biodiversity. But it is vital to understand that evolution is an active and continual process, which affects all current-day species including humans. Many examples come from human medicine, such as the global problem of evolved drug-resistance in bacteria, and the recognition that cancer spread in the body is essentially an evolutionary process. The mass production of food has clear societal benefits, but modern agriculture uses genetically similar organisms that are vulnerable to pathogens and pests that evolve to exploit them, causing huge economic losses. The understanding of evolution has transformed a wide variety of fields, ranging from forensics to linguistics, and conservation biology to software design. Also, technological innovation relies on evolution thinking, such as engineering design principles of airplanes, submarines and other machinery that mimic evolved forms in nature. Evolution especially impacts biotechnology, such as using directed evolution to manufacture algal biofuels and other alternative energy sources, and informing synthetic biology approaches to construct novel biological parts, devices and systems.

The seminar "Making Sense of Evolution" explored the fascinating importance of evolutionary biology in our dynamic world, and was designed to appeal to biology/science teachers at all grade levels. The overarching goal was to empower teachers in their knowledge of the often-confusing topic of evolutionary biology, with the expectation that this understanding would enrich the classroom experiences of their students. The resulting units were diverse, reflecting the varied interests and backgrounds of the Fellows. Jennifer Claudio develops a unit for high school students concerning the evolution of species diversity in insects and other arthropods, emphasizing how the differing feeding habits and other unique adaptations of these "silent witnesses" help forensic scientists pinpoint details such as time of death in crime scene investigations. The focus of Akemi Hamai's unit for eighth graders is on the bioethics of genetic engineering, and weighs the benefits of our ability to harness naturally evolved mechanisms such as CRISPRs to genetically alter organisms, eradicate mosquitoes and design babies versus the costs of using such technology that may accidentally alter biological systems in unexpected and uncontrollable ways. David Ostheimer's unit for first and second graders helps young learners understand how natural selection shapes animal traits across generations over very long periods of time, using the transition from

dinosaurs to birds as a prime example and explaining why 'evolution' during the individual lifetimes of familiar Pokemon characters cannot really occur. Amanda Snow's unit combines instruction on geology and evolution to help middle school students understand Earth's geological history through an evolutionary lens, emphasizing the fossil record and adaptations that allow organisms to thrive in the face of historical shifts in the planet's climate. Thomas Teague's unit for middle school students concerns transitional forms ('missing links') and the clear evidence for evolutionary change over time in familiar groups of organisms, such as the well-documented fossil transition from land-dwelling to ocean-dwelling traits during the evolution of whales. Vanessa Vitug's unit is designed for high school students and concerns the ability for evolution to inform our understanding of human physiology and disease ('evolutionary medicine'), particularly how the unique evolution of the human brain may cause its greater vulnerability to diseases such as Alzheimer's and illnesses caused by prions (infectious proteins).

Paul E. Turner

Synopses of the Curriculum Units

16.06.01
Silent Witnesses: Hexapod Helpers in Crime Scene Investigation, by Jennifer Claudio

Prime time television shows glamorize crime scene investigation, hence increasing the popularity of high school forensic science course offerings. Forensic science offers exciting opportunities to practice applied sciences in ways that contribute to meaningful learning. Moreover, the emphasis on the study of insects within this curricular unit enhances the forensic science curriculum by filling in gaps in the learning and teaching of evolution. Insects provide evidence regarding time of death, and they even sometimes are victims of poaching. Whether students calculate the life cycle of a blowfly or compare the natural variation of other insect species, the role of insects in forensic science depends entirely on their speciosity – the richness and broadness of their species – which is attributed to the mechanisms of evolution that have driven their adaptations. Insects work dutifully as silent witnesses, and forensic entomologists must provide a voice for them in the court of law. Knowledge of insect species – originating from understanding concepts in evolution – is thus essential to these specialists and for our students. This lesson was designed for a high school forensic science course, however it is suitable for most high school biology courses. Its concepts can also be adapted for younger students.

