Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2018

Contents

Preface

In March 2018 the Yale National Initiative to strengthen teaching in public schools® accepted teachers from seventeen public school districts in nine states and the District of Columbia to participate in five 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.

Thirty-eight of the teachers, named Yale National Fellows, were 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; and San José, CA. Other National Fellows came from existing Teachers Institutes located in New Castle County, DE; New Haven, CT; Philadelphia, PA; and Tulsa, OK. Overall, half of the National Fellows were participating in national seminars for the first time.

The National Fellows attended an Organizational Session of the seminars held in New Haven on May 4-5. The seminars reconvened during a ten-day Intensive Session from July 9-20 and concluded in mid-August when the Fellows submitted their completed curriculum units. The five seminars were:

- "Race, Class, and Punishment," led by James Forman, Jr., Professor of Law;
- "Poems about Works of Art, Featuring Women and Other Marginalized Writers," led by Paul Fry, William Lampson Professor Emeritus of English;
- "Adaptation: Literature, Film and Society," led by Brigitte Peucker, Elias W. Leavenworth Professor of Germanic Languages and Literatures and Professor of Film Studies;
- "Big Numbers, Small Numbers," led by Roger E. Howe, William R. Kenan, Jr. Professor Emeritus of Mathematics; and
- "Manipulating Biology: Costs, Benefits and Controversies," led by Paul Turner, Elihu Professor of Ecology and Evolutionary Biology, and Acting Dean of Science.

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 reinforces 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 five volumes, one for each seminar, and are disseminated at teachers.yale.edu. We encourage teachers who use the units to submit comments online.

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

James R. Vivian

New Haven
August 2018

I. Race, Class, and Punishment

Introduction

Our seminar began with the startling fact that the United States has the largest prison system in the world. We dove down to explore mass incarceration's historical roots, and its particular impact on communities of color. Many of the Fellows wanted to study juvenile justice and school discipline, and these topics became a theme of our seminar. Our second theme was student advocacy and activism. As a result, most units begin by exploring a problem and end with lessons on how students might work for reform.

Some Fellows sweep broadly across time, place, and subject matter. **Sean Means** identifies three systems of oppression—the education, economic, and judicial systems—and studies the ways in which they have worked to isolate and oppress black communities throughout American history. Reflecting the great number of immigrants in his school, **Mark Hartung**'s curriculum contrasts debates over immigration with those over mass incarceration. **Robert Schwartz** uses Ana Duverney's documentary *13th* alongside my own *Locking Up Our Own: Crime and Punishment in Black America* to contrast America's rhetorical commitment to freedom with its actual practice of overincarceration. Our seminar began with the startling fact that the United States has the largest prison system in the world. We dove down to explore mass incarceration's historical roots, and its particular impact on communities of color. Many of the Fellows wanted to study juvenile justice and school discipline, and these topics became a theme of our seminar. Our second theme was student advocacy and activism. As a result, most units begin by exploring a problem and end with lessons on how students might work for reform.

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Other Fellows chose to ground their units in their own states, cities, and even neighborhoods. Philadelphia's **Matt Menschner**—who became known as the Fellow who had read every book on every topic—examines the evolution of crime policy in the City of Brotherly Love as a microcosm of the national story. Richmond, VA's **Rodney Robinson** teaches in a school inside a juvenile prison. His unit seeks to understand the juvenile and adult criminal systems in Virginia and nationally, while forcing his student to grapple with how and why they have become targets. **Ann Brown**, also from Richmond, VA, focuses on her school's own Church Hill neighborhood. Church Hill is at once a site of slavery and rebellion, black cultural pride

and systematic over-policing, and Ann uses those contrasts in a unit that asks her students to imagine how they can overcome their neighborhood pitfalls and achieve greatness.

Finally, a number of Fellows choose to focus on the place where mass incarceration meets schools most directly: school discipline and the school to prison pipeline. **Sara Mingione** connects Hummarabi's Code in ancient Mesopotamia with school discipline policies in her own San Jose middle school. Our hard-working seminar leader **Jennifer Vermillion** (aka "Verm") analyzes California's juvenile justice system and the school to prison practices that sustain it. **Sharon Ponder** studies restorative piece circles as an alternative to exclusionary zero tolerance practices of suspension and expulsion. **Kalah Bell** studies three remarkable individuals who succeeded despite early involvement with punitive school discipline and juvenile courts. In so doing, she hopes to equip her students to understand—and overcome—the obstacles they face. These units do two things at once: challenge students to imagine what justice in schools looks like, while equipping them with the tools to make their vision a reality.

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James Forman, Jr.

Synopses of the Curriculum Units

18.01.01
Decriminalizing Education, by Kalah Bell

The purpose of this instructional unit is to deepen my students' understanding of the harsh realities of the school-to-prison pipeline construct and teach them how to apply principles of activism and policy making to support a dismantling of this system. The goal is to help students to become aware of the pitfalls that exist within their own schools that could ultimately lead them down a path to incarceration and to show them how to not only avoid those pitfalls but how to overcome adversity and become a voice of support for other marginalized members of their school and community.

The instructional unit is 4-6 weeks in length and the curriculum is designed to meet the academic and social-emotional needs of the students as well as to address the needs of the adults who work with them, by cultivating positive identity development, high frequency of student teacher interactions, healthy peer relations, responsibility, avoidance of risky behaviors, communication skills (reading, writing and speaking), tools for goal setting, overcoming obstacles and having successful transitions back into their schools and communities.

(Developed for ELA and Humanities, grades 8-12; recommended for ELA and Humanities, grades 8-12)

18.01.02
A Church Hill: The Birth, Death, Revival But What About the Children?, by Angela Brown

I teach 7th grade English at Martin Luther King, Jr. Middle School in Richmond, VA. There has been a lot of renovation to the Church Hill where my school is located. The problem with the renovation and rejuvenation of Church Hill is that the changes have not affected the students at my school nor their neighborhood. Church Hill's past included trading slaves and harsh punishment towards the slaves. Church Hill's past served as a reminder of Jim Crowe laws and racial degradation. However, the area is full of rich black history and culture. Since my school zone has seemingly been forgotten, I want to awaken my students and teach them about self-pride, receiving a solid educational foundation and not accepting the path that their parents and grandparents (who may have had no choice) chose. I want my students to free themselves of the mindset that may be on the road to the prison-pipeline.

I intend to do this by submitting a curriculum unit that will move MLK for being a school for misfits to a school every child wants to attend. I will propose to have time within the school hours to have peace circles, mentoring sessions, and relevant cultural activities. I

will propose that the school staff receive training on how to better teach and serve students coming for traumatic homes. I will propose that the school invest in books demonstrating how children can succeed although they have experienced traumatic lifestyles. I will propose we invite positive influential motivator speakers to have open forums for the students to heard words of encouragement.

I will propose that the curriculum involve research of Church Hill's leaders who have fought for civil rights. I will propose MLK invest in having a rich Black History celebration and develop community projects to foster a change in the mindset of the residents in Church Hill. I will propose that the school have Saturday school not just at state testing time, but throughout the school year. I will propose the school have etiquette training and vocational job training classes. I will propose that teachers mentor at least two children within the school to give them experiences beyond the neighborhood. Finally, I will propose that each teacher receive training to foster rigorous learning and activities.

(Developed for English, History, and Math, grade 6; recommended for English, History, and Math, grade 6)

18.01.03
The Intersection of Crime and Immigration, by Mark Hartung

This unit focuses on inequality in America by comparing immigration issues with mass incarceration issues. Students will investigate changing attitudes in the United States about immigrants and the current climate that equates the immigrant with the criminal. Students will begin with a relevant controversy – the separation of families by immigration officials. They will then compare and contrast the problem of mass incarceration with the attitudes about immigrants and immigration and study the connections made. Students will look at the government's role in protecting the rights of immigrants and review Supreme Court cases to determine if those rights are expanding or contracting. Applying this knowledge to the present controversy will allow students to see how the government affects their rights today – connecting the unit to the present. The final step will ask students to think about solutions that would change and improve the current climate and system.

(Developed for Social Studies, grade 8; recommended for U.S. History, grade 11, and U.S. Government, grade 12)

18.01.04
The American Dream, by Sean Means

This unit examines the educational, economic, and judicial systems within American society that have systematically and intentionally oppressed people of color since the

founding of the nation. Using both a social justice and a historical lens, the unit examines how the founding documents and the economic, educational, and judicial systems all work together to create a system that segregates opportunity based on color and class. The unit opens with an examination of the founding fathers and the documents that serve as America's promise to its people. It then explores how the American educational system has and continues to underserve children of color. These roadblocks are intentionally placed to prevent common-sense reform and perpetuate the inequitable allocation of resources. Next, the unit studies how the economic system has historically prevented the African American community from developing and building generational wealth. Lastly, the unit uncovers the truth behind the judicial system and examines the motivations of the politicians that manage and manipulate it. It explores how the current judicial system, much like slavery, has been used as a source of economic gain for some while disenfranchising others.

(Developed for African American History, Social Justice, and U.S. History, grades 11-12; recommended for African American History, Social Justice, and U.S. History, grades 11-12)

18.01.05
From Mass Incarceration to Reform: An Analysis of Crime Policy Nationally and in the City of Brotherly Love, by Matthew Menschner

This unit is designed to review the history and evolution of criminal justice and mass incarceration in the United States, with Philadelphia as a parallel case study. Many of my students understand that the system disproportionately affects people of color, yet they lack a nuanced understanding of the series of events that led to this crisis. Beginning with a brief history of early prisons in North America, we will examine the policy makers and their enacted legislation in relation to the continually-rising prevalence of "get tough" attitudes. The War on Drugs, the crack epidemic and controversial three-strikes laws will be detailed through case studies and rhetorical analysis. Short statistical analyses will give students a broad view of the scope and demographics of mass incarceration, while the aforementioned policy overviews will provide the historical context and socioeconomic minutiae. The unit will conclude with students conducting their own ethnographic research. By interviewing and detailing the experiences of members of their family or community who have had involvement with the criminal justice system, they will utilize firsthand knowledge to create an editorial piece or photo essay detailing what they have researched.

