Curriculum Units by

Fellows of the

Yale National Initiative

Guide

2021

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Preface

In April 2021 the Yale National Initiative to strengthen teaching in public schools® accepted teachers from sixteen public school districts in nine states and the District of Columbia to participate in five national seminars led by Yale University faculty members. 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-nine of the teachers, named Yale National Fellows, were from school districts that are planning or exploring the establishment of a new Teachers Institute for Chicago, IL; the District of Columbia; Pittsburgh, PA; Richmond, VA; San José, CA; Tulsa, OK; and Texas. Other National Fellows come from existing Teachers Institutes located on the Navajo Nation, AZ; and in New Castle County, DE; New Haven, CT; and Philadelphia, PA. Overall, nearly 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 online on April 30-May 1. The seminars reconvened during a ten-day Intensive Session online from July 12-23 and concluded in mid-August when the Fellows submitted their completed curriculum units. The five seminars were:

- "U.S. Social Movements through Biography," led by David C. Engerman, Leitner International Interdisciplinary Professor of History;
- "Gender, Race, and Class in Today's America," led by Frances McCall Rosenbluth, Damon Wells Professor of Political Science;
- "Democracy and Inequality: Challenges and Possible Solutions," led by Ian Shapiro, Sterling Professor of Political Science;
- "The Sun, the Solar System and Us," led by Sarbani Basu, Professor of Astronomy; and
- "Human Centered Design of Biotechnology," led by Anjelica Gonzalez, Associate Professor of Biomedical Engineering.

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 to

high-quality professional development. 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 their students about the seminar subject and to share with other teachers in their school district and, through the website at teachers.yale.edu, 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 collections, one for each seminar. 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

I. U.S. Social Movements through Biography

Introduction

The history of social movements has an almost magnetic attraction for YNI National Fellows – and for their students as well. Even before the resurgence of social protests in recent years, social movements offered teachers a chance to show students how individual actions could lead to societal change. They offered, also, a chance to put students in touch with acts of remarkable courage, speeches of remarkable power, and writings whose insights still resonate today. Most importantly, social movements have played a central role in American history, especially in the 19th and 20th centuries; to put it simply, U.S. history cannot be taught without introducing students to the struggle to abolish slavery, to provide suffrage and equal rights for women, and to ensure that the Constitution's promise of civil rights is available to all citizens.

This seminar "U.S. Social Movements through Biography" brought together a talented and deeply committed group of teachers from across the country to study social movements in general, and to prepare their individual curriculum units. Our common readings, organized around the interests of seminar participants, were framed by some general readings on how to best understand and teach the relationship between individual experiences and a broader history. We also read Sam Wineburg's influential (and humorously entitled) recent book, *Why Study History (When It's Already on Your Phone)*, which made a persuasive case for inquiry-based learning that emphasized learning to ask and answer key historical questions rather than simply memorizing names and dates.

Our general seminar readings began with a few samples from the outpouring of scholarship on the Civil Rights Movement. For instance, Jaqueline Dowd Hall's important article on "The Long Civil Rights Movement" demonstrated through powerful example the ways in which historians' decisions about periodization (when to begin and end their stories) relate to interpretation. The life of Bayard Rustin, a central figure in the Civil Rights Movement, but one who often stayed in the background, offered an opportunity to consider individual lives in the context of a broader movement. We then moved back in time to look at the rise of labor unions on a national scale in the late 19th century; these episodes revealed some of the prerequisites to successful mobilization. With these important movements – and important concepts – worked out, the seminar then examined a suite of late 20th-century social movements, including "second-wave" feminism, the American Indian Movement, and the "gay rights" struggles for LGBTQ rights.

Not surprisingly, the curriculum units for this seminar centered, by and large, around the social movements of the late 20th century – and especially around the African-American freedom struggle. Stephen Straus followed the charge of this seminar quite directly in his curriculum unit centered on John Lewis's well-regarded graphic version of his biography,

March. A remarkable figure in the 1960s student movement, Lewis's death in 2020 made Straus's examination of his life all the more poignant and meaningful. Straus also incorporated readings on the Civil Rights Movement in Richmond, Virginia so his students could understand how their own city both reflected and contributed to national events. Carol Boynton (a veteran YNI hand serving as seminar co-Coordinator) took on the challenge of teaching complex historical concepts and events to her kindergarten students. Her fortunate students will learn Hall's point about periodization through studying the life of Rosa Parks, whose refusal to move to the back of the bus was a crystallizing moment in the Montgomery (Alabama) bus boycott. Karen Mullins moved further back in time to use the lives of two remarkable artists, the writer James Weldon Johnson and the sculptor Augusta Savage to illustrate crucial aspects of the so-called Harlem Renaissance of the 1920s and 1930s.

Not all of the National Fellows worked in the field of Civil Rights. Alex de Arana prepared a thoughtful and wide-ranging unit on the labor battles of the late 19th century. After illustrating the logic behind the rise of national-scale labor unions using famous battles in the steel industry, de Arana also brings the battles back home by relating the events of the Philadelphia transit strike – over some of the same rail lines that his students use to get around the city. Jolene Smith prepared an insightful curriculum unit about the rise of the American Indian Movement in the late 1960s, showing how it managed to pull together Native Americans from across the United States to agitate for changes to policies at the federal level. And Sean Means (a first-time seminar co-Coordinator) drew on his own experiences to teach his students about Barack Obama's successful presidential campaign in 2008, introducing students to the complexities of electoral politics on the ground.

It was a particular pleasure to work not just with Social Studies/History teachers but also their colleagues in English Language Arts. Alca Usan's curriculum unit on Langston Hughes drew on our seminar discussions of his work, themselves based on some of the incomparable holdings of Yale's Beinecke Library. She combined appreciation for Hughes's artistry and his ability to shed light on African-American experiences with a methodological commitment to teach students the virtues of close readings. Tara Waugh designed an adventurous and compelling curriculum unit that combined analysis of Margaret Atwood's *The Handmaid's Tale* with a study of culturally oriented movements like the Riot Grrrrls in the punk rock scene of the 1990s.

Two of the National Fellows faced the challenge of providing significant history lessons to their English-language learners. Cristina Mejia worked on the core concerns of the seminar, exploring the lives of six Latinx activists from a variety of walks of life – but all committed activists. Her unit demonstrates the power of biography as a way of inspiring students to action. Kariann Flynn worked in an earlier period, using her curriculum unit to teach students how historical events are memorialized. Focusing on the Battle of Gettysburg, she compared Lincoln's memorable (and oft-assigned) address at the

battlefield with a competing account by Frederick Douglass – and with everyday accounts of the war's meaning from soldiers who fought there.

As any historian would remind us, our seminar discussions reflected our own times – the unusual moment of Summer 2021.Wrapping up our work together just as the delta mutation pulled us back into measures to combat the Coronavirus, we were also shaped by the battles over teaching history visible in state legislatures, and the ongoing racial reckoning in the United States as a whole. Meeting virtually, we built as much of a community as possible and found meaning in our collective and individual work.

David C. Engerman

Synopses of the Curriculum Units

21.01.01
Rosa Parks: A Civil Rights Hero, by Carol Boynton

In the many children's picture books about Rosa Parks, she is simply portrayed as a tired old seamstress in Montgomery, Alabama, who decided to resist segregation law by refusing to move to the back of the bus. This moment of defiance is presented as a spontaneous act of courage that sparked the bus boycott and placed Rosa Parks in the forefront of civil rights. In fact, there is a deeper story in her history that is missing from this civil rights story.

This primary level unit spends three to four weeks on the life and legacy of Rosa Parks by expanding her life story, using the following texts for project-based learning activities: *The Bus That Changed History: The Story of Rosa Parks* by Pamela Duncan; *Back of the Bus* by Aaron Reynolds; *If a Bus Could Talk: The Story of Rosa Parks* by Faith Ringgold; *Rosa's Bus: The Ride to Civil Rights* by Jo Kittenger; *A Picture Book of Rosa* Parks by David Adler and Robert Casilla.

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

21.01.02
Who Built the American Economy? How Labor Unions Shaped the Early Labor Movement, by Alexander de Arana

This unit plan explores the Industrial Revolution, Gilded Age, and the beginnings of the Labor Movement by examining two case studies: the Homestead Strike of 1892 and the Philadelphia Streetcar Strike of 1910. These case studies will allow students to learn about the origins of the Labor Movement and how laborers organized first in industrial sectors and then in service-based jobs. Students will conclude the unit by examining the economic impact of labor unions throughout the twentieth century. Ideally, this curriculum unit will help students see the similarities in wealth inequality during the Gilded Age compared to today's world. The coverage of these topics and the inquiry-based approach towards document analysis will provide students with the opportunity to successfully take the IB History Exam at the end of their twelfth-grade year.

Key Words:
Industrial Revolution, Gilded Age, Labor Movement, industrial capitalism, collective bargaining, industrialists, workers, labor unions, Homestead Strike, Philadelphia Streetcar Strike

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

21.01.03
Remembering the Civil War: A Primary Source Comparative Study of Rhetoric and Author Purpose, by Kariann Flynn

This four to six week curriculum unit for high school English learner students is an in-depth study of the Battle of Gettysburg and the rhetoric produced before, during, and after the battle. Students will study the canonized literature of Abraham Lincoln's *Gettysburg Address* and compare it to texts produced by participants in the battle and larger war effort, as well as a speech by Frederick Douglass. In this unit, students will explore the ways in which Lincoln's unifying rhetoric aligns, and does not align, with that of other authors. Students will conduct inquiry-based research into primary source documents and compare their findings with authoritative secondary sources. Throughout the unit, students will question the dominant narrative of the Civil War in American memory before making their own conclusions about the meaning of the Battle of Gettysburg, the Civil War, and the aftermath of America's greatest internal conflict.

