

Curriculum Units by
Fellows of the
Yale National Initiative
Guide
2022

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Preface

In April 2022 the Yale National Initiative to strengthen teaching in public schools® accepted teachers from fourteen 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-seven 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 came 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 at Yale on April 29-30. The seminars reconvened on campus during a ten-day Intensive Session from July 11-22 and concluded in mid-August when the Fellows submitted their completed curriculum units. The five seminars were:

- “Children and Education in World Cinema,” led by Dudley Andrew, R. Selden Rose Professor Emeritus of Comparative Literature and Professor Emeritus of Film Studies;
- “Alien Earths,” led by Sarbani Basu, William K. Lanman Jr. Professor of Astronomy
- “American Global Power from Empire to Superpower,” led by David C. Engerman, Leitner International Interdisciplinary Professor of History;
- “The Social Struggles of Contemporary Black Art,” led by Roderick A. Ferguson, Professor of Women’s, Gender and Sexuality Studies and of American Studies; and
- “Fires, Floods, and Droughts: Impacts of Climate Change in the U.S.,” led by Jordan Peccia, Thomas E. Golden, Jr. Professor of Environmental 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 our 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

New Haven
September 2022

I. Children and Education in World Cinema

Introduction

K-12 students have a comfortable and happy relation to films in their daily lives. Riding on that supposition, nine of us in this seminar examined the interface between World cinema and childhood education. We arrived speculating on the general analogies that can be drawn between cinema and education, especially when the films are foreign. The analogies begin when you realize that both films and teachers entice their “audiences” to follow them on a narrative journey leading to discoveries, while promising an exciting process along the way. Although the films we watched together always dealt with children, we discussed them not always (or only) for what they might impart to young audiences in the classroom, but mainly for what we as adult educators could learn from them about children, about knowledge-as-discovery, and about education. Foreign art films are challenging, which makes them perfect for this purpose, since education must find ways to bring students to deal with what is foreign and with what challenges them.

We began in France where both cinema and educational philosophy have been constantly and intensely debated. Francois Truffaut’s 1959 *400 Blows* was the touchstone example we looked at first and returned to repeatedly. Its “script of delinquency,” including improvisation from its 13-year-old subject, rubs up against the stodgy institution of French film in 1959, and at the same time puts on notice the social institutions (family, school, legal) that turn children into adults during adolescence. What are children, and what is cinema? These linked questions aim at freedom for both. Ten years later Truffaut’s more theoretical and historical film, *The Wild Child* (1969), takes up the true story of an Enlightenment educator, Jean-Marc Itard, who in 1799 tried to civilize a genuinely savage 11-year-old. Itard, it turns out, forms a bridge from 18th century philosophy (Rousseau, Condillac) to Maria Montessori who recognized his efforts. The French pedagogical ideal, and the powerful Italian version she implanted internationally, open up fundamental questions about the status of children and methods of teaching them. While only a couple participants thought they would bring up such issues directly in their teaching, we all profited from taking this step back and looking at the enterprise, teaching, we are devoted to. Truffaut’s films and others like them, dramatize and electrify such reflections. We then watched French educational philosophies in action, through a pair of award-winning documentaries, one (*The Class*) of an inner-city Parisian high school classroom, the other (*To Be and To Have*) of a one-room Alpine schoolhouse. It was important to realize that two such very different films (and models of teaching) co-exist in one country, so that as we moved from France to West Africa, Iran, Japan and China, we wouldn’t be tempted to characterize entire national dispositions on the basis of the small evidence of one or a couple films.

Our students need to know that their neighborhood is not the only world on the globe. What kinds of stories are told about children in West Africa, Japan, France, China, or

Iran, not to mention Ireland, South Asia and other places we discussed? Learning about other cultures and other approaches to filmmaking, requires that we look at the world from very different perspectives. For stories populate worlds and do so from perspectives. What are the concerns of children in Iran, for instance, and how are those concerns treated and valued? The differences we found, of course, are often not so far-reaching after all. There are plenty of universals in the way children are treated and stories about them are told because so much of human experience is common to us all. The interplay between similarities and differences in the films we encountered and in the methods of filmmaking that made them look the way they do, can bring students to an awareness about their own situations as well as those of others with whom, over the duration of a movie, they empathize.