(Developed for U.S. History, grade 10; recommended for U.S. History, African American History, and Social Science, grades 9-12)

18.01.06
Ancient Law Codes to School Discipline: Is it Justice for All?, by Sara Mingione

When we look at the first development of civilization in Mesopotamia, we see the beginnings of justice in a society. Hammurabi implemented his law code to protect the citizens and create order in one of the first empires. His main focus for his law codes was justice for his people after responding to their complaints. What is often difficult for students, especially in middle school, is to make connections from what they are learning in ancient history to today. This unit serves as a way for students to analyze the significance of Hammurabi's Law Code, but to also think about our discipline system in schools and why students misbehave. Dismantling the school-to-prison-pipeline starts in our schools. By implementing positive behavior interventions and supports (PBIS) and restorative justice practices, we can help keep our students in schools. Students who are at-risk and have experienced trauma, perform lower than their peers and are suspended and disciplined at much higher rates. Teaching students how to analyze why we have behavior issues in schools and what are some possible solutions will allow them to advocate for their own success. This unit not only challenges students to think about our discipline system, but it also challenges teachers and administrators to implement restorative practices to keep students in school and prevent behavior issues in the future.

(Developed for Social Studies, grade 6; recommended for Social Studies: Ancient Civilizations, grade 6, and Language Arts: Argument, grades 6-8)

18.01.07
This is America: Restorative Peace Circles and the decline of Suspensions and Expulsions, by Sharon Ponder

> "What's fundamental about restorative justice (practices) is a shift away from thinking about laws being broken, who broke the law, and how we punish the people who broke the laws. There's a shift to: there was harm caused, or there's a disagreement, and how do we repair the harm, address the conflict, so that relationships and community can be repaired and restored, It's a different orientation. It is a shift." Cheryl Graves- Community Justice for Youth Institute

This curriculum unit focuses on the justification for implementing restorative justice peace circles in American schools. It will also share research and evidence that demonstrates how the vicious cycle of the school to prison pipeline is damaging our cultural foundation. What positions restorative justice peace circles apart from typical punitive methods is that restorative justice does not view crime as an act against the state, but rather "as an act against individuals and their community. Restorative peace circles are designed to provide students, staff, community members and law enforcement officials opportunities to analyze and discuss their issues and or concerns in a safe space. A peace circle is a restorative justice model that, like other restorative justice practices,

can be used to address conflict holistically and solve problems. Peace circles emphasize healing and learning through a collective group process, aiming to repair harm done and assign responsibility by talking through the problem. In this unit students will learn a brief history on peace circles and its benefits. The unit will culminate in a PEACE project where students create poetry, technology integrated projects and public service announcements highlighting the benefits of conflict resolution as well as accountability through restorative practices.

(Developed for Social Studies, grades 4-5; recommended for Social Studies, Physical Education, and Health, grades K-8)

18.01.08
Understanding the System: A History of Prison and the Virginia Juvenile Justice System, by Rodney Robinson

The criminal justice system in America is ever expanding. The United States has the highest incarceration rate of any industrialized country in the world. In 1970, there were less than 250,000 prisoners in the United States. Today, there are over 2 million. It is one of America's biggest problems. Prisons are continuing to grow despite crime declining all across the country. 1 in 3 black males will be incarcerated at some point during their lifetime. This is not an accident. Criminal justice policies are rooted in racism and classism.

In Virginia, youth are incarcerated in 24 juvenile detention centers, 18 group homes, and one youth prison—Bon Air Juvenile Correctional Center—all operated or overseen by the state's Department of Juvenile Justice (DJJ). Black youth are overrepresented in Virginia's juvenile justice system and accounted for 71 percent of all admissions to Juvenile Correction Centers in 2016 (Justice 2016). Virginia's public-school system has the highest number of student referrals to the juvenile justice system in the country, with a rate double the national average. This is a system that presents significant problem.

My students are incarcerated in the Richmond Juvenile Detention Center in Virginia. Their life experiences have led to bad choices, which have caused their incarceration. Most are in survival mode 24 hours a day, 7 days a week. The students do not have the vision to understand the juvenile justice system because they are too busy trying to survive the system. This unit will allow the students to step outside of themselves and examine the system and the circumstances that have led to their incarceration and a better understanding of how to avoid future incarceration.

(Developed for Virginia and U.S. History, grades 6, 7, and 11, and Virginia and U.S. Government, grade 12; recommended for Sociology and African American History, grades 9-12)

18.01.09
13th and Locking Up Our Own: Argument, Voice, and Perspective in Two Modern Meditations on Mass Incarceration, by Robert Schwartz

Our early society flourished in a rich economy void of the burden of having to pay for its labor. This country, for all its booming rhetoric of freedom, would not be powerful enough to assert such rhetoric if not for its first enslaving people in bonds. Some would argue that these bonds were never broken, simply recast overtime to their current iteration: bars. This curricular unit is meant to educate students about those who make said arguments, while studying their rhetorical styles. The Ava Duverney film *13th* argues that slavery was never abolished, simply redesigned over time, through Jim Crow, and now into modern mass incarceration which to this day relegates people of color in this country in far too large a number to continued unpaid servitude and bondage. *Locking Up Our Own: Crime and Punishment in Black America* by James Forman, Jr. uses our nation's capital as a backdrop to explore the history of crime in a largely black populated city along with the responses by prominent black and white police and politicians that is an insider's view of the evolution of criminal justice to its current state. Through these important works, students will analyze voice, perspective and argument in writing and film, through work with vital and engaging information about mass incarceration and its evolution and consequences.

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

18.01.10
Juvenile Justice in California: A Rhetorical Approach, by Jennifer Vermillion

A summary of the causes of the school-to-prison pipeline and strategies for teachers to help use social justice and brain development research to stem the flow as well as research and lessons on juvenile justice to build empathy in students. Strategies and research for classroom teachers will provide rationale for the use of restorative justice and other practices and to avoid pushing students out of the classroom. Articles and strategies for students focus on rhetorical analysis appropriate for senior English and designed to engage and create educated voters able to converse about issues like race, incarceration, juvenile justice, social justice, adolescent brain development, and implicit bias. Focus on students of color, and particularly Latinos, allows relevance for current events and a consideration of rehabilitation versus the punitive nature of justice in California. Students will familiarize themselves with various strategies to analyze the art of persuasion and rhetorical strategies such as journaling, annotating a text, descriptive outlining, writing a rhetorical précis, and SOAPSTONE. While the unit is intended for a senior English class with a focus on rhetorical analysis, government, history, and sociology teachers may find the content useful.

(Developed for English-ERWC, grade 12; recommended for English and Sociology, grades 10-12)

II. Poems about Works of Art, Featuring Women and Other Marginalized Writers

Introduction

For this seminar I returned to the subject of ekphrastic poetry, which I have worked with in the National Initiative several times before, but I think not to the exclusion of other sorts of poem, and not with an emphasis on gender and race. This year's Fellows came from a great many different classroom situations: there were three art teachers together with an English language teacher who is also an artist; there was a middle school Spanish teacher; and there was a teacher of high school-age and even older students considered unfit for ordinary public schools; there was a teacher in an all-Black classroom in Washington, D. C.; and there were a kindergarten teacher and a middle school teacher of students on the Navajo Reservation of the Diné Nation--students quite different from each other, as the kindergarten students are ESL learners from the interior of the reservation who speak Navajo at home and the older students from near the edge of the reservation are in danger of losing touch with the culture of their parents and ancestors. The other three teach in perhaps more normative circumstances. There are also curious overlaps in interests. For example, three teachers, none of them the art teachers, are working with poetic, visual and other responses to the public art of murals. Of these three the two from Chicago are participating in the groundswell of interest in the murals of ethnic neighborhoods that is also going on at the university level there. Because of these overlaps, I have chosen not to arrange these units alphabetically but according to subject matter.

Also unusual about the ten Fellows in my seminar is the fact that apart from the experienced Coordinator the other nine were participating in an Institute model seminar for the first time. Considering that fact, it is remarkable that they could all write, with efficiency and clarity of purpose, units that will make wonderful springboards for the various kinds of teaching they hope to do. Many were attracted chiefly to the chance to compare verbal and visual works, often remarking that in the electronic age there are more and more visual learners; and in some cases one could sense them feeling constrained by the need to channel their goals entirely through poems about works of art. But as they saw soon enough, there was really no such need, despite the seminar emphasis, and most of the Fellows drew upon ekphrastic poems among many other ways of bringing the verbal and the visual into conjunction.

The first three units engage, as their primary focus, with the interpretation of ekphrastic poems, focused on seeing the work of art as the poem sees it while also training students to "read" the work of art on their own, and in their own poems. Two of these three units have in common close attention to Robert Hayden's "Monet's Water Lilies." **Anita Galloway** of Washington, D. C. selects this poem for her high school students together with Blake's illuminated and very complex "The Little Black Boy" and a poem from Natasha Tretheway's *Bellocq's Ophelia*, a series that responds to photographs of New

Orleans prostitutes taken over a century ago. **Elizabeth Mullin** of Richmond has a special interest in emotional responses to art and poetry, and builds on this interest for her middle school students with a pedagogical contrast between "objective" reading (of Longfellow's "The Cross of Snow") and "subjective" reading, modeling her own private response (to Edward Hirsch on Hopper's "House by the Railroad"), before blending the two in her way of reading Hayden's poem. The seminar's excellent Coordinator **Krista Waldron** focuses on the confessional poetry of Robert Lowell, Sylvia Plath and Anne Sexton, feeling that her socially marginal students will respond most readily to a personal emphasis—one that admits pain--and chooses for the purpose Lowell on Vermeer's "Girl by a Window," Plath on De Chirico's "Disquieting Muses," and Sexton on Van Gogh's "Starry Night."