(Developed for English 9, grade 9; recommended for English Language Arts and U. S. History, grades 9-12)

21.01.04
Mobilizing Change: Lessons Learned from Obama's 2008 Campaign, by Sean Means

This unit is for History teachers. It should be applied by teachers who want to demonstrate how campaigns are assembled, organized, and run. The Obama campaign of 2008 was a lesson in how appropriate strategizing can lead to positive outcomes. The unit begins by surveying America before the 2008 election, it highlights the state of the economy, the national debt, and how America was fighting on a two-war front. After providing context on the nation's current state, it moves to how Obama's team began to mobilize through a variety of entry points. It is important to understand that this unit is not primarily about the candidate's story, instead, it pays homage to the organization that paved the way for his presidency. The unit highlights how technology, fundraising, competent staffing, and the proper execution of well-planned tactics can lead to positive outcomes. Students should leave the lesson with a better understanding of the importance of civic duty and why proper preparation is essential to the execution and achievement of any goal they might set for themselves.

(Developed for Social Justice, grade 12; recommended for U. S. History, grade 11, Civics, grade 9, and Social Justice, grade 12)

21.01.05
Latinx Biographies and Social Activism: An Untold Latinx History, by Cristina Mejia

This unit centers around the study of Latinx biographies and social movements. The unit will focus on three types of Latinx figures, activists, celebrities, and athletes and will allow heritage students to see themselves represented in U.S. History. Heritage students will be able to work on their critical reading, writing and language skills through storytelling and presentations in the target language. The unit is intended to empower Heritage students to tell their own stories and use their collective voice to make changes in their lives. This unit was written for 12th grade Heritage Spanish class but can be suited for Levels 3-6 Spanish classes or U.S. History classes.

(Developed for Heritage Spanish 1, grade 12; recommended for Heritage Spanish, grade 12, and Spanish, grades 9-12)

21.01.06
Artist in Action: Examining the Activism of James Weldon Johnson and Augusta Savage, by Karen W. Mullins

This unit is designed to provide 7th grade English students with an overview of the social, political, racial, economic, and cultural aspects of the Harlem Renaissance. Through a study of the Harlem Renaissance's precipitating factors and competing political ideas, students will get a broad overview of the complexity of the movement outside of artistic creations. By reading excerpts of James Weldon Johnson's autobiography, *Along This Way*, students will explore Johnson's leadership in the anti-lynching movement and the fight for African-American enfranchisement alongside his prolific literary accomplishments. Similarly, a close reading of Augusta Savage's biography, *Augusta Savage: Renaissance Woman* will help students understand how her protests against both racial and gender discrimination in the arts paved the way for many modern artists who use their platforms for social commentary. Students will then use their readings as the basis for a fishbowl discussion comparing and contrasting Johnson and Savage. The unit will conclude with students creating a children's book illustrating the connection between the artists' lived experiences, their art, their activism, other artists of the Harlem Renaissance, and social movements of their time as precursors to modern movements. *In Her Hands: The Story of Sculptor Augusta Savage* will be the model text for the children's book.

(Developed for ELA, grade 7; recommended for History, Social Studies, African American History, and African American Literature, grades 6-8)

21.01.07
AIM and Native American political activism in the 20th century, by Jolene Smith

Native Americans have had to struggle with surviving on their reservation since the 1800s. Some individuals have stepped up to fight the struggles and created a movement known as the American Indian Movement (AIM). These leaders became prominent figures who fought for better housing, better health care, native language and culture education, and treaty rights.

Dennis Banks, Clyde Bellecourt, Russell Means, and Anna Mae Aquash led the cause. Banks and Bellecourt were the first leaders who established AIM. The two focus on the Minneapolis area, where many of the Indians moved from the reservation. Eventually, natives from across the nation asked for AIM's help and traveled to the places and took a stand in defending issues that were not supportive of a better life for Native Americans. The occupation of Alcatraz, Mount Rushmore, the Mayflower, Plymouth Rock, Wounded Knee, the Trail of Broken Treaties, and the BIA headquarters take over were some areas AIM occupied with demonstrating their tribal issues to the public, government, and news media.

AIM was on the FBI watch list as a group that interfered with government regulations. After the loss of a prominent AIM leader, the movement slow decimated into its chapters.

(Developed for Social Studies and Navajo [Diné] Language, grade 5; recommended for Social Studies, grade 5)

21.01.08
John Lewis: Examining the Past to Inform Understandings of the Present, by Stephen Straus

Students will study the Civil Rights Movement through the life of John Lewis by reading *March*, a graphic novel adaption of Lewis's account of the Civil Rights Movement. Students will explore the local context of the Civil Rights Movement in Richmond, Virginia through primary sources that document the Richmond sit-in movement and its retrospective fifty years later. Students will make connections to Black Live Matters and other contemporary social movements as part of a broader analysis of social movements against institutional racism and systemic oppression that includes the Civil Rights Movement. They will examine primary sources focusing on the George Floyd protests in Richmond and retrospective accounts from Richmond locals published a year later. These social movements will allow students to explore the evolution of movements and their connection to other historical events. These materials will help students assess the complexity of memory and history as it relates to their own personal experiences. This unit is designed for middle school English Language Arts.

(Developed for English Language Arts, grade 7; recommended for English Language Arts, and Social Studies, grades 6-8)

21.01.09
Literary and Historical Reading with Langston Hughes, by Alca Flor Usan

Langston Hughes is an incredible poet and storyteller known for his participation in the Harlem Renaissance. His poetry is popularly taught in classrooms across the country and yet, the way it is presented in typical prescription curricula, simply does no justice to the wealth of historical knowledge lying beneath each poem. As English teachers, while we focus on close reading analysis, we miss out on the historical events crafting those words. Events such as the Great Migration and World War 1, create the conditions through which Hughes experiences a life different from African Americans who came before him. The Harlem Renaissance captures a culminating moment where the African American identity would shift from the "Old Negro" to the "New Negro:" from the legacy and stereotypes of slavery, to a crafted identity of independence, pride, and struggle, existing in a still prejudiced society. His own familiar relationships, educational tension, experiences abroad, and participation in the Harlem Renaissance, add a crucial layer of understanding to his many works. This unit uses inquisitive historical thinking to add onto close reading skills, as a way to teach students to dig deeper into texts and history, therefore reaching a greater understanding about society today.

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

21.01.10
From Handmaids to Riot Grrrls, using Fiction to Understand Social Movements, by Tara Cristin Waugh

Punk is dead, but punk rock feminism is not. Focusing on social movements, my unit will ask students to read *The Handmaid's Tale* as a social movement theorist. First, we will study the structure and strategies of social movements that they are already familiar with. This unit will focus on the punk-inspired Riot Grrrl Movement from the 1990s using the biography of Kathleen Hanna, one of the movement's most influential leaders, and on the zines they created. This social movement deals with the same issues of *The Handmaid's Tale* like sexism, rape, and the silencing of women. After reading the novel, students often feel dissatisfied with the ending. For their final project, students will be asked to turn that dissatisfaction into meaningful action. They will create a Riot Grrrl zine from the characters' points of view and create a fictional social movement using the tactics and strategies of this unit's studied social movements. Having students understand how a social movement works and planning their own, even if it is fictional, will allow them to

see how their voice and their participation in a social movement can fight against social injustices in our world.

(Developed for AP Language and Composition and IBHL I, grade 11; recommended for English III, grade 11, and AP Literature and Composition, grade 12)

II. Gender, Race, and Class in Today's America

Introduction

This year the Yale National Initiative brought together a talented and committed group of teachers, despite our inability because of Covid to work in New Haven together. Nine teacher Fellows worked together, albeit from a distance, to build their projects. Based on a set of related themes, the teachers built an extraordinarily powerful set of course units under the theme of **Race, Class, and Gender in Today's America**. Some of this group were highly skilled and knowledgeable teachers while others were developing new approaches for the first time, but the projects are all impressive. This is an impressive group of teachers whose curriculum ranges from very young to senior scholars, from diverse ethnic, racial, and class backgrounds. The group members not only understood the challenges of their own students, but were also empathetic about different kinds of students than their own.

A number of the teachers established powerful intellectual projects on American history. **Matthew Menschner** built a unit around colonization and early American history, African slavery in North America, the Civil War, segregation and racial discrimination in the military, the women's suffrage movement, and the civil rights movement. **Catherine Cunha** focused on the 13th and 14th amendments, Plessy V. Ferguson, Jim Crow laws and Black Codes, and Brown v. Board of Education. Introducing her students to "Roll of Thunder, Hear My Cry," helps explain the potency of racism. **Tara McCrone** adds a unit focused on an important but discouraging period: racism and class from the 19th century sseen through the lens of conflicts ver immigration. She uses *Esperanza Rising* as well as books about Irish and Chinese immigration, Ellis Island, and Angel Island entry points and the enforcement of Japanese internment camps.