The availability of foreign films, thanks to film festivals, streaming services and DVDs, makes for a fantastic reservoir of stories, allowing our seminar to become a forum for film analysis and criticism as well as for discussions of teaching. In the units written for the seminar, most Fellows took up the challenge of incorporating films into their strategies and often into their objectives, because films can be both attractive to students and can serve as tools in helping them locate elements of stories. Foreign films tempt us to go beyond stories to the texture of the world they depict. And so the poetic details that crop up in such films, as well as the rhythm felt through actions, music and silence, can make us realize how much we are bound by our own Hollywood conventions. While all the films we discussed involved the lives of children, we distinguished those told from a child's viewpoint, from others that were told by an adult narrator. And we looked into the special status of certain kinds of storytellers that certain films literally depicted or imitated. The African *griot* served as the example we spent most time on, in part because griots still tell (or sing) stories in contemporary Africa, and in part because their attitude toward the entire function of storytelling differs so markedly from the novelist we are used to in American culture, and in the West generally.

The griot readily combines the overlapping functions we were intent to link. The griot is a repository of cultural and practical knowledge and thus stands as an educator. The Griot in *Keita* explicitly gives history lessons to the young boy, Mabo, who then has trouble reconciling these lessons with what he is learning in his classroom where a French view of history prevails. But the Griot is also an entertainer around whom the locals gather in the evening as if he were projecting a film. This West African case raises the question of different forms of participation in films and in education. How much control should the griot (the teacher) exert? How much "call and response" leads to independent ideas rather than rote learning? The film director, like the teacher, establishes a relation to those addressed that assigns them roles and responsibilities. It can be liberating for students to recognize those roles and to argue about what they mean socially and politically.

With its sixty-year history of making serious films for and about children in its national film institute, Iran proves to be an especially rich place to examine. It is also special since

politically it is at odds with the USA, while its artists and filmmakers work around strict censorship regulations. Since the mid-1980s their filmmakers have consistently dazzled Western critics, and mainly with films involving children. The films are never dogmatic and invariably clever, reflective, and ambiguous. Some, like *Turtles can Fly*, are too dispiriting to show in most of our classrooms, but they are all worth the attention we give them, for they strip childhood down to its essentials and observe it in conflict with the institutions that try to shape it. Iran's literary culture is based less on storytelling than on poetry, making their films visionary, and dreamlike in their use of repetition, framing, and resonance. For instance, the trips taken by the little boy up and over the hill to the neighboring village in *Where is the Friend's House*, are like rhyming lines in stanzas. The carefully designed patterns of each location, the images of clothes hanging on the line, of babies crying, of water spilling from a balcony, of wind rising in the night while dogs bark, become memorable through repetition. The key images are those that open and closes the film: a classroom from the point of view of a young boy who is both eagerly expectant and afraid. All the Iranian films we watched seem to operate through variants of this tension.

Films such as these were balanced by the grotesque Japanese satire, *Family Game*, making us understand that "childhood and cinema" should not be treated as a genre. This is the point made by Vicky Lebeau in a book of that title which shows that the subject of children can be richly mined by many genres, some sentimental, some comic, some harshly realist, some allegorical. The films we chose to dwell on made us think deeply and differently about what makes a good film and what makes for good education. They were, to repeat, foreign and challenging.

Many of the units produced by the Fellows took up one or several of the films we collectively discussed. But even those units that aimed at adjacent topics drew on the approaches and vocabulary our analyses exemplified. One unit focuses on the issue of young girls growing into self-confident agents for change, by comparing the Disney film *Encanto*, set in Columbia, with a rare Saudi film (*Wadjida*). Another unit, featuring tales of children migrating north to the USA and focusing on two films we did not take up, nevertheless employs tools we developed when discussing *The Runner* and *Abouna*, films about children living in precarious, unstable situations. A unit for very young children aims to help them identify emotions in popular films like *Inside Out* and *Shrek*, but only after exposing the students to the foreign faces of the Chinese characters of *Not One Less* and the Iranian ones of *Where is the Friend's House*, and finding that in fact they are legible.