One of the three units with an emphasis on murals points toward the whole class's production of a mural—and then writing about it—as a culminating exercise. **Stephany Jimenez** of Chicago, an art teacher, teaches eighth graders and will warm them to the task of visual-verbal comparison with U. A. Fanthorpe's hilarious poem, especially funny to adolescents, on Uccello's "St. George Killing the Dragon," "Not My Best Side," then get them to think about compositional form with Williams on Bruegel's "Fall of Icarus" and about the public reception of controversial art with E. B. White on a Diego Rivera mural before turning to the mural project, for which, as an artist, she is well suited to give instruction. (I paint, and I took notes!) **Laura Gillihan** of Chicago teaches in an elementary school that is surrounded by three proud and wholly distinct Chicago neighborhoods featuring works of public art. Having introduced her students to ekphrasis with a neighborhood poem, Dan Masterson on Hopper's "Early Sunday Morning," she then moves them into the back and forth of imaging poems and writing about images, all in response to repeated neighborhood walks. The Spanish teacher **Holly Bryk** of Delaware, who shares Jimenez's interest in Diego Rivera, will devote her unit to a poem in the target language by Xánath Caraza called "Catrina," the skeletal Mexican "grande dame of death," which responds in part to Rivera's great mural "Suena de una Tarde Domical in Alameda" (Catrina its central figure) with the purpose of simultaneously teaching the Spanish language, Mexican cultural mythology, and Mexican history.

As I indicated, the two Diné teachers face opposite challenges, yet they share the ultimate purpose of cherishing traditional culture. **Desiree Denny** will encourage her Kindergarteners to learn English vocabulary through the mnemonic means afforded by rhyme and augmented by illustration. For this purpose she has chosen four Mother Goose rhymes with fine Edwardian illustrations, rhymes with subjects familiar to the children--sheep and other animals—allowing them to make connections with their own traditions while learning the exotic language of a distant time and place. **Ella Earl** encourages her ninth graders to reflect on tradition and their sense of place, first with Georgia O'Keefe's "Red Hills and Bones" and Laura Kasischke's poem about it, and then with a poem that Navajo artist Shonto Begay wrote about his own painting, "My Mother's Kitchen." She

then encourages the students to write poems about traditional objects, such as bowls and baskets, which have acquired aesthetic value.

The other two art teachers are devoted to their students' sense of personal well-being, to be realized through psychological activism and political activism, respectively—not that these are wholly distinct approaches. **Leigh Hall** of Pittsburgh has engaged in research showing that the leading cause of students' disruptive behaviors is household and neighborhood trauma. To make her fifth graders more comfortable with themselves, she encourages verbal and visual self-portraiture. The ekphrastic poems she chooses to familiarize them with the possibilities of the genre are Bobbi Katz's pantoum on Mark Rothko and John Stone's poem on Hopper's "Early Sunday Morning," a poem strikingly different in attitude from Dan Masterson's, studied by Laura Gillihan, who also urges neighborhood activism. **Nina Ford** of Richmond**,** finally, uses a remarkable visual archive ranging from images of Blacks in the Jim Crow era to the complex cultural statements of today's African-American avant-garde artists to get her ninth through twelfth graders to recognize the pervasiveness of micro-aggression in white culture, turning eventually to the work of Black poets from June Jordan to Claudia Rankine expressing this same theme.

Paul H. Fry

Synopses of the Curriculum Units

18.02.01
The Poetics of Truth and Beauty: A Practical Approach to Reading and Understanding Ekphrastic Poetry, by Anita Galloway

Poetry has a way of speaking to our souls and encouraging us to connect to the world on a personal level that gives us a sense of solidarity and oftentimes relief. A great poem can remind students that the world is a big, interesting place full of opportunities and adventures. To make the most of these illuminations, we must be able to effectively read and understand poetry. This unit aims to introduce new and reluctant readers of poetry to a practical and reliable approach to poetry, with a special emphasis on the ekphrastic poem. The unit content includes a poetry "tool kit" that serves as a fundamentals resource, with strategies for how to read poetry, use poetic devices, and interpret ekphrastic poetry. Further, the unit proposes two forms of assessment: a critical analysis essay and an original ekphrastic composition. There are suggestions for physical and virtual field experiences and a culminating activity. One of the primary goals of this unit is to get students to understand that poetry can help us to release a range of emotions and make sense of them in a way that others can appreciate and relate to.

(Developed for English/Language Arts and Humanities, grades 9-11; recommended for English/Language Arts and Humanities, grades 9-11)

18.02.02
Reflections Upon Reflections: Ekphrasis as Self-Exploration in Middle School ELA, by Elizabeth Mullin

Because moody middle school students are often unwilling to pay attention to topics that aren't personal, making learning personal is key. As an ELA teacher, I have an advantage here, and an opportunity. The arts have no meaning without our affective responses. We can help our students realize this, while also supporting literacy, school engagement, and emotional intelligence, by teaching ekphrastic poetry, which inherently values subjectivity.

Putting their subjective responses to literature and art front and center may be novel and interesting enough to engage even the most reluctant ELA students if they have the right tools. My seventh graders will first study the vocabulary of emotion, creating personal chapbook lexicons of emotion words. They will also study color's effect on emotion. Then, after closely reading several examples of ekphrastic poetry, we will embark on two field trips to the local museum of fine arts. Students will choose a work of art that they find evocative, and describe their moods before, during, and after encountering it. In their poetry, these descriptions will be conflated with their interpretations of the art itself.

Ideally, the final poems will be naturally metaphorical, deeply personal, and surprisingly satisfying for my students.

(Developed for English, grade 7; recommended for English, grades 8-10, and Art, grades 7-10)

18.02.03
The Third Space: Ekphrasis, Confessional Poetry, and Mental Health, by Krista Waldron

Written for an image-oriented group of students who are mostly behind in grade level and literacy skills, this unit pairs art and poetry in the study of poems written about works of art, or ekphrastic poetry. Students will learn or improve visual literacy skills, deep-reading skills, and poetry writing skills while they practice mature discussions around the three main strands of the unit: confessional poetry, ekphrastic poetry, and poets who struggle with depression and bi-polar disorder. Robert Lowell, Anne Sexton and Sylvia Plath are the three poets whose ekphrastic poems we will study. The artists whose work is written about are Johannes Vermeer, Vincent van Gogh, and Georgio de Chirico, respectively. We'll finish the unit by studying works of art—mostly by artists who have their own mental health struggles—and writing our own ekphrastic poems. In addition to the academic objectives of the unit, we want to honor and explore the struggle of these creative people. In my student body, mental health issues are common and not often treated. Because of the sensitive but relevant nature of the poets' lives and their poems, this unit is intended for my more mature students in 11th and 12th grade.

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

18.02.04
Creatively Communicating through Visual and Verbal Art- Poetry and Murals, by Stephany Jimenez

This unit will introduce the concept of ekphrastic poetry to 8th grade students to challenge their way of thinking and learning through verbal and visual art. Specifically, students will examine poems and murals to discover how poets and artists effectively communicate an idea in their minds to an audience using text and paint. This analysis will enrich a student's appreciation of how various art forms mutually inspire one another. Through this immersion, students will appreciate art and poetry to such a degree that they begin to recognize the value of those artistic forms in their own lives. It is imperative that students have the opportunity to possess meaningful experiences with poetic language and aesthetic images to build personal confidence as poets and artists. This will be accomplished with lessons that compare poetry with visual artworks and serve as a guide to viewing murals as a means of communication through originality and imagery.

Throughout the unit, students will experience profound dialogue with ekphrastic poems. They will also emulate the poets in writing original poems about murals in their community. Lastly, students will collaborate to create a mural that effectively communicates their communal ideas as artists and poets.

(Developed for Visual Arts, grade 8; recommended for Visual Arts and Language Arts, grades 6-12)

18.02.05
Activism and Cultural Identity Through Works of Art in Chicago Neighborhoods, by Laura Gillihan

We and our students want to see ourselves in our community and feel that our culture and identity are represented. This unit will turn students into activists for that purpose. Students will learn how to use works of art and poetry about works of art as the vehicle for community change.

Students will prepare for this by first interpreting works and then poetry about works of art through collaborative learning. Students will then view works by artists who have pursued the goal of reclaiming the culture and identity of their community. Students will then use their own photographs and poetry as community activists. Students will learn about three neighborhoods that surround our own and explore the history of Chicago's intentional segregation. They will study neighborhood art to learn how these communities have used and continue to use art to reclaim their culture and identity. We will have art walks in each neighborhood, with students documenting the art they see and later writing a poem about the works they documented. Students will display their work in gallery walks and in a poetry slam. Finally, students will create a collaborative mural for the whole community to view.

(Developed for Language Arts and Social Studies, grade 5; recommended for Language Arts/Social Studies, grades 3-8)

18.02.06
Ekphrastic Poetry in the Second Language Classroom, by Holly Bryk

Poetry is a mystery to most students in their native tongue, so you can imagine how intimidating it might be for them to study poems in another language. For a second year language learner reading and analyzing a poem in the target language may appear to be overwhelming, and quite possibly impossible. Ekphrasis, an author's written response to a work of art, provides a way for the students to enter into a poem that gives them a visual perspective. This affords the language learners the confidence to comprehend the ekphrastic work at its most basic level. Ekphrastic poetry supplies the students with multiple occasions for practice and growth in the target language while learning about the

culture by using rich authentic works. This unit is designed for second year language students of Spanish who will study Xánath Caraza's ekphrastic poem "Catrina," written in response to Diego Rivera's mural "Sueño de una Tarde en la Alameda." The goal of this unit is for students to develop their own techniques for self-expression in the target language through the study of ekphrastic poetry, author their own ekphrastic poem and share it with others digitally and in the form of a poetry slam.