Kaitlin Waldron, also focusing on American history, tackles five texts: *Esperanza Rising, House on Mango Street, We Are Not Free, Braiding Sweetgrass,* and *Ghost Boys.* By studying these texts, students will gain potent and powerful content knowledge. **Christine Shaub** shifts the attention to African American male figures, and asks why African American males are so often killed by white police officers. Do the ideologies of the white slave masters still have credence in the mindset of white law enforcement officers today? **Krista Waldron** focuses on whether potent racism continues, focusing on the Tuskegee Syphilis study, the story of Henrietta Lacks and her HeLa cells, and current inequalities in our Covid 19 present. These questions lead her to ask some key questions including about the roles race and/or gender play in healthcare access and whether and how government institutions and the medical establishment affect these inequities?

Sharon Ponder-Ballard begins by helping her students understanding the murder of George Floyd in Minneapolis, Minnesota and the subsequent murder of Adam Toledo in Chicago, Illinois. She engages her students with hip hop lyrics and its intersection to

various social justice movements in America. **Sophia Alvarez** asks her students to understand ethnography of a gang in Chicago and the surrounding neighborhood, by anthropologist Laurence Ralph, as an entry point to issues of belonging and exclusion. Alvarez helps students investigate the ethics and nuances of ethnography, build empathy and self-awareness, and gain the academic language to discuss social issues today. **Shaasia Jackson** also aims to teach her students about resilience and empathy. They are given the opportunity to read *Class Act* by Jerry Craft. Her aim is to get them to understand how resilience is multiplied exponentially when supplemented by empathy.

This year's teachers illustrate a wide range of classroom plan and teaching style. They are an impressive group with extraordinary teaching talent.

Frances McCall Rosenbluth

Synopses of the Curriculum Units

21.02.01
Exploring Belonging and Exclusion through Ethnography, by Sophia Alvarez

Do I fit in? Where do I belong? Why are some people excluded or dismissed? These are questions that teenagers ask themselves, as they explore their identities and try to understand how they fit into their communities and society. This unit provides an anthropological approach for helping students grapple with these questions. Students read *Renegade Dreams,* an ethnography of a gang in Chicago and the surrounding neighborhood, by anthropologist Laurence Ralph, as an entry point to issues of belonging and exclusion. They learn about sociological and anthropological theories of social categorization and the history of race-based exclusion in the United States, particularly in America's cities. Students also explore the resilience and dreams of people who have been marginalized based on race, socioeconomic status, or other markers, like incarceration or disability. The content instruction is supported through student inquiry, social and emotional learning, structured discussion, and mastery-based assessment. The goals of this unit are to help students investigate the ethics and nuances of ethnography, build empathy and self-awareness, and gain the academic language to discuss social issues today.

(Developed for IB Anthropology, grades 11-12; recommended for U. S. History, Sociology, and English Language Arts, grades 11-12)

21.02.02
"*Roll of Thunder, Hear My Cry*: Historical Context through a Critical Lens", by Catherine Cunha

The attempt of this unit is to provide students with historical depth of knowledge needed to access and critically analyze complex text. In elementary schools and districts across the United States, social studies content is being taught less in favor of dedicating more classroom hours to developing elementary students' literacy and mathematical conceptual understanding. This however creates issues when students are presented with works of historical fiction in middle and high school that they are expected to critically engage with. This unit will serve to bridge that gap by enhancing student understanding of the historical legacy and ramifications of Jim Crow, the laws that preceded it, and the laws that came after. Through this exploration students will learn not only how the past has shaped their current reality, but they will also gain a deeper understanding of how the laws of the past left room for the continued reign of white supremacy today. Students will analyze the laws and acts such as the 13th and 14th amendments, Plessy V. Ferguson, Jim Crow laws and Black Codes, and Brown v. Board of Education which have repeatedly left room and enabled racism to cement itself into American law and life. We will analyze these stories for the historical context that they fit into and how they relate to the

anecdotes from our anchor text: Roll of Thunder, Hear My Cry, by Mildred Taylor. Students will need to continually compare past to present and ask themselves: "Have things become better since Jim Crow? If so, how much? If not, why?" and "What can be done about it?"

This unit is written for 6th grade English Language Arts classes, but the core unit content and historical background provided could be suitable for students of all middle school ages or early high school.

(Developed for English Language Arts, grade 6; recommended for English, grades 7-8, and U. S. History, grades 6-8)

21.02.03
Family of Empathy, Shaasia Jackson

This unit is really special because I want to emphasize how you can be resilient and have empathy for others despite the hardships in life. This unit will be taught through readings. I have picked a book that deals with students from different backgrounds that my students can relate to. They will learn about being resilient and having empathy for others through reading Class Act by Jerry Craft. Resilience is multiplied exponentially by its most important factor empathy. Empathy encourages community. This community then provides an important support system for students to get through stressful situations. Which in turn helps build a family environment in the classroom, where my students can develop empathy for each other and are aware that when working together we can all make it through hardship. The pandemic is good example of how people from many different cultures had to come together in hard times and really work together. I want for all my students to feel supported and important. I want them to understand that having empathy can help them see that other people are important as well. I want them to learn that even though they go through hardships they can make it.

(Developed for ELA, grades 3-5; recommended for ELA, grades 3-5)

21.02.04
A Nation of Dreamers: Examining American Immigration and Race through Esperanza Rising, by Tara McCrone

his unit showcases how students can build their historical background knowledge about American immigration through the use of paired texts during a novel study of *Esperanza Rising* by Pam Muñoz Ryan. Racism and class are prevalent throughout Esperanza's fictional journey to America. This unit provides significant moments where race and class also played an important role in American immigration policies and practices: 19th century Irish and Chinese immigration, Ellis Island and Angel Island entry points, the alliance of Mexican and Filipino farm workers during the Delano Grape Strike, and the

enforcement of Japanese internment camps. Teacher strategies and classroom activities include close readings of paired texts during the novel study, informative biographical writing, and creative writing of poetry. Students will end the unit by writing and preforming their own "My American Dream" poem.

This unit is written for the 5th grade English and Language Arts classroom but can be adjusted to for a middle school Language Arts or Literature classroom as well.

Key Words: Immigration, Esperanza Rising, novel study, paired text, racism, class, poetry, creative writing, American Dream

(Developed for English, Language Arts, grade 5; recommended for English, Language Arts, grade 6)

21.02.05
American Intersections: How Race, Class, and Gender Shape our History and Lives, by Matthew Menschner

This unit seeks to explore the intersection of social and political identities, and specifically how they have impacted--and have been impacted--throughout various periods in American history. The unit will incorporate a number of readings and case studies that exemplify each of the topics of study. Some of these topics include colonization and early American history, African slavery in North America, the Civil War, segregation and racial discrimination in the military, the women's suffrage movement, the civil right movement, and more. It is no secret that there is much inequality across the country, and it can usually be traced back to some combination of the aforementioned periods in history, and the interconnectedness of people's social and political identities. This curriculum unit will present an opportunity for students to not only understand the historical, societal, and political roots behind "the origins of our discontents," but will better prepare them to navigate and overcome through community facing and equity based frameworks.

(Developed for African American History, grade 11; recommended for African American History and United States History, grades 9-12)

21.02.06
How Hip-Hop Moved The Crowd to Social Activism, by Sharon M. Ponder-Ballard

This Hip-hop and social activism unit is intended to be an interdisciplinary one which involves literature, music, research, writing and various forms of art. The historical event that will serve as the springboard for this unit is the murder of George Floyd in Minneapolis Minnosota and the subsequent murder of Adam Toledo in Chicago Illinois. Students will engage in an examination of hip hop lyrics and it's intersection to various

social justice movements in America. Students will closely look at lyrics that will assist them in critical analysis, response writing and discourse. The issues and guiding songs are Race: The bigger Picture by Lil Baby, Class: White Privilege by Macklemore, Gender: Moment 4 Life by Niki Minaj, LGBTQIA: Panini by Lil Nas X and Police Brutality: The Sound of Da Police by KRS-one. Classroom strategies and activities are provided in addition to culminating projects which involve students as activists within their school and community at large.

This unit is designed for ninth grade students to build analysis skills around social justice issues through music. The activities and discourse that revolve around each artist is scaffolded and modified based on students interest and skill level.

(Developed for English I, Advisory, and Extra Curricular, grade 9; recommended for Music, Social Studies, History, and Art History, grades 6-12)

21.02.07
American Policing Disparities: Today's African-American Males Living in the Shadows of their Male Ancestors, by Christine Shaub, PhD

The sad history of the slave trade is viewed from a different perspective. Bridging historical African American male figures to today's killing of unarmed African American males by white police officers are explored in this curriculum unit. The cultural oral history of many groups are passed down from generation to generation. This is prevalent in the African American culture. Is it the same for whites? Could the white slave master's characteristics and ideology be passed from generation to generation? Could the ideologies of the white slave masters still have credence in the mindset of white law enforcement officers today? This unit will look at the slave and the white slave master to examine these questions.