These and all the units rely, sometimes explicitly on a key book in the theory of cinematic pedagogy by noted French film theorist, Alain Bergala. His *The Cinema Hypothesis* does not bargain with administrators or with students. He admonishes teachers to take films seriously and submit themselves (and their students) to the unpredictable, mysterious, always ambiguous power of strong films. He concludes by

offering ways to incorporate both film reviewing and filmmaking in the classroom for those teachers ready to help students exploit their creative potential. One unit thus aims at film reviewing as a final achievement, while another, on Music Videos, challenges students to develop brief, but potent and imaginative clips after they learn the history and elements of this mode of image=production. For a different unit in her art classroom, one Fellow will deploy the terms of our film analyses (framing, mise-en-scene, etc.) to prepare high school students for future creative work.

Our seminar recognized the uphill struggle good cinema and good education demand. Art films, particularly foreign ones, are increasingly lost in the new entertainment economy of streaming and of social media. Will we, or our students, take time to concentrate on films that derive from other traditions and aim to shift what we notice, feel, and value? As for education, can the dedicated teacher, rather like the passionate film auteur, stand up to the demands and regulations of institutionalized education that increasingly emphasizes pre-established outcomes and methods? The units prepared by the Fellows in the seminar “Children and Education in World Cinema” are betting on the freedom, rigor, calculated improvisation, and sensitivity that we observed again and again the films that gave us such pleasure to watch and talk about.

Dudley Andrew

Synopses of the Curriculum Units

22.01.01

The Child Migrant: Evaluating the Journey to the United States through Film and Nonfiction Text, by Brandon Barr

This unit explores the ways film represents the challenges and opportunities associated with children migrating from Central America to the United States. In this unit, students will watch *Which Way Home* for two purposes: to learn about documentary as a mode of filmmaking and to activate prior knowledge about immigration from Central America. Students will read the text *Enrique's Journey* by Sonia Nazario and discuss each chapter in class, reflecting on Enrique's experiences in the text. Finally, students will view the film *Under the Same Moon* and learn about elements of a film review to write their own version of a film review. This unit is written for middle school English Language Arts students assuming that they know little about film study or criticism; the content of the texts is not suitable for students in grades younger than middle school.

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

22.01.02

Film and Art: Setting the Stage with Framing, by Tina Berry

Anyone who creates, whether it be in writing, painting, sculpting, theater work, or film, knows how important setting the stage is. Once the stage is set, framing and space come into play to build a relationship between the viewer and who or what is in the scene before filming or photography can begin. This unit will present full movies, scenes from movies, clips, and stills, as well as non-film photographs and paintings, to help students understand and practice framing, territorial space, contextual framing, and composition and design of mise en scene, or setting the stage. Students will view, discuss, and create based on what they learn. Realistic narrative is the focus of the films used in this unit, but other genres also follow these basic guidelines of mise en scene. Students will learn to recognize and reflect on the care that filmmakers take to make a film more interesting and eye-catching, even in the most ordinary of situations. This unit is meant for a high school Art and Filmography class but could easily be used to teach photography or 2-dimensional art; it could also be used in other classroom settings, in particular in Drama and English.

(Developed for Film Production, grades 9-12, and Art 1, grades 8-12; recommended for Art, English, and Drama, grades 8-12)

22.01.03

Social Emotional Learning through Film, by Carol Boynton

This six- to eight-week unit, designed for students in kindergarten through third grade, focuses on Social Emotional Learning. Students learn to identify and discuss the feelings and emotions of the characters in the various films they view, including *Inside Out*, *Shrek*, *The Red Balloon*, and many others. They focus on identifying and recognizing six emotions: happy, sad, afraid, angry, surprise, and disgust. The film *Inside Out* shows students that we all have lots of emotions, which we can identify, manage, and understand in ourselves and others. *Shrek* gives students an opportunity to observe and identify how emotions change over time, through a variety of experiences. Finally, students make a personal photo album of their own facial expressions.

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

22.01.04

Cultivating a Growth Mindset through Film Studies, by Stephany Jimenez

The objective of this unit is to implement what students already tend to gravitate towards for enjoyment, music videos, and use it as tool for developing a creative mindset and critical thinking skills. Music videos will be my 8th grade students' first introduction to film studies. since music and short videos stand as great influence in their lives. Through the application of *Mise-en-scène* analysis, students will discover the intentions behind a director's use of elements for aesthetics as well as to interest the audience. Together, we will explore a number of music videos to recognize and interpret the moods and tones created in the staging aspect of these audiovisuals. Students will also have the opportunity to apply what they have learned in a creative task, and experience the making of this form of art as well as the critical thinking mindset that comes with it.