(Developed for Spanish I and Art, grade 7; recommended for World Languages, grades 1-4, ESL Upper Levels, and Art, grades 7-12)

18.02.07
The Words Inside Me: Learning to Express Myself through Words, by Desiree Denny

This unit was created to accommodate English Language students who enroll in Navajo Reservation Schools in very rural areas of the Navajo Nation. Because these students have little exposure to the English language, they will benefit from the experience of ekphrastic poetry to build their vocabulary, help them find a way to express their thoughts, and strengthen their ideas in order to share their voice in their writing. Students will be viewing works of art and analyzing poems that are written for the art works. The students will be practicing the Reading Standards implemented in our school district. As the students are observing works of art they will be understanding key ideas, characters, and settings in the poems. They will answer questions about the poems and relate key details about both the works of art and the poems. They will also practice their listening and speaking skills by identifying vocabulary words and phrases. With teacher help, the students will to begin to formulate the foundational skills to build sentences that support their thoughts for creating their own ekphrastic poetry. This unit is generated for English Language students ranging from Kindergarten to Second Grade.

(Developed for Reading and Writing, grade K; recommended for Reading and Writing, grades K-3)

18.02.08
Ekphrastic Poetry: Connecting with the Original Language and Culture Through Poetry, by Ella Earl

This unit is about introducing the type of poetry called ekphrastic to ninth grade students who are reluctant readers and writers of the English language. To interest these students, who are predominately Native Americans at a rural public school, I felt that "bells and whistles" would be needed. So, as an introduction to the unit, I found an excellent short video created by PBS about Vincent Van Gogh's life and art work. The introductory art is Van Gogh's "The Starry Night", and Anne Sexton's poem of the same title. Once the criteria for performing analysis and interpretation of art pieces and poems have been

established, using well-known art and poems, the unit is designed to introduce the students to Navajo art objects that have had practical uses in the past and write ekphrastic poems about these objects. The intent is to establish identity and a sense of pride in Navajo culture and language. Most Navajo teens are mainly influenced by main-stream pop culture and have lost connection with their native traditional teachings and customs. The unit will bring awareness of the Navajo culture and language and appreciation of being bilingual.

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

18.02.09
Reflective Self Portraits: A Study of Oneself through Ekphrastic Poetry and Art**, by Leigh Hall**

This unit is for K-12 teachers who want to infuse or integrate the arts and poetry as a therapeutic means to lessen the impact of trauma on students. With two-thirds of school-age students in the United States affected by one-time or on-going traumatic event(s) it is necessary to consider this in our teaching. Subjects like art, English Language Arts, and music, that lend themselves naturally to expression, are a perfect opportunity. This unit utilizes a poem by Bobbi Katz, "Lessons from a Painting by Rothko," to aid in the connection between poetry and visual arts through Mark Rothko paintings. John Stone's "Early Sunday Morning poem" and Edward Hopper's painting of the same title are presented to students to evoke an emotional response that is developed by using art criticism and close reading skills started with the first poem. Therapeutic activities include a series of representational self-portraits and poetry writing in a visual journal with self-reflection build throughout to help students form a positive identity where it may have been compromised. The culminating activity is a self-reflective collage with poetry integrated throughout.

(Developed for Visual Arts, grade 5; recommended for Visual Arts, English Language Arts, and Guidance Counselor, grades K-12)

18.02.10
The Spirit Task: African Americans Reclaim Power through Art and Poetry, by Nina Ford

Have you ever seen an object with a racist caricature in someone's home or in an antique store? What should we do with these relics of the past? Are they truly relics, or are they closer to us than we'd like to think? Designed for the high school art classroom, this unit seeks to uncover and name anti-blackness in America, today and throughout our history, while examining how we might think about conflict as productive. Objects of racial intolerance will be used to teach about racism, resulting in conversations that yield difficult but honest dialogue and the breakdown of racist ideas. Foci will include color-

conscious pedagogy, ekphrastic poetry, and contemporary Black artists. Poets and artists whose work we will study will focus on topics like truth telling, fear, sorrow, power, and redemption. Because of the cross-curricular nature of this unit, it can be used in high school visual art or English classes. Students will gain new insight into American history and how artists and writers talk back to oppression and racism.

(Developed for Art II, grades 9-12; recommended for English/Language Arts, grades 9-12)

III. Adaptation: Literature, Film and Society

Introduction

Cinematic adaptation translates a literary text—a text comprised of words—into a visual text—a text that tells a story in images. When a novel becomes a film, there's a change of medium. Although we're tempted to consider adaptation in terms of a film's fidelity to the literary text that is its source, what emerges in the translation from the literary to the cinematic is an *interpretation* of a source text. In our seminar we expanded the notion of adaptation beyond the text and image dichotomy by also considering the interpretation of historical figures by film. We focused on the medium of film and its techniques; we discussed what distinguishes literature from film and what they have in common. We also considered the displacement of the original work's time and place into a new time and place, asking both how the social world of the source text enters an adaptation but also in what ways the social world in which the film *is made* is reflected in it.Whether a film is faithful to its source text is only one question among many when we analyze a film adaptation. Other questions include: Who is the intended audience of the film? Are there prior adaptations and how does the new adaptation take them into account? Does the adaptation bring other arts into play—such as painting or theater? What are the artistic and political concerns reflected in the film and how do they inflect it? And finally, we also asked whether the adaptation in some sense "saves" the source text, making it more accessible to a new audience in a new time or different culture.

From the beginning, the Fellows in the seminar had definite teaching goals and projects in mind. There was a preponderance of elementary school teachers in our group, and I will begin with their curriculum units, moving into the projects of the middle and high school teachers.

Joe Parrett, a kindergarten teacher, chose films by Disney, including *Frozen,* as vehicles for exploring changing concepts of the hero with his students. His class will explore a series of Disney films with respect to stages in the progress of the hero, including the departure, the initiation of the hero as he/she confronts obstacles, and his/her return home. **Carol Boynton** will also use *Frozen* in her second-grade classroom, emphasizing its loose adaptation of the Hans Christian Anderson fairy tale, *The Snow Queen*. Her students will discuss the fairy tale as a genre and how filmmakers create their own versions of classic tales. **Elizabeth Isaac** bases her unit on another Disney film, *Pocahontas*, which she will use in conjunction with a book by Leslie Gourse titled *Young Peace Maker.* She and her third-graders will discuss the presentation of Native American characters and their roles in society in literature and film.

LaKendra Butler also teaches third-graders. Her curriculum unit is based on the children's book *Black Panther: The Young Prince* by Ronald Smith*,* to be discussed alongside the recent blockbuster film *Black Panther*. She will use these texts to address

questions concerning character development and identity as she instills a love of reading in her students. **Irene Jones**'s unit focuses on reading development for her fourth-graders, using both text and film. Her students will be watching *Smoke Signals*, an adaptation of Sherman Alexie's short story to the film by Native American filmmaker Chris Eyre. **Jolene Smith,** a fifth-grade teacher, focusses on a 1920 story by Oliver La Farge, *Laughing Boy*, and its adaptation to film in 1934. She will use both versions of the story to discuss changing historical and cultural perspectives on Native American culture, as well as to improve the literacy of her students.

Lea Stenson, a fifth-grade teacher whose area is social studies, plans to use *Wonderstruck* in both book and film versions (by Brian Selznick and Todd Haynes, respectively) to teach her students about reading literature and film, but also about disabilities, hoping to teach empathy towards those who have them. And **Brandon Barr** will make use of the Helen Keller story as told in three different texts: in Keller's autobiography, in a play about her life, and in the film *The Miracle Worker*. His sixth-graders will read the texts, perform scenes from the play, and analyze the film in order to develop a full understanding of Keller.

Tara Waugh, who teaches AP English, developed a curriculum unit based on Sylvia Plath's *The Bell Jar* in text and film, and J.D. Salinger's *The Catcher in the Rye*, about which Salinger insisted there should never be a film version. The students will learn to analyze both literary texts and film using the vocabulary appropriate to each form, and make their own movie adaptations. **Barbara Prillaman's** curriculum unit draws on *The Walking Dead* in both comic book and the TV version in order to generate discussions about storytelling and analyzing the presentation of character in both forms. She will use these stories of a post-apocalyptic zombie society to ask questions about our own society. Finally, **Jennifer Mazzocco** uses Ray Bradbury's *Fahrenheit 451*--another dystopian text--and the recent film version directed by Rahmin Babrani to teach her ninth-graders analytical skills, and to ask questions about whether the 2018 film version successfully adapts Bradbury's 1953 text to our time.

These units make an imaginative use of the adaptation of literary texts by films and are well worth reading, both for their overall topic and for the outstanding teaching strategies which they outline.

Brigitte Peucker

Synopses of the Curriculum Units

18.03.01
The Miracle Worker: Bridging Drama and Film Study to Build Critical Literacy Skills, by Brandon Barr

The Miracle Worker is a text that traces the early life experiences of Helen Keller. Adapted from her autobiography, *The Story of My Life*, strategies for exploring both the dramatic and film texts are explored in this unit for middle school English Language Arts classes. In addition to exploring important parts of these texts, considerations for reading both drama and film are made. Also, included in the unit, is a brief exploration of Helen Keller's life beyond the narrow narrative encountered in *The Miracle Worker*. It is hoped that students will understand that Helen Keller is iconic for reasons beyond popular myth captured in *The Miracle Worker* derivations. It is hoped that students will understand that while iconic, Keller is not a saint and that parts of *The Miracle Worker* do not align with historical truth. Despite these tensions and concerns, Helen Keller is an interesting historical figure worth exploring.

(Developed for Reading, grade 6; recommended for Reading and Social Studies, grades 6-8)

18.03.02
The Snow Queen in Film, by Carol Boynton

Who doesn't love fairy tales with their dramatic plots, evil characters and good ones, fantastical settings with magical happenings and, of course, the predictable happy ending! Young--and not so young-- children cheer for the good guys and boo the bad, sit wide-eyed as they wait for the next amazing event, and breathe a sigh of relief as the ultimate "good over evil" prevails.