Keywords: slave, slavery, African Americans, black males, police, law enforcement, slave trade, criminal justice, Brown v. Board of Education, Plessy v. Ferguson, Tamir Rice, George Floyd, Black Lives Matter, Trayvonn Martin, Frederick Douglas, Fountain Hughes, Henry "Box" Brown, racism, white supremacy, unarmed black men, police brutality, Plessy v. Ferguson, Black Codes, Fugitive Slave Act 1950, white slave owner, Booker T. Washington, police accountability

(Developed for LA 1, grade 10; recommended for Social Studies and History, grades 9-11)

21.02.08
Giving Voice to the Silenced, by Kaitlin M. Waldron

We rarely find historical events that highlight those who have had no voice, the oppressed, the downtrodden, the women. The purpose of this unit is to provide a voice to those who are continuously looked over: Immigrants, Indigenous people, African Americans and specifically women who fall into three of those categories. The unit uses excerpts from five texts: *Esperanza Rising, House on Mango Street, We Are Not Free, Braiding Sweetgrass,* and *Ghost Boys.* Using those texts, students will close read the text excerpt, answer questions that align with it and then get started on their content knowledge. Following the content lessons, the students will read biographies or primary source documents for women who could have lived during the times and events from the readings. The story of Emmitt Till in *Ghost* Boys will look at his story and the accusers recantation. The unit is written to align with the 7th grade American History curriculum from1865 to the present. Many of the students that I teach are struggling readers and English Language Learners. They text is able to be read to them or they have the option to read through it themselves, passages are capped at three to four paragraphs.

(Developed for American History, grade 7; recommended for American History, grades 6-12)

21.02.09
Medical Inequality in America: Henrietta Lacks, the Tuskegee Study, and Covid 19, by Krista Waldron

In our seminar Race, Class, and Gender in Today's America, I became interested in the history of medical inequities for these groups and what has been or can be done to address them. This unit will cover three main topics: the Tuskegee Syphilis study, the story of Henrietta Lacks and her HeLa cells, and current inequalities in our Covid 19 present. The focus will be on the problems and solutions that arise from these key questions: (1) What role do race and/or gender play in healthcare access? (2) What are the long-term effects of this? (3) What role do institutions like government or the medical field play in these inequities? (4) Do the rights of one outweigh the benefit to possibly millions? (5) What can be done after the fact to restore medical justice? Because this unit is for a language arts classroom, grades 10-12, the emphasis will be on critical reading, writing, and viewing, with lots of opportunities for students to think about tone and purpose, especially. We will read primary and secondary documents from a variety of resources, and we will end the unit with a cumulative problem-solving project.

(Developed for English and Language Arts, grades 9-10; recommended for English and Language Arts, grades 9-12)

III. Democracy and Inequality: Challenges and Possible Solutions

Introduction

It was once widely believed that democracy and equality went hand in hand, a belief that frightened wealthy elites and heartened the poor as the franchise expanded. In fact, democracies often coexist with high and even increasing levels of inequality – as we have seen in the United States and many other democracies over the past half century. The units written in this seminar were motivated by the desire to understand this puzzle and explore possible responses to it.

Among the topics discussed in the seminar that are reflected in the units the teachers wrote were:

- the ways in which the economy and political system affect one another
- the role of electoral systems and political parties
- differences among types of democracies, historical and contemporary
- the role of courts
- why attempts to address different kinds of inequalities, (such as those involving class, race, and gender), often fare differently from one another in democratic politics
- the impact of inequality on education and that of education on democracy and inequality.

An enduring concern about democracy since the time of Alexis de Tocqueville and John Stuart Mill has been the possibility that the majority might tyrannize over minorities. A number of the units focused on disadvantaged minorities in the U.S. Brittany Zezima Dilworth focuses on prejudice against Asian Americans, and the ways in which it has been embodied in legislation such as the Chinese Exclusion Act of 1882 and Supreme Court decisions like *Korematsu v. US* which (1944) upheld as constitutional the internment of Japanese Americans during World War II, calling into question whether courts can be relied on to protect vulnerable minorities when majority-sentiment is strongly against them.

The role of courts is explored in relation to efforts at school desegregation by Lisa Yau and Emma Kessler, both of whom develop units focused on the failures to desegregate American schools during the decades since *Brown v. Board of Education* (1944), and possible responses to this failure. Part of the reason these inequalities are so difficult to tackle is that they are trenchantly embedded in and reinforced by forces in the broader economy and society. As Debra Jenkins shows in her unit on the ways in which comparatively unhealthy foods are successfully marketed to minority students for school meals, corporate America can be a significant source of unequal treatment. And while women are not a numerical minority, historically they have been systematically

disadvantaged in the political, legal, and economic systems – as Cinde Berkowitz explores in her unit on the failed attempt to enact and Equal Rights Amendment and its consequences.

An additional source of inequality among schools can be traced to the decentralized character of public school funding out of local property taxes, aggravated – as Mark Hartung explores – by the anti-tax movement spawned by the passage of Proposition 13 in California in 1978. This is a cautionary tale about the role of social movements, which many people embrace uncritically as a good response to the failures of the political system to deliver reforms benefitting minorities. The civil rights movement and (failure of the ERA notwithstanding) the women's movement have been effective social movements, but so has the anti-tax movement and the Tea Party since 2009 – much more so than Occupy Wall Street that arose at around the same time. Laura Grisham's unit digs into these issues, examining the conditions under which social movements can be effective instruments of change. Among other factors, they need to be linked to the agendas of major political parties if they are to endure.

If quick fixes that bypass politics are few and far-between, how might the political system be reformed to operate more effectively for the benefit of all? One major obstacle here is voter suppression as Jenny Kim and Tiffany Robinson explore in their units, both of which examine aspects of the history of voter suppression as well as current battles over it, and suggest strategies to ameliorate it by empowering voters. Robinson also brings to bear a comparative lens by looking at democracies elsewhere, a theme Brandon Barr expands on by comparing contemporary American democracy with that of ancient Greece and Rome.

In 1788 James Madison wrote in *Federalist # 51* that "in framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself." Most of the units developed in this seminar are primarily concerned with the first of Madison's challenges. Raven Sisco takes up the second in her unit centered on George Orwell's *Nineteen Eighty-Four*, supplemented by excerpts from his writings on politics and economics – notably his book on the Spanish civil war, *Homage to Catalonia*.

Taken together, the units offer a variety of lenses on the promise of and challenges to American democratic politics. They will be a helpful resource to teachers who want to teach their students about America's failure to live up to that promise, but also to educate them about the shortcomings of ineffective solutions and give them a better understanding of those that are more likely to result in enduring improvements.

Ian Shapiro

Synopses of the Curriculum Units

21.03.01
Examining the Inequitable Treatment of Asians in the US: A Civics Unit for Newcomer Els, by Brittany Zezima Dilworth

This unit was written as part of the Yale Teacher Institute, an organization dedicated to writing strong, research-based curriculum for use in diverse K-12 education settings. Written during the summer before 2021-2022 school year, its purpose is to address and explore the concept of minority rights and how various factors affect equality and equity for minority groups in the United States' democracy. It will intertwine Common Core and state history standards with research-driven pedagogy for English Learners to simultaneously meet the language, content, and culture needs of my students. The unit will focus on excerpts conveying the concept of majority rule and minority rights through the lens of the often overlooked Asian-American experience throughout United States history. Before examining this content directly, the unit will introduce students to the idea of unconscious bias and how it impacts the decision-making skills of individuals. They will apply their knowledge of bias as the unit continues into more direct instruction on major events in Asian-American history spanning from mid-19th century railroad workers to the present discrimination stemming from the COVID-19 pandemic, as well as analysis of how related policies and laws influenced their politically-motivated vilification as a minority group.

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

21.03.02
The New *Brown v. Board of Education* in Today's School Segregation, by Lisa Yau

In a Langton Hughes' poem titled *Democracy*, the speaker asks readers to do more than just understand, but more importantly, to DO their part to realize equal rights belong to ALL of us. In 2021, the struggle for equality and digital equity remains troublesome, especially for our Black and Brown students. The purpose of this ELA, Math and Social Studies interdisciplinary unit is to empower 4th to 8th grade students to think like problem-solvers, and act like civic leaders. This 3-part (3 lessons per part) unit is designed for students to: 1) acquire building blocks associated with the principles of democracy by studying primary sources such as quotes, the *Declaration of Independence*, photos, political cartoons, and landmark segregation cases; 2) analyze today's issues of school segregation with maps, ratings, and game theories; 3) plan possible solutions and action steps that might include op-ed letters, public testimonies, and community outreach. The unit is designed to be taught intermittently throughout the school year, but teachers can choose to teach only Part 1 or Part 2 before Part 3. The ultimate goal is for students to

actively execute a service-learning project that will benefit inside and outside of their school community.

Key Words:

United States History, school segregation, *Brown v. Board of Education*, *Alvarez v. the Lemon Grove School District (1931)*, affirmative action, *University of California v. Bakke (1978), Students for Fair Admissions v. Harvard* (2019), game theories, Divide-the-Dollar, Schelling's Model of Segregation, democracy, Preamble of the *Declaration of Independence*, Elizabeth Freeman.