(Developed for Forensic Science and Advanced Science Research, grades 10-12; recommended for Biology, grades 9-12)

16.06.02
Genetic Engineering and the Potential Effects on Evolution, by Akemi Hamai

Imagine a world without disease; no cancer, no zika virus, no malaria parasite. Just a decade ago, there was not a way to effectively eradicate these and other harmful diseases from the human population, until recently when some new technologies were developed. These same advances can be applied to agriculture to help crops grow in drought plagued areas and to enrich food to make it more nutritious. Now there are new technologies called CRISPR-Cas9 and gene-drive that are so powerful that they can potentially force a species into extinction and may allow parents to choose their children's genes. There are many ethical questions about using this new technology and we as a society must decide if the risks are worth the rewards and how it will affect evolution on this planet. Students in this unit will explore the ethical considerations of GMOs, "designer babies" and genetically engineering mosquitoes though readings, a Socratic Seminar and an argumentative paper. This unit is geared towards 8th grade students and can be adapted for high school. This unit aligns with the NGSS and Common Core standards.

(Developed for Science, grade 8; recommended for Life Science/Biology, grades 9-12)

16.06.03
Gotta Evolve 'Em All! Evolutionary Ideas for 1st Graders, by David Ostheimer

This is a unit for 1st and 2nd grade classrooms and will address the Next Generation Science Standards 1-LS3-1 Heredity, 2-LS4-1 Biological Evolution, and the Common Core State Standards for Speaking and Listening and Writing. The goal is for students to be introduced to the idea that evolution does not happen within an individual, but must happen across generations for a population or species to become better adapted to its environment. Similarly, adaptations do not spring forth all at once unlike for popular characters such as Spiderman; rather, it takes many generations of evolution for major changes in the traits of a species to occur. To do this we will discuss natural selection and how this process contributes to evolution. We will discuss how Pokémon "evolve". We will then discuss how birds evolved from dinosaurs. We will revisit Pokémon and discuss how they do not really evolve, in the true sense of a population evolving by natural selection. Our activities will include adapting Mr. Potato Head to survive in new environments and piecing together the transitional forms from dinosaur to bird. For our culminating activity, students will choose a Pokémon (or other organism), design adaptations that their creatures will evolve, and will identify why those adaptations were key to the survival of the species. Students will also provide transitional forms to show how their creature changed over time.

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

16.06.04
Understanding Earth's History and Geologic Time through Evolution, by Amanda Snow

Although we can imagine the Grand Canyon being carved by the Colorado River over millennia, it can be difficult for adults and students to picture and understand the considerable changes not only in geology but in the life forms that have existed. In schools it is not common to teach the concepts of geologic time and evolution in tandem. Prior to this unit, students should have studied basic geologic processes and laws, such as sedimentation and the law of superposition. This unit aims at helping middle school students better understand Earth's history, events, and environments through the lens of evolution. Topics in this unit include the geologic time scale, fossil formation, fossils and evolution, mechanisms of evolution, evolution and the environment, and a glance at an example organism, the woolly mammoth. Students will bring geology and evolution together through the construction of explanatory models, hands-on activities, fossil analysis, argumentation with evidence, and scientific literacy.

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

16.06.05
Transitional Forms: The Evidence for Evolution by Natural Selection, by Thomas Teague

(Developed for Science, grades 7-8; recommended for Junior High Science, grades 7-8)

16.06.06
The Ever Evolving Brain and Neurodegenerative Disease, by Vanessa Vitug

The human brain is perhaps the last unchartered frontier of the human body. Understanding the story of human brain evolution provides a foundation for understanding human intelligence, and even the development of disease. Through this curriculum designed for 11th and 12th grade Physiology, students are introduced to the basics of neuroanatomy, functional areas of the brain, and evolution.
Evolution is traditionally taught in 9th grade Biology. This curriculum unit extends students' understanding of Charles Darwin's descent with modification by focusing just on the brain. When questioned what makes the human brain so unique among all other species, students will be able to cite evidence from the comparative anatomy of brain volumes, gyrification (brain folding), and genetics. A further extension of this unit will explore the relationship between evolution and medicine by considering two protein-folding diseases.
As a culminating Next Generation Science Standard project, students will utilize readings, internet research, and supplemental texts to model brain evolution, disease evolution, and brain disease. Students will showcase their brain evolution understanding through the creation of models for their Health Forum Series showcasing current health topics to their peers.
Keywords: brain evolution, disease evolution, Alzheimer's disease, prion disease
(Developed for Anatomy and Physiology, grades 11-12; recommended for Health Science, grades 9-12, and Biology, grade 9)