In this six-week second-grade literacy unit, the students focus on the essential questions: Why is it important to understand choices that characters make? What elements need to be present in an adaptation of a classic tale? How do writers and directors create their own versions of a fairy tale? This unit specifically focuses on the story The Snow Queen by Hans Christian Andersen and Disney's loose adaptation of this story in the film, Frozen. Students will learn to recognize the similarities and differences in the language used in each version of the story as well as the story itself. The students will create adaptations of fairy tales of their choosing and create their own storyboards, act out and recite scenes. Together, they will film these adaptations and invite parents and fellow students to enjoy our work.

(Literacy, grade K; recommended for Literacy, grades K-3)

18.03.03
From Prince to King: Black Panther in Text and Film, by LaKendra Butler

Do you remember playing games at recess as a child? When I was in elementary school back in the 90s, the show Power Rangers was all the rage. Every day it was a great debate amongst my classmates and I about who would be which Power Ranger. Being an African American girl, the only options for me were the girl rangers who were the yellow and pink rangers. One of them Caucasian and the other Asian, so I never really had anyone who resembled me to dream about and emulate. The same was the case for Saturday morning cartoons and growing up loving comic books and superheroes. I imagined I too could possess the talents and superpowers that they did, but I remember always wishing that there was one that looked like me. There was a deep longing I had to buy a toy, watch a show, or read a comic strip with someone that looked like me, my family, and my friends.

My unit, *From Prince to King: Black Panther in Text and Film*, is based on the Marvel Comics Universe's 2018 blockbuster film, *Black Panther* and the children's novel *Black Panther: The Young Prince* by Ronald Smith. The movie tells the story of Prince T'Challa, a young man who becomes the newly crowned king of the fictional wealthy African kingdom of Wakanda upon the death of his father, King T'Chaka. The film drew praise around the world. It is among the ten highest grossing films ever made. For African Americans and other minority groups, this film is a game changer. A new and different type of superhero is showcased as the star: a powerful black man. Young, influential, intelligent African people are shown in their own land, not as victims or in poverty, but as royalty. *Black Panther* has changed society's perception of African culture, as consisting of poor, desolate countries. The film's popularity and use of advanced technology has set a new standard and raised expectations. I would love my students to see and read about characters who look like them and are depicted in a positive light.

The children's novel is an early adaptation of the Marvel Comics' character T'Challa as he travels to America from his home in Africa as a twelve year old boy. I selected this book in an effort to make learning fun for my students, as they are very interested in the world of comic books and superheroes. They role-play superheroes at recess, write about them in their journals, and often check out books from our school library about superhero adventures. It is a culturally relevant age-appropriate novel, and this story will engage my students as they are very interested in the character of Black Panther. Our school is an inner city school with mostly African American students who are learning who they are, so *Black Panther* gives them a superhero they can relate to. He is a strong role model that begins his journey at an age not much older than they are, which will be very captivating.

In the unit I will focus on the skill of analyzing character as we look at the development of T'Challa from one medium to the other (literature to film) and over time as a prince

and then as a king. Studying these adaptations of *Black Panther* will allow me to teach my students to visualize and on a larger scale understand how when adapting a text to film, filmmakers are bringing that text to life using the descriptive words of the author. I will also be able to introduce them to the many ways that film manipulates its audience through showing short scenes. Additionally, students will be practicing the skills of compare and contrast as well as creative writing through creating storyboards, graphic novels, or comic strips.

(Developed for Language Arts Block, Grade 3; Recommended for Language Arts, Grades 3 and 4)

18.03.04
Stories Told through Literature, Film and How It Applies to Our Society, by Elizabeth Isaac

This curriculum unit focuses on uncovering the life of a historical figure through film adaptation from a literary text. Students will become familiar with film adaptation vocabulary words and understand the meaning of the words in order to analyze the materials. A film as well as a literary text will be studied and analyzed in this unit. This unit will develop a better understanding of who Pocahontas is and how she is considered of importance in our history. The lesson will take the students through the use of graphic organizers, cooperative learning, and use of visual aids as well as technology to gather information. Once the information is gathered, students will be comparing and contrasting information to get an idea about how to find and sift out information about a historical figure. Students will become aware of all the sides of a story and be able to come to his and her own conclusion about a person. This will raise awareness and allow students to discuss and be familiar with their history. Finally, this unit allows students to use relevant cultural materials for Native American students. It is important for students to learn about the history of Americans, especially those that they can relate to. When using the tools and strategies learned from this unit, students are well equipped to further study other historical figures.

(Developed for Reading (ELA) and Social Studies, grade 3; recommended for Reading (ELA) and Social Studies, grades K-12)

18.03.05
Native American Literature Adaptation: From Smoke Signals to Reading Comprehension by Irene Jones

In this unit, the students will compare/ contrast, analyze scenes, characters, and literature through rigorous instructions to achieve reading comprehension for a group of fourth grade English Learners. I will be using two reading materials: a short story, This is What it Means to Say Phoenix Arizona from the book The Lone Ranger and Tonto Fist Fight in

Heaven by Sherman Alexie, and Smoke Signals: A Screen Play, also by Alexie. The film I will be using is Smoke Signals, an adaptation of the short story by Sherman Alexie.

In my unit, the students will use anchor charts and graphic organizers to explore the themes of Native American issues (alcoholism, domestic violence, and stereotypes). Students will compare and contrast how these issues are presented in the film and the literature. Students will also analyze character traits and motivations of the characters, and how the film interprets the traits. We will discuss how the voiceovers, the landscape, soundtrack, and Indian traps helped the students understand the story.
The bottom line is that I want students to develop reading comprehension skills using visualization, points of view, and inferencing skills. I want students to make use of the new skills to achieve proficiency in reading comprehension.

(Developed for Reading and Writing, grade 4; recommended for ELA, grades 3-5)

18.03.06
Fahrenheit 451 in 2018: Can film bring Ray Bradbury's classic into the modern age? by Jennifer Mazzocco

Fahrenheit 451 is a classic taught frequently in high school classrooms across the United States; over its lifetime, it has also been the victim of banning and censorship, bringing to life the issues its addresses. *Fahrenheit 451* was set in a dystopian future, but its themes tie it tightly to the world of the 1950s America it hopes to criticize.

In May 2018, Home Box Office released director Ramin Bahrani's film adaptation. Many of the themes of the novel hold true despite the film's many significant departures from the novel. These changes, however, are able to translate the themes into a modern context: they are not simply the lessons of the 1953 novel applied to today, but they are complicated to fit the world of 2018. In fact, translation to the medium of film allows the director to raise more complex themes in a subtle manner that might be difficult or impossible to do the same way with written prose.

In this unit, students will view Bahrani's 2018 film *Fahrenheit 451* in conjunction with a reading of Bradbury's novel. As they watch, they will consider the complications of translating a dystopic novel like *Fahrenheit 451* into a modern context. Students will consider how the director uses the techniques of film to tailor a message specific to a 2018 audience and whether the changes made effectively beg the viewer to question society.

(Developed for English 1 CAS and English 1 PSP, grade 9; recommended for English Language Arts, grades 9-12)

18.03.07
Our White Hats: A Study of Heroes, by Joseph Parrett

This is a kindergarten unit lasting about two weeks. Students will be exploring the concept of heroes. As students read and view the heroic stories of the Disney company, they will be practicing several English language arts standards including those related to asking and answering questions, retelling stories, and comparing and contrasting narrative elements. To aid with these challenges students will be writing and using graphic organizers. We will also be developing the history concept of past and present by exploring change over time and the civics concept concerning the qualities of a good leader. Specific content covered will include evaluating how heroes grow and change through their adventure and an examination of character traits exhibited by heroes. We will also discuss whether individual heroes have the makings of good leaders. Students will then be challenged to implement these heroic character traits in their own lives.

(Developed for Reading/ELA, Social Studies, and Social Skills, grade K; recommended for Reading/ELA and Social Studies, grades 1-2)

18.03.08
Understanding the Apocalyptic Society: The Walking Dead from Comics to Television, by Barbara Prillaman

In this unit for high school students, the pop culture of *The Walking Dead* regarding a zombie apocalyptic society will be used to help students learn the skills of closely reading comics and a film (in this case – a television series). In doing so, two Common Core Standards about text analysis and speaking will be addressed. They will be able to analyze the information in both media, interpret the source texts, and participate in whole group and small group conversations. These discussions will concern a variety of things, including background information on zombies as well as the similarities and differences between the two media, determining what is compelling about each version. Students will answer the questions: How can storytelling be the same and different with respect to the two media – comics and television series? Is one more compelling than the other? How so? How is the presentation of the characters different in the comics and the television series? What are some of the reasons for these differences? What do the two media tell us about our society – what are their messages?

(Developed for Advisory, grades 9-12; recommended for Advisory/Enrichment, English/Language Arts, and Social Sciences, grades 9-12)

18.03.09
Adapting Culture from Book to Film: Laughing Boy, by Jolene Smith

This unit teaches students how to analyze adaptations from book to film. The texts used are *Laughing Boy* the novel by Oliver La Farge and S. W. Van Dyke's 1934 *Laughing Boy* movie. Students will need to know what adaptation means when analyzing the movie. They also need to study the vocabulary used in analyzing a film, so they know what to look for when viewing the DVD. Academic learning involves watching short clips of particular scenes and discussing the adaptations with their peers. I will show clips of the dance, wedding, married life, and the characters Slim Girl and Lily so that students can analyze and evaluate them to study and identify adaptations. Teaching strategies and classroom activities are the applications students will use to explore the adaptation from the novel to the film. Think-Pair-Share, Characterization, and creating a grid to distinguish the difference between the source text and the film are activities students will use to learn the main content. As students study the book and film, they will practice and learn their own culture and language. The novel and movie *Laughing Boy* are about Dine (Navajo) history and are focused on a love story about the couple, Laughing Boy and Slim Girl.