(Developed for ELA, Math, and Social Studies, grade 4; recommended for ELA, Math, and Social Studies, grades 4-8)

21.03.03
Racial Inequities in Public School Today: Reflecting on Failures of Brown V Board, by Emma Kessler

There are two sides to every story- the advantaged and the disadvantaged. A culmination of five court cases throughout the United States led to the Supreme Court- Brown V Board of Education in 1954. The ruling favored Brown, stating that schools must desegregate as it was found that separate was not equal per the Constitution. Since then, what has happened has been shocking- public schools continue to be segregated and appear to be more and more segregated as time goes on. It begs the question- there a winning side and a losing side? Who is winning? Are those on the losing end getting the short end of the stick and access to the information and education they deserve? We'll be taking a deeper look using disparate sources on what happened in Brown V Board to today and looking to the future on where public education is heading. My students will be asked challenging questions that require critical thinking to differentiate between desegregation and integration and create solutions to the problems we face as a nation. My students will present these inequalities and possible solutions as a living museum allowing them more ownership of their learning and taking action against segregation that continues in schools and how to make positive changes.

(Developed for Virginia Studies/Social Studies, Science, and Math, grade 4; recommended for Social Studies, English Language Arts, and Science, grades 4-12)

21.03.04
Can They Escape from Hot Cheetos & Takis? Black Appetite, White Food: Examining Issues of Race, Democracy, and Place, by Debra Jenkins

When school lunch provided to the students of Hearne Elementary is confronted with disdain and groans, it is primarily those foods on the higher end of the nutritional

spectrum. Why do students turn their noses up at the healthier food options? Why is there hesitancy or refusal to consider trying new foods? Is there a possibility that due to the lack of whole foods and farmer's markets in their town they are limited in their knowledge of the tastes of these food choices, or is it because of their race and class they are not provided healthier food options as a community? This unit will explore if 4th-grade students who live in Hearne, is their community a food desert compared to schools from surrounding areas. It will also raise the question of if not given equitable access to foods that could boost their learning and development is fair in a democracy. Conversations and readings taken from the seminar led by Ian Shapiro, writing standards will be addressed when they compose an opinion essay on why they are deserving of whole fresh foods at fair prices.

(Developed for Reading and Writing, grade 4; recommended for Reading and Writing, grade 4)

21.03.05
Breaking Barriers: The Fight for Gender Equality, Equal Pay and Civil Rights, by Cinde Berkowitz

The Equal Rights Amendment (E.R.A.) stands as a century-long dream for many women, suffragists, feminists, and activists as it would ban discrimination based on sex and guarantee equality for women in the Constitution. Lawmakers and advocacy organizations have put the E.R.A amendment back on the nation's agenda to guarantee women full constitutional rights. The E.R.A. is still pending as of August 2021 and will need to have a new ratification date to secure the passing of the amendment. The complex issues of the E.R.A. were propelled by the social movements to enact advances and action in the courts.

Essential questions of this unit include: Should the E.R.A pass or not? How have issues of gender inequality been successful or not in advancing equal protection? Written for 9th and 10th grade U.S. government students, we will study the history of the E.R.A., the 14th Amendment, the Equal Protection Clause and how this clause relates to the E.R.A. We will also discuss how the Courts have argued issues and landmark cases of gender inequality that are not stated in the Constitution but have been fought and have advanced the causes of justice for men and women in the United States.

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

21.03.06
Still Separate and Unequal? A Look at School Equality in the American Democracy, by Mark A. Hartung

One persistent myth about Brown v Board of Education is that it ended school segregation and inequality. In fact, many schools today are resegregated and still unequal compared to others. Another myth conflates democracy with equality. In fact, many democracies not only experience inequality but cause and perpetuate it. Students experiencing this unit will look at inequality by researching their own school and making comparisons to other schools around the state and country. Student engagement will rise because they are investigating their own society. In addition, they will be partnered with other students across the country to share and analyze information. Students will then talk about ways to equalize schools and look at the challenges involved in using the courts or voting to try and make improvements. After considering what changes have been attempted elsewhere and how they fared, students will propose changes within their own school and district, come up with a plan for implementation, and then present to relevant school officials. Written for High School Sophomores and Juniors in History classes, this unit involves data gathering, research, analysis, collaboration, and presentation, and could be taught at other grade levels or in other subject areas as well.

(Developed for U. S. History, grade 11, and World History, grade 10; recommended for Social Studies, grades 7-8; U. S. Government, grade 12; U. S. History, grade 11; and World History, grade 10)

21.03.07
Cause and Effect: Inequality and Activism, by Laura Grisham

his curriculum studies the cause-and-effect relationship between activism and inequality. Students use multi-media texts to examine and evaluate modern-day activist movements. Students will first gain historical context for inequality in the United States by reading excerpts from Michael Klarman's book *Unfinished Business*. Students will then apply this learning to modern-day activism. Students will learn about the two activist movements that came after the 2008 financial crisis: Occupy Wall Street and the Tea Party movement. They will also learn about the history of activism by the WNBA and its players. Then, using the six building blocks of distributive politics as laid out by The Wolf at the Door, students will evaluate the effectiveness of these three groups. Finally, students will select an activist movement or group on their own. They will go through the process of evaluating their movement against the six building blocks to write a persuasive essay. As a result of this unit of study, students will gain an academic-based understanding of activism and allow them to advocate for causes they support.

(Developed for Speech 3, grade 8; recommended for Social Studies and English Language Arts, grade 8)

21.03.08
Jim Crow 2.0: Voter Suppression in the 21st Century, by Eun Jung Kim

With the passage of the 15th and 19th Amendment, all Americans gained the right to vote. But the path to voting has never been so hard for many disenfranchised groups. Vote suppression has a long history in the United States. In the last few decades, the United States saw an increase in the passage of legislation that have made it difficult for voters to vote, especially for disenfranchised groups. A significant numbers of voters were prevented from casting their votes through restrictive measures such as strict voter ID laws and voting times, restricting registration, and purging of voter rolls. Students will learn about the history of voter suppression in the United States and its impact. They will analyze court rulings as well as legislations that have contributed to voting suppression in the United States. Through their inquiry students will explore ways to increase voter participation withing the study body and their immediate communities.

This curriculum unit is designed to be taught in a 12th grade U.S. Government class, but can be adapted for 11th grade Advanced Placement United States History and 11th grade United States History.

(Developed for A.P. U. S. History, grade 11, and A.P. U. S. Government and Politics, grade 12; recommended for U. S. History, grade 11, and Government, grade 12)

21.03.09
Democracy & Inequality: To be or not to be?, by Tiffany Robinson

By the end of the unit, students will be able to explain what democracy, inequality and voting means to them. This will happen as a result of them examining and researching what democracy and inequality is. They will be able to synthesize all of the information that we have learned over a period of time which will result in them taking action as world changers. They will learn how to use components of the democratic process such as voting to initiate and be agents of change. This level of empowerment will encourage them to be more active as participants in this process.

This unit will allow us the opportunity to also look at democracies in other countries as well. We will compare and contrast how democracies look across the world. We will examine different types of governments and their voting processes. Understanding the various types of governments and how they operate will allow my scholars to have a better understanding of how countries are different everywhere. They will learn firsthand that not every country has a democratic society where people have the right to choose. The way we view and understand democracy varies here in the United States too!

(Developed for Spanish, grades 3-8; recommended for History, ELA, and Math, grades 3-8)

21.03.10
Democracy: The Ancient World and Modern Implications, by Brandon Barr

In this unit, students will learn more about democracy in ancient Rome and Athens and how influential and comparable these early democracies were to the establishment of democracy in the United States. Democracy seems like the standard and aspirational ideal for government today, but it was not always considered an ideal form of government by many great thinkers. This unit will help students to see that there are clear parallels that are worth considering between the ancient world and modern democracy. Knowing that there was a significant period in which democracy disappeared from the face of the world, this unit also briefly explores challenges that democratic nations face in modern times that might threaten democracy going forward.

This unit is designed for sixth grade students to extend historical knowledge about the ancient world by using a guided inquiry approach. Documents for an archive bin have been curated to support the inquiry. This unit could be used in middle school or high school Social Studies classes. It assumes little knowledge about Roman and Athenian societies, but this information is readily available in the content objectives section of the unit.

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

21.03.11
Orwell's Dystopian Inequality: Fact or Fiction?, by Raven Sisco

In his 1946 essay "The Lion and the Unicorn," George Orwell writes: "An illusion can become a half-truth, a mask can alter the expression of a face…[the arguments that] democracy is 'just the same as' or 'just as bad as' totalitarianism never take account of this fact...concepts of justice, liberty and objective truth are still believed in. They may be illusions, but they are very powerful illusions" (page 12). Despite the fact that this essay explores his observations of his home country of England, Orwell presents concepts that confront our perception of how power is exerted over people by governmental systems. The novel *1984*, a fictional account of the future written by Orwell in 1948, challenges the reader to think about the concepts of democracy, totalitarianism, information control, and individual liberties, among many other themes. Students in my AP English Literature and Composition class will investigate the historical and biographical context surrounding Orwell's writing and political viewpoints, apply those lenses to our class wide reading of *1984*, and make connections to these aforementioned themes as they see them presented in their own lives, their community, and the world around them.

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

IV. The Sun and Us

Introduction

We live in a star's backyard. This star has eight planets revolving around it, it has myriad dwarf planets, and comets and other objects that it holds together with its gravity. This star gives us warmth and light and is responsible for life on Earth. Thus, among all the stars, it holds a unique position in our lives. This star is the Sun. The Sun has been worshipped and venerated as the giver of light and life, long before it was recognized as an ordinary, low-mass star around which we revolve. However, the Sun can have an adverse effect on technology. The magnetic regions on the Sun can emit an immense amount of radiation and magnetized plasma that can interact with the Earth's magnetosphere and cause geomagnetic storms. Such "space weather" events can potentially cause billions of dollars of damage.