(Developed for Visual Arts, grade 8; recommended for Visual Arts and Media Studies, Junior High and High School grades)

22.01.05

Themes in *Encanto* and *Wadjda*, by Akela Leach

In this unit students will analyze the films *Encanto* and *Wadjda*. They will compare and contrast elements of the films and their overall thematic ideas. In order to accomplish this, students will first gain an understanding of the characters' motivations and of the plot development. Students will recognize how elements in the films such as lighting, music, and shot angles help audiences understand the feelings and underlying motivations of the protagonists. Students will participate in gallery walks and character analysis activities.

Encanto is a Disney animated movie about a young girl who is part of a magical family. Each family member has a role and magical gift except for Mirabel. The family's magic is weakening and Mirabel tries to save the magic and feel accepted by her Abuela, the family's matriarch. *Wadjda* is a live action movie from Saudi Arabia. Wadjda a 10-year-old girl who desires to buy and ride a bike, which girls are not supposed to do in Saudi Arabia. She is defiant against cultural norms for girls and finds ways to earn money to buy her bike. Both films explore themes of family, roles in society, coming of age, and overcoming obstacles.

(Developed for English Language Arts, grade 5; recommended for English Language Arts, grades 4 and 6)

22.01.06

Film as a Site for Education and Resistance, by Andrew Maples

“Film as a Site for Education and Resistance” links education to film and film to the English classroom. It relies on the creative analysis laid out in Alain Bergala’s *The Cinema Hypothesis* to engage students in watching and discussing films that speak to and challenge them, and ultimately in encouraging their own small acts of filmmaking, where they will encounter and deal with the resistance and possibilities that space offers during a shoot. This unit is rich in resources and questions that guide students through analyzing and interpreting poetic images in film. Students are invited to study “film as film” and film as a meaning-maker. There is a push and pull between film and education in this unit, for students will collectively debate and compose educational theory in response to their experiences with freedom and discipline in both the classroom and in front of the screen. This will involve their shared film experiences, as well as a day of curated research involving a spectrum of educational thinkers.

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

22.01.07

Teaching Writing through Films: A Visual Exploration of Identities, by Brad Pearce

The purpose of high school and college writing can be a blur for marginalized students. Some students enjoy writing, some may yet enjoy it, but haven't had the impetus. Others just don't see the point. Students may be coaxed into the complexity of writing with the complexity and beauty of film. This unit will explore through cinema the types of writing expected in high school and college. We will watch films, read flash fiction, nonfiction, and poetry, and write in response, including writing narrative, exposition, description, persuasion, and analysis. The unit will culminate in a fictional script or documentary idea to be filmed; alternatively, students may revise their journals into a cohesive whole. How cinema and writing can benefit students in understanding

culture, social relationships, class conflict, and identity formation will be the context that motivates student writing.

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

II. American Global Power from Empire to Superpower

Introduction

The United States was born a global player and became a major global power over the course of the 19th and 20th centuries. As a rich vein of scholarship in the last generation attests, U.S. offers an unusual combination of economic, political, and not least military power – and indeed has helped define new forms and vectors of international engagement over the 20th and now the 21st centuries.

This seminar was designed to introduce National Fellows to some of the ideas about American global power, focusing especially but not exclusively in the 20th century. Our main reading, Daniel Immerwahr’s innovative and eminently readable book, *How to Hide and Empire*, set the tone for our seminar, showing how much the United States relied – and indeed still relies – upon unincorporated territories that fly the American flag but do not guarantee residents the rights of American citizens.

Our readings went well beyond Immerwahr, however, to look at some of the key elements of American global power. The readings were selected with the Fellows’ interests in mind, and ranged from American missionaries operating in Hawai’i in the early 19th century to immigration policies in the administration of President Trump. We also had the opportunity to visit the incomparable collections of the Yale archives, looking at letters and publications of American missionary organizations. While we struggled with the handwriting, we gained a new appreciation of the complexity of American overseas engagements – as well as the work of historians.

Since many of the Fellows wanted to focus their curriculum units on immigrant experiences, we looked at immigration as an aspect of foreign relations, looking at two works (by Aviva Chomsky and Juan González) that connected immigration issues since the 1990s directly to American foreign policy – “the harvest of empire,” in González’s felicitous phrase. We also read a challenging article by the innovative historian Paul Kramer.