(Developed for Social Studies, English Language Arts (reading and writing), and Diné (Navajo) Language, Grade 5; recommended for Social Studies, grades 5-6)

18.03.10
Wonderstruck: Disability Awareness Through Visual Storytelling, by Lea Stenson

Young people need emotional tools like empathy and acceptance to navigate our complex world. In this unit, students will build their social and emotional intelligence through the study of disability, inclusion and identity. They will build empathy along with analytical skills as we explore Brian Selznick's graphic novel *Wonderstruck* and Todd Haynes' film adaptation of the book, which feature two main characters who are deaf.

We will study the novel and its film adaptation, with particular focus on how the characters' deafness in handled in both formats. This will lead to a larger discussion of disability, inclusion and identity. We will discuss the idea of re-framing disabilities as differences that present challenges. We will look at the ways in which these differences can impact daily function and how accommodations and universal design can address these challenges.

As a culminating project, we will read picture book biographies of people such as Louis Braille, Temple Grandin and Ansel Adams. Students will form inquiry circles to learn more about these people and explore differences such as autism, ADHD, dyslexia, blindness, deafness, and stuttering. Students will work in their inquiry circles to adapt

these biographies using visual storytelling techniques, and present their adaptations to the class.

(Developed for Social Studies, grade 5; recommended for Social Studies and Reading, grades 5-8)

18.03.11
Filmic Adaptations of Mid-Century Bildungsromans Using The Catcher in the Rye and The Bell Jar, by Tara Waugh

Lights. Camera. Action. This unit will turn bored English students into enthusiastic filmmakers. Designed for 11th grade English, specifically AP Language and Composition, this unit will bring the art of film analysis and adaptation and dated, seemingly irrelevant bildungsroman together to help students share their vision of the modern world. After learning the language of film and practicing the close reading of film, students will choose either *The Catcher in the Rye* or *The Bell Jar*, coming-of-age novels from the 1950s and '60s that may seem dated to modern teens. However, both novels share themes of depression, identity, and fitting into society which will resonate with teens today. In this unit, students will have the opportunity to research historical context, practice persuasive writing, and deepen their analytical skills using visual close reading techniques. By using a filmmaker's lense, students will closely read and annotate their chosen bildungsromans and brainstorm ways to take these novels out of the dusty past into the 21st century. The unit ends with teenage filmmakers, no longer yawning, creating a modern adaptation of their chosen novel in the form a movie clip or trailer with a contemporary soundtrack -- finally breathing life back into these old-school books.

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

IV. Big Numbers, Small Numbers

Introduction

The "Big Numbers, Small Numbers" seminar primarily focused on estimation, and calculation with numbers, especially large numbers, that are not known exactly. It is essential to be able to deal with numbers that are known only approximately, because essentially all numbers that come from the real world, from population to production information to income and cost, are in fact not known exactly.

Approximation therefore was a central theme. Accuracy of approximation was captured by the notion of *percentage error*, of an approximate value to a "true" value. In order to relate this to standard base ten notation, the concepts involved in this notation were reviewed, and expressed in five levels of interpretation, or stages, of place value, exemplified by the expressions

$352 = 300 + 50 + 2$

$= 3x100 + 5x10 + 2x1$

$= 3x(10´10) + 5 x10 + 2x1$

$= 3x10^2 + 5 x 10^1 + 2x10^0$.

The first stage is the standard notation. The second stage expresses the number of a sum of parts, namely 300, 50 and 2, labeled by the digits. These were called the "place value parts" of the number. The third and fourth stages dig into the multiplicative structure of the place value parts, and the fifth stage uses exponential notation to exhibit the number as a "polynomial in 10".

With this structure in hand, we were able to be precise about the effects of rounding a number. In summary:

The largest place value part of a number always contains at least half the value of the number, and at least 90% about half the time.

The largest two place value parts of a number always contain at least 90% of the number and at least 99% of the number about half the time.

The largest three place value parts of a number always contain at least 99% of the number, and 99.9% about half the time.

From considering typical measurement errors, and especially, looking at placement of numbers on a number line, we concluded that many, probably most, real-world numbers could not meaningfully be reported to more than three figures.

We also discussed the relationship of these ideas to scientific notation. To summarize: scientific notation, such as $A = 1.98 \times 10^8$, focuses attention on the most significant aspects of A from a measurement point of view, namely

a. how large A is (encoded in the exponent of 10, e.g., 8 in our example); and
b. how accurately A is known (encoded in the number of figures reported, here 3).

The Fellows incorporated these ideas into a wide variety of units. A substantial number found the idea of place value parts and the five stages useful, and included some of these ideas. Krystal Smith focused on increasing her students comfort with place value. Lajuanda Bland emphasizes the role of place value in understanding and computing multiplication. Marnita Chischilly uses the stages to explore subtraction, and plans a project that will involve estimation. Tierra Ingram uses base ten notation to analyze the behavior of exponents, with the goal of having her students understand decimal fractions. Charlotte Perry uses the ideas of order of magnitude to help her students understand scientific notation, with a project requiring each of them to create a superhero and compare their powers to ordinary human powers. Lynnette Shouse will have her students perform estimations, using the books *Great Estimations* and *Greater Estimations*, and will use number lines to grasp the relative sizes of place value parts. Aaron Bingea will use number lines heavily to help his students grasp the relative size of large numbers and help them appreciate the significance of order of magnitude. Zachary Meyers will give his students a sense of scale and the meaning of scientific notation, using the metric system and the electromagnetic spectrum. Finally, Lawrence Yee will present his students with a collection of problems that insert combinatorial ideas into everyday situations, to help them understand and appreciate the very large numbers that can arise in dealing with permutations and combinations.

Roger E. Howe

Synopses of the Curriculum Units

18.04.01
Answering Big Questions by Finally Understanding Big Numbers, by Aaron Bingea

As a middle school math teacher I find a level of joy in mathematics and more specifically with numbers. I believe that if we understand numbers, we are better able to make sense of our world. Unfortunately, my students in large part do not share my enthusiasm for math and often times demonstrate an aversion to numbers especially those that are unfamiliar. My overarching motivation for this unit is to revisit the basic structure of our number system and help them understand numbers in a more in depth and conceptual way. This will allow students to access 8th grade content that involves laws of exponents and scientific notation with greater ease and interest. Ultimately by developing my student's abilities to reason and operate with big numbers they will be able to ask and answer their own big questions about the world and hopefully enjoy doing it. The concepts covered in this unit are as follows:

1. Understanding the Relative Size of Numbers
2. Numbers as Powers of 10 and Laws of Exponents
3. Estimating
4. Scientific Notation
5. Operating with Scientific Notation

(Developed for Mathematics, grade 8; recommended for Algebra I, grade 9)

18.04.02
Place Value Meets Multiplication: Utilizing Place Value to Comprehend Multiplication, by LaJuanda S. Bland

This eight-day, 70- minute, block-scheduled curriculum unit directs students through the use of place value as a guide for understanding conceptual multiplication. The purpose of the unit is to connect the Base-Ten number system and place value with three different, yet closely -related multiplication strategies: area model, box method, and the standard U.S. algorithm. The unit also incorporates carefully selected operational properties for both addition and multiplication since they assist in explaining the many whys associated with performing various types of multiplication algorithms. The lessons are designed for whole group instruction, collaborative teamwork via small groups or peer pairs, and student-led discussions and demonstrations leading to individual, inquiry-based exploration. At the conclusion of the unit, the students will have an increased understanding of the ways place value and multiplication are connected and will have a minimum of three strategies at their disposal to solve and check multiplication problems of all sorts of complexities in the elementary years and those beyond.

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

18.04.03
Making Number Sense through Relevancy: Place Value, Adding and Subtracting, Decimals, and Estimation, by Marnita Chischilly

The fundamental foundation for strong number sense is the development and understanding of numbers through in-depth instruction in place value of whole numbers, computational adding and subtracting using base 10, decimal numbers, and estimation. My unit is designed to support in developing the understanding of these basic relations of numbers. Students will develop place value concepts, a sense of magnitude (small numbers, big numbers), and estimation skills for whole numbers and decimals. Often students do not connect what is happening in their mathematics classrooms with their daily lives, so incorporating relevant content that arise in the context of the students' world are important as well. Connecting math with real world context is more meaningful to students than traditional textbook exercises and it helps them develop a sense of how numbers and operations are used in their daily life. Also, in my unit I implement cultural relevancy using our native language to support our students' connection of self-identity as young Native Americans. Frequent practice and use of the concepts learned is important in the development of number sense, as are regular opportunities for student communication. Discussion of their learning and problem solving helps students strengthen their intuitive understanding of numbers and the relationships between numbers.

(Developed for Mathematics/Number System, grades 6-7; recommended for Mathematics/Number System, grades 4-7)

18.04.04
Closing Deficits Exponentially: Addressing Base Ten & Small Numbers Using Exponents, by Tierra Ingram

(Developed for General Mathematics and Algebra I, grade 8; recommended for General Mathematics, grades 4-8, and Algebra I/Algebra II, grades 9 and 11)

18.04.05
Exploring the Metric System and EM Spectrum Through Base Ten Numeration, by Zachary Meyers

The scale of the known universe is truly immense, from quantum level interactions that affect molecular affinities to collision of whole galaxies. Scientists have utilized the base ten numeral system for hundreds of years to accurately represent quantities; from the distances between particles in an atom to the energy output of a quasar. Many students struggle with contextualizing content and the related quantities associated with cosmic

energy outputs and extreme distances in physics. The electromagnetic spectrum provides the necessary context to integrate the concept of scale and refine skills of scientific notation due to the inherent inverse relationships between wavelength and frequency. This 3 – 4 week unit is designed to elevate high school students' conceptual understanding of several interdisciplinary concepts (i.e., scale, units, and scientific notation) during the months of September to November as well as March by solving problem sets, conducting inquiry activities using the metric system, and comparing datasets related to wavelength, frequency, and energy.