This seminar covered a wide range of topics. We discussed the science of the Sun and space weather. We learned about other stars and examined how the properties of stars are determined. We discussed the solar system but did not limit ourselves to that —we also looked at how exoplanetary systems are observed and what would make them habitable. We also touched upon astrobiology and tried to imagine what life on a different planetary system could look like. Closer to home, we examined seasons, climate and climate change. We also examined how solar energy can be used to power homes.

The seminar has led to the creation of ten excellent curriculum units for grade levels that range from kindergarten to high school. Perhaps what is even more interesting is that not all units are from science teachers; we have one unit from an art teacher, one from a social science teacher and one from a biology teacher — testaments to the fact that the Sun is not merely an astronomical object of scientific curiosity, but an object that has inspired art, plays a big role in society and is crucial for life.

The units in this volume are organized by grade level. We start with the unit written by Joseph Parrett for his kindergarten class with his imaginative use of Superman to explain that different colors of light have different levels of energy; the unit introduces students to basic facts about the Sun, stories about the Sun and seasons. Next is Martine Devine's unit to introduce her 2nd graders to the solar system using poems she has written herself and an imaginative board game. Both Alexandra Wagner and Jason Ward tackle seasons and climate in units for the 3rd grade. The former is about how the Sun causes seasons and how the changing configuration of the Earth-Sun system can change climate; she also focuses specifically on what a change in the climate of the Great Lakes region, where her school is based, will do to that region. Jason Ward's unit uses an unusual hailstorm in Guadalajara to explain concepts of weather. Elizabeth Isaac's 3rd-grade unit takes us into traditional life in the Navajo Nation and the role the Sun plays in the culture, and how

solar energy can be useful there. Taryn Coullier, who usually teaches social studies, found the subject matter fascinating enough to prepare a unit for the 4th grade in which she talks about the life-cycle of stars; this unit can be easily modified for other grades. And then we have Tina Berry, an art teacher, who was fascinated enough about the Sun and solar mythology to create a unit to teach art while teaching both the science and mythology of the Sun. She also makes a foray into exoplanetary systems so that her students can imagine life on very different kinds of planets around different kinds of stars. Although the unit is directed towards 6th graders, it can be used at upper levels too. Next is the set of three units written specifically for high-school students. Joanna Minott's unit introduces students to spectroscopy and how spectroscopy is used to determine what stars are made of. Zachary Meyers uses the example of the Sun to teach electromagnetic radiation and its properties; he also discusses appliances that use or capture electromagnetic radiation. The last unit, by Christopher Sikich, is a unit for biology classes that traces the journey of a photon (a bundle of electromagnetic energy) from the core of the Sun to its absorption by a leaf to get the energy for photosynthesis. This unit goes further and delves into astrobiology and how to examine whether a planet can support life as we know it.

The units cover a wide range of subjects, and each unit is versatile enough that it can be modified to suit other grade levels. I hope that these will be useful to a much larger group of teachers and not just the ten in the seminar.

Sarbani Basu

Synopses of the Curriculum Units

21.04.01
Our Sun: The Myths, The Facts, and Superman, by Joseph Parrett

This unit leverages the popularity of Superman to add relevance to and enhance engagement of kindergarten science and English Language Arts (ELA) lessons (though it could be adapted to 1st or 2nd grade as well). In the unit students will learn about Superman's connection to the stars and our Sun. Through the lens of Superman, students will learn about observable patterns of nature that relate to the relationship between the Sun and Earth. Concepts covered in lesson will include: day and night, the seasons, the Sun and plants, and how the Sun affects weather on Earth. A goal of the unit is to better connect the kindergarten science units regarding plants and trees, the weather, and force and motion. Additionally, students will be exposed to multicultural mythology that relates to the content of this unit. This unit will address Next Generation Science Standards as well as kindergarten ELA standards prescribed by the Common Core State Standards. Student engagement is about to go "up, up, away".

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

21.04.02
Bringing the Solar System into Our Classroom, by Martine Devine

This curriculum unit will bring the solar system into my classroom. It will provide a foundational framework for the students to investigate the Sun, planets, and other objects of the solar system. If my second-grade students were in school fifty years ago, they would be coming to class with space-themed lunch boxes. The topic of space would be in the news; students would hear about it frequently and they would know that space was for them. This unit will allow students to create reference materials, participate in songs, and play a board game to practice and reinforce their knowledge. It will bring the Sun, planets, and the rest of the solar system into our classroom and allow the students the opportunity to look to the sky as people have done for thousands of years. It will allow them to wonder and think about what they have learned. This curriculum unit will teach my students that space is for everyone and that space is for them.

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

21.04.03
The Sun & Chicago: Its Weather, Climate, and Climate Change, by Alexandra Wagner

Climate change is a term that has become politicized and confuddled over the past few years. But climate change is a reality that all of us are facing and a topic that our students need to explore if they are to understand how to help our planet. This six-week unit, designed for third grade or upper elementary students, will deeply engage students with the science behind climate and climate change. They will complete experiments to learn why different parts of the Earth have different climates and learn the details of their local climate. Students will learn how climate differs from weather and use meteorological data and mathematical reasoning to see how the climate in their region has changed over time. Students will compare historic and present temperature trends to see, tangibly, what the term "climate change" means. From here, students will research the causes and effects of climate change in the Great Lakes region to deeply understand the connection between the temperature graphs they have created and what is happening in their local community. Students will have the opportunity to choose a climate change intervention tool and evaluate its usefulness. They will also make recommendations about how the item/intervention could be improved to help protect the Great Lakes region from the damaging effects of climate change.

(Developed for Science, Social Studies, and Literacy, grade 3; recommended for Science, Social Studies, and Literacy, grade 3)

21.04.04
Using Case Studies to Understand the Sun's Influence on Earth's Climate System in 3rd Grade, by Jason Ward

This unit is written for teachers of 3rd grade students and is aligned with the latest Next Generation Science Standards for 3rd grade Earth Science topics about weather and climate. These include obtaining and combining data to describe climates in different world regions, representing weather data using charts and graphs, and making a claim about the merit of a design to reduce the impact of a weather-related hazard.

Students will begin this unit by viewing a news report about an interesting, real-life phenomenon that occurred in Guadalajara, Mexico in June of 2019. Residents were shocked to wake up to the aftermath of a massive nighttime hailstorm unlike anything they had ever seen. Engaging phenomena gives what they are learning a sense of purpose as they develop questions and acquire information to help them make reasonable conclusions. This hailstorm is one of several interesting events that will help students learn about the Earth's Climate system. This, in turn, leads to an examination of our Sun and how the Earth's atmosphere and magnetic fields interact with the Sun's energy and radiation.

The unit culminates with students designing a solution to a weather-related problem.

(Developed for Elementary Science/STEM, grade 3; recommended for Elementary Science, grades 2-4)

21.04.05
The Sun - the Father of All Energy for Life, by Elizabeth Isaac

This curriculum unit focuses on the Sun and solar energy. The unit is intended for third-grade students on the Navajo Reservation but can be modified to any grade level at anywhere. It is developed for students to gain a deeper understanding of the solar energy that is radiated by the Sun and transmitted to Earth. The content of the unit begins with the introduction to the Sun, moves on to understanding the Sun's energy and it uses, and then to cultural perspectives of the Sun. The objective of "Sun's Energy" is a part of the science standards. Students on Navajo Reservation, who lack fossil fuel energy, can learn about solar energy, and also learn that not just fossil fuels can light up a home, cook a pizza, or store energy in battery! In addition, the activities discussed in this unit will give a cultural perspective about how the Sun is viewed by the Navajo people. Students will be involved in reading, viewing videos from YouTube, images, and listening to a guest speaker. The unit involves hands-on activities for students such as creating a solar box, make a solar panel and generate light, and show respect for the Sun and Earth.

(Developed for Science and English Language Arts, grade 3; recommended for Science and English Language Arts, grades K-12)

21.04.06
***Stardust Students*-Our Class Cosmos of the Stars, by Taryn Coullier**

The astronomer Carl Sagan stated, "The cosmos is within us; we are made of star stuff; we are a way for the universe to know itself". This belief, that the Universe is within us and that we are a part of it and also its future, is an ideal that we can give our students. Within this four-week unit, students will learn about the life and characteristics of a star. Students will learn about how stars are categorized by color, temperature, visibility, distance, mass, luminosity, apparent brightness and sounds. Students will catalog information about stars into an interactive journal and into a concept map about stars. The knowledge of the components of a star, will then be used to form a *Class Cosmos*, where students will create their own Star. They will classify the different characteristics of their star in an official chart, as well as chart the star on an astronomical diagram, and then create a model. The synthetic star that the students create will also be cataloged in their interactive journals. Students will complete a display board that shows the characteristics of their star. These *stars* will be put together into a whole class display and presentation.