These readings came in particularly handy for the two Fellows who wrote directly about immigration: Stephen Straus took up Chomsky and González’s call to link immigration to the effects of American foreign policy in Central America in his curriculum unit, which uses the historical background gained in this seminar to help students understand the backstory of immigrant narratives collected (and translated) in *Voces sin Fronteras*. Kathy Volin focused on a different relationship between empire and immigration: the treatment of Filipinos hoping to come to the United States both when the Philippines was an American colony, and after independence in 1946.

The Philippines was also at the center of Melissa Muntz's unit, which used American colonization of the Philippines as a way to bring imperialism into US history courses - and to bring the United States into discussions of imperialism in World History courses.

Other projects struck out further from our readings. Sandy Alvarez wrote a highly creative unit on the value chain of banana production – a curriculum unit that will culminate, no doubt to students' delight – in eating banana splits in class. But Alvarez is delivering more than dessert to her first-graders; she is also showing them how international economies work, how many steps there are from a banana tree in Guatemala to a bunch of bananas for sale at a U.S. grocery store.

Mark Hartung, a YNI veteran and the seminar Coordinator, wrote about the difficult dilemma facing President Lyndon Baines Johnson in the late 1960s: a version of “guns vs. butter.” Johnson came into office determined to create a more just and equitable world, but his main vehicle for doing so – the Great Society – was endangered and eventually engulfed by government spending and eventually political turmoil engendered by the escalation of the Vietnam War.

And Cinde Berkowitz looked at a neglected front in the Cold War: American-Soviet competition over standards of living that reached their illogical extreme in the so-called Kitchen Debate between Nikita Khrushchev and Richard Nixon in a Moscow exhibit hall in 1959.

From Nixon in Moscow to LBJ and Vietnam, to future president William Howard Taft serving as colonial governor of the Philippines, American leaders projected American power, and even had to face its limits, as they shaped American foreign policy. And from Filipina nurses to Guatemalan banana-pickers to immigrants fleeing violence in Honduras and El Salvador, the effects of American global power were made visible by individual people and their life stories. These curriculum units thus offer fitting documentation of the extent and intensity of American engagements around the world.

David C. Engerman

Synopses of the Curriculum Units

22.02.01

Let's Go Bananas! U.S. Imperialism through the Lens of a Fruit, by Sandy Alvarez

From the clothes we wear to the gas we use in our vehicles to the foods we eat, aspects of U.S. imperialism are visible in our everyday lives. As the title states, this social studies unit, intended for first graders, seeks to explore U.S. imperialism through the lens of a fruit. A study of bananas serves as a child-friendly, engaging, and applicable approach. Students will delve into the topic of bananas and understand where they come from, how much they cost, and how they reach our kitchen tables. Students will learn about the history of the banana and answer questions such as: "What is a banana?" and "How is a banana grown?" After establishing that bananas are imported overwhelmingly from Central and South America, students will be able to answer the question: "Where do bananas come from?" To that end, students will define the meaning of international trade and begin to understand how bananas arrive at one's kitchen table (or lunchbox, for that matter). From plantation workers to U.S. companies to neighborhood store workers, students will discover the complexity of how this fruit lands in our hands for consumption. Lastly, students will write an opinion piece about how much they think a banana worker should get paid and why. If they purchase bananas, would they purchase Fairtrade or non-Fairtrade bananas? Why or why not?

(Developed for Social Studies, grade 1; recommended for History and Social Studies, all grade levels)

22.02.02

Public Diplomacy and Consumerism during the Early Cold War, by Cinde Berkowitz

During the Cold War, tensions moved from the nuclear age to the domestic front. Winning the "contest for the hearts and minds" of the American people became a challenge in the ideological campaign of mobilizing societies for a new kind of geopolitical rivalry. After the containment of the Soviet Union on the military and atomic front, economics and consumption played a prominent role in swaying public sentiment. The U.S. government aimed to combat Communism not with nuclear weapons but with automobiles, refrigerators, washing machines, and capitalism.

The unit will combine the historical facts of the Cold War and how consumerism and propaganda were used as a tool to sway Americans to buy goods and services. Students need to learn the way governments manipulate people. After World War II, Americans were ready to purchase many new devices and inventions, including the T.V. Spending on furniture and appliances increased by huge margins. Business and political leaders claimed consumerism was more than shopping as it promoted the benefits of capitalism.