(Developed for Physics, grades 11-12; recommended for Physics, grades 11-12)

18.04.06
What Makes a Superhero Super? Putting Scientific Notation in Context, by Charlotte Perry

This curriculum unit is designed with lessons to build foundational math skills and improve writing skills in enjoyable, relatable ways while students learn about the five stages of place value and base ten notation. Students will use of scientific notation as a useful tool for comparing very large and very small quantities quickly and efficiently. Lesson objectives include describing patterns in the placement of the decimal point when a number is multiplied by a power of 10; locating and comparing very large and very small values on a number line; writing and comparing quantities in scientific notation; and developing a superhero character through creativity and writing. Students will generate problems, develop an inquiry, critique the reasoning of others, and collaborate on ideas and solutions. The culminating project connects the narrative writing process more fully with mathematics instruction to increase student writing skills while engaging in activities that strengthen number sense.

(Developed for Mathematics and Writing, grades 7-8)

18.04.07
Estimating Big Numbers: Do You Really Understand Them?, by Lynnette Shouse

Numbers are all around us every day. They are a crucial part of our everyday life. The unit focus will be on developing deeper number sense, interpreting place value and order of magnitude, and how all of these lead to reasonable estimations. The theme of my unit will be on clarification of place value and order of magnitude. By reviewing what estimation is and how we can create a reasonable guess, my hope is that students become more comfortable working with and manipulating larger numbers such as ten thousand, hundred thousand, and continuing into the billions. In keeping with our theme I will use three key texts with students: *Great Estimations* and *Greater Estimations* by Bruce Goldstone and *Millions, Billions, and Trillions, Understanding Big Numbers* by David Adler. This unit is designed to have students take a deep "dive" into using the above

mentioned skills and fully develop their number sense and ability to work with numbers in a strategic and flexible manner as well as to make a direct connection to their daily lives.

This unit has been designed to be used with academically advanced fourth graders, but it could be used for fourth through sixth grades.

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

18.04.08
Decimal Place Value: A Culturally Responsive Approach, by Krystal L. Smith

Flying paper airplanes, running relay races, and analyzing the data! This Decimal Place Value Unit, intended for 5th grade students, includes all of this! Intended to help students develop a deep content knowledge of decimal place value to explain and illustrate multiplicative patterns, read and write decimal numbers in various forms, and compare decimals numbers to the thousandths place, this unit will allow the teaching and learning of decimal place value to be fun, hit the standards, and be culturally responsive!

Fifth grade is a pivotal year for students, and often a very challenging one as they learn who they are as students and individuals in the world. A major goal of this unit is to empower teachers and students in urban school settings by being culturally responsive. Focusing on the numbers in their world, students will engage with the past, present, and future of math. Connecting to the past will increase a positive self-identity. Connecting to the present will allow students to see a purpose in learning and doing math. Connecting math to the future will allow students to learn how math can benefit them and help them achieve their hopes and dreams.

Many lessons in this unit are "storified," "gamified," and "social," all things 5th grade students love! Have fun!

(Developed for Mathematics, grade 5)

18.04.09
Enumerating Daily Life with Counting Principles, Permutations, and Combinations, by Lawrence Yee

Counting allows us to quantify our world. The Fundamental Counting Principle is introduced in elementary and middle school as a way to find the number of outcomes in a situation. In high school, permutations and combinations are emphasized in Integrated Math II (or Algebra II) and then further explored in Math Analysis (pre-calculus) courses and Advanced Placement Statistics. The connections between these three topics are often not clearly explained or emphasized, though the structures and formulas for computation

are similar. This unit highlights the relationships between these mathematical concepts through examples and generalizes the structures to derive the general formulas and properties. This unit is written for students taking Math Analysis, but the problems and ideas can be adapted and modified for other math courses and grade levels.

(Developed for Math Analysis, grades 10-12, and AP Statistics, grades 11-12; recommended for Algebra 2, Integrated Mathematics 2, and Math Analysis, grades 9-12, and Mathematics, grade 7)

V. Manipulating Biology: Costs, Benefits and Controversies

Introduction

Humans are ever more capable of manipulating biology; but are we fully aware of our actions and their possible consequences? We are increasingly able to 'design' babies with preferred traits; but are we mistaken in believing that human perfection is (or should be) a possibility? We are improving technology that links human genetic-testing with better estimates of future risks of developing Alzheimer's and other diseases; but how valuable is this information and the resulting mental anguish if many such diseases remain incurable? Gene-drive technology can be used to force the extinction of disease-transmitting mosquitoes and other 'unwanted' organisms, and genetic engineering can revive wooly mammoths and other extinct species. However, is it fine for humans to gain increasing power to control which species thrive alongside us on earth, or does this cross an ethical boundary? Very many technologies can make our lives more comfortable and disease-free, but these efforts are controversial because the pace of developing them is happening faster than research to fully examine their broader consequences. Examples include artificial intelligence and the creation of cyborgs; pros/cons of widespread vaccine-use; and using nanotechnology and microbes such as viruses as novel therapies to treat disease. These discoveries are truly amazing. But they offer the possibility for students to examine the potential costs and benefits to society, and to consider the overarching controversy of whether humans may be manipulating biology 'too much' without fully acknowledging or understanding the consequences of our actions.

The seminar "Manipulating Biology: Costs, Benefits and Controversies" explored historical and modern-day efforts by humans to change the biology of organisms, including ourselves. The seminar was designed to appeal to biology/science teachers at all grade levels. We read and discussed book chapters and magazine and online articles that concerned manipulating biology. In addition, we examined the many ways that these biotechnologies are presented (accurately and inaccurately) to the lay public, particularly on TV and in the movies. The overarching goal was to empower teachers in their knowledge of past and current technologies to manipulate biology, with the expectation that this understanding would enrich the classroom experiences of their students. The resulting units are diverse, reflecting the varied interests and backgrounds of the Fellows. Cristobal Carambo develops a unit for high school students concerning the possibilities, perils, and unintended consequences of newly-emerging technologies for genetic engineering, where students conduct independent research and present their findings on the impacts of these manipulations. The focus of Pierre Clark's unit for 6th graders is the science of genetically modified organisms (GMOs), allowing students to weigh the pros and cons of engineering crops to feed our expanding human population size. Similarly, Michael Doody's unit for Advanced Placement (AP) high schoolers examines the considerable public resistance to developing GMO plants that increase agricultural yields in the face of climate change and can better resist crop pests. Nancy Ibarra's unit for 7th

graders looks at gene-drive technology to eradicate mosquitoes that spread malaria, and asks students to consider the ethics of purposefully driving species to extinction. Sheila Lacanaria's unit for AP Chemistry high-school students concerns the rise of antibiotic resistant bacteria, and emphasizes the structure and function of enzymes as students consider the consequences of banning growth-promoting and prophylactic uses of antibiotics in animal agriculture. Patricia Moncrief's unit for 7th graders allows students to learn about pesticides, as well as hormones and other food additives, which help in food production but increasingly enter human bodies and may be toxic to our health. The unit by Eual Phillips explores gene-drive technology intended to treat mental illness, especially schizophrenia, relating this idea to familiar themes of comic books where medical therapy unintentionally leads to super powers. Valerie Schwarz develops a unit for 4th graders that concerns technology to resurrect extinct species, and challenges students to think critically about the consequences of altering genes and whether we should counter extinction versus use resources to preserve current-day species. Thomas Teague's unit for 7th graders examines the ability for students to weigh conflicting information and sources of evidence, in the context of medical technologies such as vaccination that have saved countless lives but are still viewed with skepticism by many people.

Paul E. Turner

Synopses of the Curriculum Units

18.05.01
Augmenting Bone Regeneration: Structure, Function, and Dysfunction of the Skeletal System, by Kwame Adu-Wusu

Augmenting Bone Regeneration is a short unit intended for high school Anatomy & Physiology students who may lack mastery of some foundational biology concepts. The unit explores the benefits and challenges associated with established methods of regenerating bone as a basis for understanding normal skeletal function. Further, it explores novel and theoretical therapies for bone regeneration to emphasize the idea that in all levels of biology (from the simplest to the most complex), function is determined by structure and dysfunction results from changes in structure. Students explore possibilities and implications of using gene editing and other technologies to manipulate human structures to restore or improve body functions. The unit incorporates Next Generation Science Standards (NGSS) for Life Sciences (HS-LS1: Structures and Processes, HS-LS3: Inheritance and Variation of Traits). It incorporates NGSS Science & Engineering Practices (SEP) - developing and using models; analyzing and interpreting data; constructing explanations and designing solutions; engaging in argument from evidence; obtaining, evaluating, and communicating information. Students develop a basic understanding of sophisticated biological innovations and use these ideas to plan possible but as yet undeveloped interventions for complex medical challenges.

(Developed for Human Anatomy and Physiology, grades 11-12; recommended for Anatomy and Physiology, and Biology, grades 9-12)

18.05.02
Should We? Possibilities, Perils, and Unintended Consequences of Genetic Engineering, by Cristobal Carambo

Humans now have the technology to eradicate entire species of ticks, mosquitoes and rodents responsible for transmitting diseases. We can design our children to be taller, smarter and free of hereditary disorders. We can make our fruits larger, more nutritious and pest resistant. Modern biotechnologies such as CRISPR Cas-9 and gene drives have given our society the ability to manipulate the genomes of thousands of living (and even extinct!) species. But should we? Is there a limit to our use of biotechnology to benefit our species?

This unit will engage high school students in a two-week course of study that will explore the perils, possibilities, and unintended consequences of emerging genetic engineering technologies. Through the use of guided inquiries (POGILS), simulations, and independent research students will learn the science of modern techniques of genetic manipulation. The unit will culminate in a series of presentations that analyze the

potential ecological impacts, socioeconomic consequences and ethics of genetic engineering.

Keywords:
CRISPR-Cas-9; Gene Drive, POGIL, Genetic Engineering, Biotechnology, Bioethics.