(Developed for Science, grade 4; recommended for Astronomy, grades 9-12, and Science, grades K-8)

21.04.07
Our Sun: Through Scientific, Cultural, and Artistic Lenses, by Tina Berry

I've heard people say, "We are stardust" but I wonder how many of them really understand that everything on this planet literally came from star dust. Humans have strived to understand and rationalize the Sun's and our own existence and purpose throughout history through study and observation, but also through stories, legends, and the creation of gods to explain its purpose and importance. Monoliths have been built, gods have been worshipped, and stories and beliefs have lasted through many millennia. Yet, with all the technical and scientific study, so many still don't know how a star like our Sun is born and how it can possibly assist in the creation an entire solar system. At the end of this four-week unit students will have a more solid understanding of our Sun, the beginnings of our solar system, and how the Sun affects us on Earth. Students will recognize that civilizations and cultures all over the world have created Sun stories and myths based on their beliefs and understanding about the Sun throughout history (sometimes sharing interestingly similar characteristics). Students will research a Sun story or myth from a culture in Earth's past to share out before working as a class to create a new planet revolving around a distant star. Each student, or pair of students, will create a final Sun/star story and art project based on a culture living on the class created planet.

(Developed for Art, grades 6-12; recommended for Art, grades 6-12, and Science and English Language Arts, grades 6-9)

21.04.08
Beyond the Rainbow: Investigating the Characteristics of Stars, by Joanna Minott

At a very early age, children across the globe gaze with wonder at the sighting of a rainbow in the sky. These colors of the rainbow are nature's example of a spectrum of light. In this Earth and Space Science Curriculum Unit, students will deepen their understanding of how astronomers analyze the light of a star to determine the chemical composition, color, temperature, motion, luminosity, distance, and the evolutionary stage of the star. In this high school level curriculum unit, students will see "beyond the rainbow" and enter the world of spectroscopy. Spectroscopy is a sophisticated technique used by astrochemists and astrophysicists to determine the characteristics of stars. The ease with which students can recall not only the colors but more importantly the sequence of these colors in the rainbow enables them to engage in more complicated content material that learn how scientists unlock the mysteries of the cosmos. They will "see the rainbow" throughout this unit as they analyze blackbody curves, categorize stars using

the Hertzsprung-Russell diagram, determine the motion of stars using the Doppler Effect, identify the chemical composition of stars from absorption spectra and explore the Sun's surface features using satellite imagery under different wavelengths of the electromagnetic spectrum.

(Developed for Earth and Space Science, grades 10-11; recommended for Astronomy, grades 9-12, Physics and Chemistry, grades 10-12, and AP Environmental Science, grades 11-12)

21.04.09
Analyzing Electromagnetic Wavelengths and Their Interactions, by Zachary Meyers

For millennia humanity has revered the stars and local celestial bodies. The light, i.e., electromagnetic waves, emitted by the Sun combined with its interactions with our atmosphere have provided us with a small oasis in the dark vacuum of space. Today our fundamental understanding of electromagnetism has given rise to a technological revolution. This three-week unit attempts to provide students with an opportunity to explore electromagnetism by investigating the components of digital devices. Students' cellphone usage is typically confined to social media or texting. However, a myriad of scientific principles and engineering design are at their fingertips. Students will investigate the properties associated with various electromagnetic wavelengths and their associated interactions with matter. Students will acquire mastery in electromagnetic wave properties, types of wave interactions as well as a fundamental understanding in the function(s) of various technological components (i.e., TV and cellphone). To assess mastery, students will develop a research proposal that seeks to improve a feature that utilizes the electromagnetic radiation in an existing digital device.

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

21.04.10
The Sun and Photosynthesis: From Photons to Astrobiology, by Chris Sikich

Sunlight is so ubiquitous that we take it for granted. When thinking of photosynthesis, it is a necessary ingredient emanating from the Sun. But to consider the origin of photons of light and the journey they take to get here is the crux of this unit for high school biology students. The first part of the unit explores the travels of photons from the core of the Sun to chloroplasts to aid in the process of photosynthesis. The second part of the unit considers how disasters could limit the exposure of photons to plants. Thinking about asteroid impacts, volcanic eruptions, wildfires and nuclear explosions, the limitations or enhancements to photosynthesis that occur because of these events will be revealed and discussed. In the final part of the unit, astrobiology will be explored. By considering what could make another planet habitable or not, students will research known exoplanets to

hypothesize whether or not life could exist on them, taking into account the planet's distance from its parent star(s), planet composition including water occurrence, signatures of chemicals that are a byproduct of life, and potential for photosynthesis.

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

V. Human Centered Design of Biotechnology

Introduction

The Yale National Initiative seminar entitled "Human Centered Design of Biotechnology" was filled with science, technology, engineering and math (STEM) educators from across the country. With varying backgrounds, classroom sizes and levels, each Fellow within the seminar was fully engaged in readings and discussions that ranged from biotechnology design processes and economics to vaccinology and anthropology. From the wide scope of academic topics, these teachers were able to build curriculum units that will encourage creativity, drive and resilience in students that will master geometry, biology and data literacy among other topics.

In "Human-Centered Design of Biotechnology: Where will we Be without Bees?" Valerie Schwarz has created a unit that will incorporate ecology and botany with skills of design and coding. For grades 3-8, Valerie has designed a curriculum that gives students the opportunity to see how their scientific knowledge has wide-reaching application to the world they see and the food they eat. As important, bringing their world into the classroom, Taissa Lau's unit, entitled, "Vertical Farming: The Future of Urban Agriculture" provides the opportunity for students to understand urban food deserts and design agricultural solutions to food scarcity in the form of vertical farming.

Mike Doody has created a curriculum unit entitled "Human Population Over Time – Analyzing the Demographic Transition Model" that is designed for students to develop a deep understanding of the Demographic Transition Model, including its causes and effects, limitations as a model, and some potential solutions to the environmental challenges it poses. Similarly, in her curriculum unit "Math by Design; Creating Innovators in a Post-Pandemic Classroom" Christianna Loza created a student-centered classroom approach to developing data literacy to enable students to tell the story of public health historical transitions. Leslie Solomon also created an integrated unit that emphasizes the value of data literacy. In her unit entitled "Data and Graphical Analysis in Life Science" Leslie describes activities in which students will learn to analyze and interpret graphs, with the goal of communicating the overall ideas and conclusions generated from data analysis.

While Mike, Christianna and Leslie focused their units on data literacy to understand historical elements of human health and longevity, others, like Michelle Melby and Irene Jones, are challenging students to create their own technologies for public health solutions. In her unit entitled "The Curb Cut Effect: A Local and Global Citizen Bioengineering Challenge" Michelle Melby describes how designing for the most vulnerable of our local and global populations enables the most widely used and applicable solutions to medically related problems. "More Than Frybread: The Road to Healthy Eating and Physical Fitness" is a unit, created by Irene Jones, that utilizes the

Design Thinking method to introduce concepts of noncommunicable diseases and their association with nutrition. This work is targeted to 4th grade American Indian and Alaska Native students who will engage the Navajo Food Pyramid to develop both healthy and culturally appropriate food choices for themselves and their families.

Finally, as teachers, we know that creativity, resilience and persistence are keys to advancement in any endeavor. Two Fellows, Charlette Walker and Jesse Baker have incorporated the concepts of creativity and failure into their units as a means of encouraging self-directed and self-exploratory interest in Math and Engineering. Jesse Baker developed a curriculum unit that emphasized the need for arts in creating affordable, accessible and appropriate biotechnology in the unit entitled "STEAM and Human Centered Design of Biotechnology." By acknowledging that the process of learning involves trying, making mistakes, learning from those mistakes, and trying again, Charlette Walker embraces failure as part her unit entitled "Harnessing the Power of Failure as a Catalyst for Innovation." Specifically, Charlette has designed a unit that utilizes Design Thinking to help middle school aged students harness the power of making mistakes to find novel solutions to challenging problems.

During our multiple week Intensive Session together, the National Initiative Fellows of the Human Centered Design of Biotechnology seminar worked together to create a series of novel and impactful curriculum units that will be well received by their own students and those across the country. The experience of leading this seminar was not only an utter joy, but also an extraordinary opportunity for me to learn from some of the best and most dedicated STEM educators in the country.

Anjelica Gonzalez

Synopses of the Curriculum Units

21.05.01
Human-Centered Design of Biotechnology: Where Will We Be without Bees?, by Valerie Schwarz

The curriculum unit entitled, *Human-Centered Design of Biotechnology: Where Will We Be without Bees?* examines the plight of the most prolific pollinator in the world. Bees are a keystone species. The extinction of bees will have a profound impact on ecosystems around the world. Bees are responsible for one third of the world's supply of food. Imagine a world devoid of fruits and vegetables and the nutrients they contain. Bees face a host of problems, but most recently Colony Collapse Disorder is ravaging honey bee colonies. The cause is unknown but human impact is a contributing factor. Insecticides, pesticides, transportation and habitat loss are some of the ways humans have made life more difficult for the bees.

Students will use Design Thinking and computer technologies, such as Scratch, Makey Makey invention kits, and Hummingbird robotics kits to create and model ecosystems and try to develop innovations to help the bees survive. The activities can be completed with basic arts and craft supplies if these technologies are not available. The unit can be adapted for grades 3-8 and focuses on science content.