Using the famous kitchen debate to showcase these efforts, students will learn how the government manipulated its citizens through propaganda, consumption, and advertising. This unit will be taught in 10th grade U.S. History.

(Developed for U. S. History, grade 10; recommended for U. S. History and World History, grades 10-11)

22.02.03

Imperial Dilemma – Great Society versus Vietnam in the 1960s, by Mark A. Hartung

The major foreign policy strategy of the post-World War II era was the policy of containment. Vietnam was the prime focus of that strategy during the presidency of Lyndon Johnson. Concurrent with the escalation of conflict in Vietnam from 1965 on, President Johnson was attempting to reform American society with the War on Poverty and the Great Society social programs. How did these two goals interact and affect each other? Both cost money, and though the United States was enjoying an unprecedented economic boom, that prosperity would not last. Would the efforts to contain communism in Southeast Asia limit the ability of the United States to assist those less fortunate and to roll back years of prejudice and racism? Would the choices made by Johnson about how he fought for these programs and communicated with the nation about Vietnam lead to success or failure? These questions and more are the ideas that students experiencing this unit will investigate.

This unit is written for an 10th grade World History class as an alternative look at ideas about imperialism, though with modification and scaffolding could easily be adapted for 11th and 8th grade U.S. History and used in High School Government classes.

(Developed for World History, grade 10; recommended for World History, grade 10, and U. S. History, grade 11)

22.02.04

Creating Filipino Nationality: Race and Hierarchy in the Context of Empire (1886-1916), by Melissa Muntz

This unit is a look at the history of colonization of the Philippine islands between 1886 and 1916. In a single generation, the Filipino people experienced a shrinking Spanish Empire, two wars for independence against Spain and the U.S.A., and the reorganization of Filipino society with ties to Mainland U.S. culture.

This unit can be taught in both US and World History classes. It examines events from many perspectives to understand how Filipino people constructed identity in combination

with, and in opposition to, Spanish and American colonial cultures. Filipino voices and sources are used as much as possible.

The culminating project of this unit has students write a series of imagined newspaper articles. This will help students to imagine what it would be like to experience the events under discussion. An important part of the lesson is gaining experience in writing first-hand narrative in the form of newspaper articles. This is particularly relevant, since newspapers were the primary source of news and information for the public at the time period that this lesson covers. Students today rarely interact with newspapers and so the production of printed news is a way of conveying information in a historical format.

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

22.02.05

American Imperialism in Latin America: Territory Expansion, Trade, and Immigration, by Stephen Straus

This unit focuses on American imperialism related to territorial expansion, trade, and immigration in Latin America from 1846 to the present. The unit primarily examines relations between Mexico and the United States. The unit is geared towards a 7th English Language Arts class. Classroom activities and the content of this unit will be anchored in *Voces Sin Fronteras*, a bilingual graphic novel in Spanish and English that focuses on contemporary youth immigration experiences from Latin America to the United States.

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

22.02.06

Immigration Narratives: Hidden Links between U.S. Empire and Filipino Immigration to the U.S., by Katherine Cohen Volin

Immigration has been a topic of discussion and debate since the beginning of the United States. Missing from the U.S. public's understanding of the history of immigration and immigration today is the understanding of the connection between immigration to the U.S. and the history of global empire. This is because most people do not see the U.S. as a colonizing power. The United States' colonies have been hidden and forgotten about.

In this unit, students will learn about and discuss the influence of U.S. empire on immigration by reading the immigration narratives of people from the Philippines, a U.S. colony from 1899 to 1946. Students will use these narratives as a jumping off point to learn more about the colonization of the Philippines and immigration history through a variety of sources. Then students will use the narratives as mentor texts in order to write

their own immigrant narratives, either of their immigration experience or by interviewing someone who has immigrated to the U.S.

This unit is written for a 7th grade English/Language arts class but could be adapted to be used in higher grade levels or in a Social Studies class.

(Developed for English Language Arts, grade 7; recommended for English Language Arts, United States History, and World History, grades 7-12)

III. The Social Struggles of Contemporary Black Art

Introduction

Historically, Black art has been not only a domain for various artistic representations but also a venue from which to recast and explore several historical and social struggles. While that exploration has obviously dealt with issues of race, slavery and colonialism, black diasporic art has also been a powerful venue for addressing issues of gender, sexuality, the environment, militarism, technology, and so on. Indeed, recent developments in scholarship, curation, and activism have exhibited the central place that black art occupies in engaging these issues.