(Developed for Contemporary Issues in Science, grade 10; recommended for Biology, grade 10)

18.05.03
GMOs: Costs, Benefits, and Controversies, by Pierre Clark

We have entered a time in human history in which we can potentially engineer crops so that they retain whatever favorable traits we desire. Imagine a super sweet cherry the size of a fist and devoid of its seed, or a mushroom the size of a basketball that could feed an entire family for several days. Although these particular organisms haven't been created, the potential and ability to create them is at our fingertips thanks to new advancements creating Genetically Modified Organisms (GMO). In this unit 6th grade students will address the following questions-What are GMOs? What are the costs, benefits and controversies surrounding GMOs? Do I support GMOs? How can I impact this topic in a way that reinforces what I believe? This unit provides teachers and students with choice and options through out the unit in order to give instructors flexibility and differentiation strategies. This unit also gives students the chance for a strong level of engagement and sense of ownership over their work. The content in the unit is in alignment with several NGSS Standards which include: LS3.A: Inheritance of Traits, LS3-1 Evidence Statements, *SL.8.5*: Integrate multimedia and visual displays into presentations to clarify information and RST.68.1 Cite specific textual evidence to support analysis of science and technical texts.

(Developed for Science: Genetics, grade 6)

18.05.04
Feeding the World Using Genetically Modified Organisms: A Survey of GMO Technology and its Impact on Agricultural Production, by Michael Doody

As human population size increases worldwide, agricultural yields must increase significantly to reduce and prevent undernourishment. Genetically modified organisms (GMOs) have the potential to help farmers increase yields even in the face of threats brought about by climate change. For example, engineered Golden Rice has been used to ward off vitamin A deficiencies in developing countries, while pest resistant Bt crops have been deployed worldwide. Additionally, drought, heat, and salt tolerant crops are being developed for use in areas threatened by a changing climate. Despite widespread agreement in the scientific community for their safe and effective use, GMOs still face

considerable public resistance. This unit designed for Advanced Placement Environmental Science (APES), engages students in the connections between human population, agricultural practices, and GMOs. Students also explore the nature of the controversy surrounding GMO use. Ultimately students are tasked with developing an understanding of how GMOs can be used as part of a broader agricultural strategy to increase food production for feeding a growing population. Students use various Next Generation Science Standards Science and Engineering Practices (NGSS SEPs) to support learning, including "obtaining, evaluating, and communicating information," "engaging in argument from evidence," and "developing and using models."

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

18.05.05
The Power and Responsibility of Human Changes to Biology: Malaria, Mosquitoes, and CRISPR Technology, by Nancy Ibarra

In this unit, I present to my 7th grade life science students the topic of manipulating biology to eradicate malaria through the use of CRISPR technology. I use science-fiction author Octavia Butler's book, *Parable of the Sower* to introduce the subject and engage students to begin thinking about making ethical decisions. While referencing quotes revolving around "change" as being the center of the universe and ironically the only constant, we will work on hands-on labs that will prepare students to become familiar and comfortable with cellular biology. They will complete a karyotype chromosome lab, a strawberry DNA extraction lab, and a Punnett square lab among other activities. They will go on to make a decision of whether using gene drive technology is ethical in driving malaria-transmitting mosquitoes into extinction in order to save millions of human lives each year, including those of many young children. We will research the benefits, costs, and controversies associated with gene drive technology. We can look at the monetary costs involved in preventing malaria and make decisions based not solely on ethics but also financial costs. This unit addresses the Next Generation Science Standards (NGSS) and the International Baccalaureate's key concepts, related concepts, and global contexts.

(Developed for Life Science, grade 7; recommended for Biology, grades 7-9)

18.05.06
Chemical Warfare and the Rise of Antibiotic Resistance, by Sheila Lacanaria

Can you imagine a scratch costing you a limb, or a minor cut killing you? Believe it or not, not too long ago people had to live with the constant threat of lethal bacterial infections. Before antibiotics, minor accidents and routine medical procedures could turn deadly. After Alexander Fleming's serendipitous discovery of penicillin however, we aggressively waged a war against pathogenic bacteria and won. Or so we thought. The

emergence of hard-to-treat multi-drug resistant bacteria is challenging even our last-resort antibiotics. With our antibiotic arsenal running out, we all had to ask ourselves: What should we do to control the spread of antibiotic resistance? This is the question that my AP Chemistry students will try to answer. In this curriculum unit, the problem of antibiotic resistance will provide a meaningful context for learning scientific concepts relating to the structure and function of enzymes. They will investigate the role of enzymes in structure-based antibiotic design and in the bacterial modes of resistance. Students will consider the controversy surrounding the proposed ban on the use of antibiotics in food-producing animals for growth promotion and routine prevention, weigh the costs and benefits, and create an evidence-based argument for or against this ban.

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

18.05.07
Chemical Footprints: Health Threats of Food Toxins?, by Patricia Moncrief

"Give us this day our daily bread", can now be inheriting a new interpretation. This insight possibly would read "Give us this day our daily poison" signifying the toxic chemicals humans ingest on a daily basis. How many times do you see middle school students with a bag of snack foods, and caffeinated energy drinks, and insisting this is their lunch?

This 7th grade unit will identify common toxins that students ingest on a daily basis. I will incorporate information concerning genetics, how toxins accumulate in their bodies, and how toxins can be passed along to children. I feel it imperative to introduce and establish a brief history of genetics / DNA, to set the foundation for the unit. Added building blocks will cover food sources manipulated by: adding hormones, using food additives to enhance and enrich taste, chemicals that extend the shelf life of food, and pesticides sprayed on produce that can relocate permanently to their body systems.

Topics emphasized here will cover problem solving, analytical writing, collaboration, communications and creativity which all 21st Century learners need to possess. NGSS standards in life sciences, and Earth sciences will be addressed at the middle school level.

(Developed for Life Science, Physical Science, and Health, grades 7-8; recommended for Health, grade 6)

18.05.08
Exploring CRISPR Gene Drives for Schizophrenia and Superpowers, by Eual Phillips

Imagine a world where the government issued a vaccination to lower aggressive behavior in your community without your knowledge. Their failed attempt killed test subjects, began a new era of drug abuse in your neighborhood, and also created a few people with superhuman powers. Drawing from these events in the DC Comics' superhero series, *Black Lightning*, this unit will explore the idea of using CRISPR/Cas9 gene drive technology to treat mental health, specifically schizophrenia, in African Americans, who have demonstrated a higher propensity for the disease. Students will learn to describe the biochemistry of CRISPR and its functions in treating gene-related disorders using core topics aligned with Next Generation Science Standards such as intermolecular forces, DNA and RNA, and amino acids. Students will assess the benefits, risks, and controversies concerning the use of such groundbreaking advancements in genetic research. Ultimately, students ought to be able to reflect on the impacts of science on their world and evaluate how our increasing understanding of DNA empowers scientists to make new biomedical discoveries. The unit was designed for use with grade 10 chemistry students enrolled at the Middle Years Program of an International Baccalaureate school. The suggested timeframe for teaching the unit is approximately 10 days.

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

18.05.09
Endangered Species, De-Extinction and MANipulation, by Valerie Schwarz

Should we resurrect the passenger pigeon or de-extinct the woolly mammoth? The idea of using gene-editing to manipulate biology is no longer only an idea in a science fiction novel or movie. Scientists are using CRISPR and other methods to alter the genomes of organisms in an effort to counter the loss of species and the impending sixth mass extinction. Some scientists think the de-extinction of keystone species may be a viable way to solve biological problems brought on by human activity including climate change. This four-week science unit is written for fourth grade students but could be adapted for middle school students. It utilizes *Jurassic Park*, hands-on simulations and case studies to engage students to think critically and to consider the consequences of altering genes. The standards that are addressed are Virginia science standards 4.5 and 4.9.

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

18.05.10
Vaccines and the Outbreak of Nonsense, by Thomas Teague

Today's world is full of conflicting information! Unfortunately, this includes the world of science, and vaccines have become ground zero for bad information. The science is in, and vaccines are safe and effective. This 3-week unit intends to teach the science of vaccines for 7th grade science students, harnessing Next Generation Science Standard MS-LS4-5: Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. Students will learn how vaccines have drastically changed the course of diseases and saved millions of lives while building critical literacy skills and the ability to differentiate between sources of information. The history of vaccination and germ theory is also the history of science itself. Activities for this unit include an introductory activity where students will refute the flat Earth idea and debate the quality of different sources of evidence. Case studies and close reading strategies will be utilized before students have a seminar over an 1804 cartoon about vaccination. Finally, students will do independent research and create a presentation sharing evidence for whether or not vaccines should be mandatory.

(Developed for Science 2, grade 7)

18.05.11
From Wolf to Woof! Artificial Selection via Selective Breeding, by Jason Ward

Domestication is at the heart of how humans arrived where we are today. It is a vast concept with implications that have rattled and elevated the trajectory of human society; and yet as we marvel at the brilliance of human achievement we must not be blinded by the costs of such advancement. Animal domestication is the process by which a wild animal adapts to living with humans through selective breeding over hundreds or thousands of years. Out of all the plants and animals that have been domesticated by humans, the dog outdates them all. This unit provides an overview of natural and artificial selection (with human intervention), and then returns to focus on dogs and how selective breeding has been utilized to develop breeds with certain physical and behavioral traits. Selective breeding has brought us dogs that provide service as well as companionship. Unfortunately, inadvertent negative consequences have also plagued some breeds, including skeletal and respiratory problems that may lead to a shortened and poor quality of life for the animal. You and your students will apply your knowledge of how humans have used natural selection to domesticate dogs through carefully selected activities, games, and simulations imbedded within this unit.

This unit is designed for third grade (although it could easily be adapted for older students) and is directly connected to the Next Generation Science Standards.

(Developed for General Science STEM Lab, grade 3; recommended for Life Science and Biology, grades 3-8)