(Developed for Science, grade 4; recommended for Science and Technology, grades 5-8)

21.05.02
Vertical Farming: The Future of Urban Agriculture, by Taissa Lau

The effects of historical redlining in urban cities, like Chicago, has exacerbated community issues related to housing, food access, and public health. The focus of this particular unit is food accessibility. The neighborhood in which my school is located is designated as a food desert meaning it lacks access to fresh, high-quality foods within a reasonable distance of neighborhood residents. The disparity of healthy food options can be further linked to issues with public health in low-income neighborhoods making this topic a top priority in achieving equity. The overarching objective of this unit is to expose students to the different stages of the engineering process, specifically focusing on the issue of food deserts, with a culminating engineering project to design an indoor controlled garden that can be used year-round to produce nutritious crops at an affordable price for the community. In order to meet the main objective, students will receive an introduction to urban agriculture and investigate the more recent farming technology of hydroponics. This unit is designed to meet standards covered within the Next Generation Science Standards and the content within can relate to Life Science and engineering.

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

21.05.03
Human Population Over Time – Analyzing the Demographic Transition Model, by Michael A. Doody

This unit, designed for AP Environmental Science, helps students develop a deep understanding of the Demographic Transition Model, including its causes and effects, limitations as a model, and some potential solutions to the environmental challenges it poses. Throughout the unit students are introduced to specific vocabulary words, including birth and death rates, total fertility rates, replacement level fertility, developed and developing countries, communicable and noncommunicable diseases, as well as the Human Development Index and population pyramids/age-structure diagrams. Students build their own learning map using the vocabulary terms as a means of organizing their own learning. Additionally, students engage in design thinking in order to develop, propose, and justify a solution to the social, cultural, economic, and/or environmental problems experienced by individuals in countries moving through the Demographic Transition. Students also present their work to the class and respond to mock and previously released Free Response Questions as their end of unit assessment. This unit addresses several Science Practices outlined by the College Board, including explaining environmental concepts, processes, and models presented in written and visual format, analyzing and interpreting both text and data, and proposing and justifying solutions to environmental problems. Students use these practices to satisfy Learning Objectives EIN-1.A (explain age structure diagrams) EIN-1. B (explain factors that affect fertility rate in human populations), EIN-1.C (explain how human populations experience growth and decline), and EIN-1.D (explain the demographic transition).

(Developed for AP Environmental Science, grades 11-12)

21.05.04
Math by Design; Creating Innovators in a Post-Pandemic Classroom, by Christianna C. Loza

Data can illustrate a deeper story; however, making sense of data through analysis requires data literacy. Analyzing information to make health decisions is a high-level task with added pressure when the decision could potentially harm the health of oneself and our community. Numeracy for analyzing data is becoming increasingly important. The ability to discern the misinformation that quickly spreads could be life-saving measures and imperative literacy skills to include in k12 education. This unit will serve as a student-centered classroom approach to building awareness of public health, biotechnology, and data literacy while modeling the design thinking process to show students the value of their ideas for solving solutions in our communities and beyond. Students will use math to tell a story across our history of how public health has changed the globe, what technologies drove that advancement, and what factors might be holding

communities back. Students will empathize with this information and start to prototype their ideas while also emphasizing that all good ideas are generated through slow hunches, inter-disciplines, and collaborative efforts.

(Developed for Mathematics, grade 7; recommended for Mathematics, grade 7)

21.05.05
Data and Graphical Analysis in Life Science, by Leslie M. L. Solomon

This unit on Graphical Analysis is designed to create strength and consistency in constructing explanations and evaluating arguments from graphical data. Within this integrated unit, students will learn to analyze and interpret graphs, with the goal of communicating their overall all ideas and conclusions. Students will have the opportunity to utilize provided data, pull data from official websites, and generate their own data. Students will have the ability to discuss their findings and peer evaluate others. In addition, students will participate in a Design Thinking Process to generate solutions to present to the community. This unit of curriculum is not an independent unit. It is important that students see that graphical analysis and visuals are not exclusive to one part of science. Rather, data analysis and generating explanations are key to formulating the underlying knowledge and concepts within all of STEM.

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

21.05.06
The Curb Cut Effect: A Local and Global Citizen Bioengineering Challenge, by Michelle Melby

The American medical system is an agglomeration of some of the best, most innovative minds in the world. Unfortunately, these fantastic innovations are usually only accessible if you have expensive, employer sponsored medical insurance or are wealthy. The US Census Bureau found that 27.5 million did not have health insurance in 2018.[1] Fortunately, there are a growing number of innovators who are designing low cost, rugged, and sustainable medical technology for those in vulnerable populations. Many of these innovations are so useful and well-designed that they are mainstreamed to the general public. This happened with curb cuts, the dip in the sidewalk where one can access crosswalks. These were originally designed for those in wheelchairs, but they benefit the whole population: baby carriages, delivery persons, bikes, etc. Helping the larger population by designing for the most vulnerable is called The Curb Cut Effect.[2] This unit will prepare the next generation of innovators to innovate accessible and valuable medical technology.

James Lick Physiology (grades 11 and 12) students will work with various organizations to identify a local population that could benefit from rugged and sustainable medical technology. The students will interview and empathize with that population (or experts who care for that population), define a health issue that could be improved through innovative engineering, and build a prototype of the technology.

Notes
1. US Census Bureau, "Health Insurance Coverage in the United States: 2018".
2. Ryan Sprott, "Curb Cuts and Texting Might Change the Way You Design Projects" in PBL Works.

(Developed for Physiology, grades 11-12; recommended for Physiology and Engineering, grades 11-12)

21.05.07
More Than Frybread: The Road to Healthy Eating and Physical Fitness, by Irene Jones

More Than Frybread is about how to use Design Thinking processes to solve the health problems faced by American Indians and Alaska Natives (AI/AN). AI/AN have a high prevalence of chronic disease such as heart disease, diabetes, and stroke.[1] In addition, lifestyle choices for instance poor nutrition, tobacco use, lack of physical activity, and alcohol use increases the risks for chronic diseases.[2]

Poor nutrition and lack of physical activity contribute to a high prevalence for overweight and obesity among NI/AN children. Lack of education, and socio-economic status, along with the existence food desert contributes to poor nutrition. Navajo Food Pyramid and traditional foods can be used as a catalyst to improve the diets of the students. The students will use the Navajo Food Pyramid to evaluate the food they eat at home. Also, the pyramid will help them determine, which foods are considered nutritious and which foods they should be eating more. What's more, the use of Design Thinking Process can challenge students to increase physical activity and increase access to nutritious food at home and at school. This unit is designed to target 4th grade to increase the knowledge of students by identifying and analyzing the relationship between healthy behaviors and long-term personal health.

Notes
1. CDC. "Poor Nutrition."
2. "Healthy Gardens/Healthy Lives: Navajo Perceptions of…"

(Developed for Science and Health, grade 4; recommended for Science, grades 3 and 5, and Health and P.E., grades 3-5)

21.05.08
STEAM and Human Centered Design of Biotechnology, by Jesse Baker

How can we increase the overall adoption of biotechnology that is affordable, accessible, and appropriate to improve the human condition? Students will discuss the importance of using the arts to become well-rounded and creative bioengineers to foster a work force that can be effective, sustainable, and fosters innovation. Background information on why STEM vs STEAM is met with skepticism by the scientific community will be researched in this unit. By 2025, the U.S. alone is projected to have 3.5 million STEM jobs, with 2 million of them going unfilled.[1] As introduction to the topic, students will view and discuss MIT Professor Hugh Herr's Ted Talks on bionics. The project workflow will have students view photos of biotechnology on the web and discuss the reasons why this technology exists and why it is important. By integrating the arts into the teaching of STEM subjects, it is clear STEAM becomes increasingly accessible and appealing to more people. Studying art subjects contribute to the development of essential skills like collaboration, communication, problem-solving, and critical thinking. The maker movement reminds us regularly that art and science are inseparable.[2] This unit is targeted towards fourteen- and fifteen-year-old 9th or 10th grade students in Geometry.

Notes
1. *STEM vs. STEAM, Why STEM Should Welcome the Arts!*, Twist Bioscience, 9 Nov. 2020, www.twistbioscience.com/blog/perspectives/stem-vs-steam-why-stem-should-welcome-arts.
2. Martinez, Sylvia Libow, and Gary S Stager. *Invent to Learn: Making, Tinkering, and Engineering in the Classroom*. Constructing Modern Knowledge Press, 2019.

(Developed for Geometry CAS, grade 9, and Geometry PSP, grade 10; recommended for Geometry, grades 9-10)

21.05.09
Harnessing the Power of Failure as a Catalyst for Innovation, by Charlette Walker

One of the greatest obstacles to learning is a paralyzing fear of failure that keeps a person from making an effort. However, the process of learning involves trying, making mistakes, learning from those mistakes, and trying again. Failure is a necessary component of innovation as well, and students must be taught to embrace the process of exploring different possibilities, making mistakes along the way, learning from those mistakes, and making new discoveries. This will require a shift in mindset towards a growth mindset that will increase the capacity for students to learn any subject and to become innovators in the process. This unit will use the principles of Design Thinking to help students harness the power of making mistakes to find novel solutions to challenging problems. Students will be inspired by other innovators who made discoveries by mistake while in the process of trying to create something else. Students will have multiple

opportunities to participate in hand's-on activities where they will learn from their mistakes and innovate something new. This unit is appropriate for middle school students, but can be modified for older and younger students in S.T.E.M. classes, as well as any class where students are struggling with the concept of failure.

(Developed for General Science/Digital Literacy, grade 8; recommended for Science and ELA, grade 6-8, and Engineering/STEM, grades 9-12)