These developments have placed at least two significant pressures on how we think of art, in general, and black art, in particular. First, these shifts have challenged conventional assumptions that art is best known and assessed according to its formal properties only. Instead, this rethinking in how we encounter art insists on placing it in dialogue with historical, political, and social contexts. Second, these transformations urge us to understand black art and the social processes that it engages within transnational rather than national frameworks. To this end, these approaches have eschewed frameworks that seek to contain art within any single national tradition and instead has located black art within both national and transnational social processes, movements, and struggles.

To this end, our seminar worked to place art by black artists from Africa, Europe, and Latin America in feminist, anti-colonial, anti-racist, abolitionist, environmental, and queer politics. As the Fellows engaged these works, they produced a dynamic set of conversations about the relevance of black contemporary art in this historical moment. Those conversations led to unit plans that are both pertinent and inspired. In their own individual ways, each one manages to address a variety of social issues and to present the intricacies of black art as well.

Irene Jones's curriculum unit "Reclaiming the Lost Art of Using Textile" puts African American textile artists in conversation with their Navajo counterparts, forging a necessary conversation with two groups that have rarely been in dialogue. In "'Do You See me? I see you:' Identity and Activism in Black Art," Amy McIntosh considers how black art has been used to address and mediate social urgencies and devastations. Sean Means's "The Resiliency of the African American Financial Narrative Presented through Multiple Media of Art" uses visual art, theater, and television shows to demonstrate how financial distress and wellbeing have been central to African American cultural production. Perrine Punwani's "Art as Advocacy: Explorations into Literary and Visual Art to Provoke Change" examines how art by people of color has not only been used to express beauty but to incite social transformation as well. In Katherine Steiner's "Struggle, Defiance, and Triumph: Black Photographers and Their Magic," she presents the work of black photographers to show students how artists have responded to social

and political crises with artistic and technical innovations. Tara Waugh's "*Things Fall Apart*: Piecing it all Back Together with Contemporary Black Art" supplements Chinua Achebe's 1958 novel with art that addresses the circumstances and legacies of colonialism for black people. To engage black art and its social implications, each of the curriculum units powerfully results in assignments that ask students to become artists, critics, and curators themselves.

Roderick A. Ferguson

Synopses of the Curriculum Units

22.03.01

Reclaiming the Lost Art of Storytelling Using Textile, by Irene Jones

There are so many similarities in Navajo textile and African American artist, like Bisa Butler, Quilters of Gee’s Bend, and Faith Ringgold. One of the similar characteristics is the ability to tell stories or recall stories about a particular piece of textile. Story telling is an important part of the history of both the Navajo and African American when they create their art. Navajo stories are often retold through storytelling, prayers, and songs. These stories often recall important events such as family and cultural histories. The tapestry can continue to preserve the struggles, perseverance, and stories woven or sewn into the art.

This unit is intended for second grade students but could be used for first grade, too. This unit will be covered in three weeks. It incorporates art and Language Art Lessons to teach the students about storytelling. Both Navajo and African American cultures have a rich history of storytelling passed down through art. Students will learn storytelling by listening and reading about artists from both cultures as they recall stories that are elicited by their art.

(Developed for Social Studies and Art, grade 2; recommended for Art, Social Studies, and Diné Studies, grades 1-3)

22.03.02

“Do you see me?” “I see you.”—Identity and Activism in Black Art, by Amy McIntosh

The curriculum unit has been designed for my 10th-grade ELA students, who will review academic vocabulary while practicing skills like annotation, persuasive and analytical writing, research, and oral presentation. We will begin with a week-long survey of works from the artists of the AfriCOBRA movement. During the second and third weeks, we will examine artworks from Kerry James Marshall and Hank Willis Thomas respectively. Works from additional artists (Faith Ringgold, Kehinde Wiley, Ester Hernandez, and Betye Saar) will supplement the selections from Marshall and Thomas. Students will examine the politics of celebratory representations of blackness as well as the ways that Black artists resist and undercut a dominant culture stemming from European and American colonialisms that would erase or malign Black identity. Students will consider the ways that personal style (clothing, hair, music, dance) can serve as forms of resistance. Finally, students will examine the ideological power of advertisements and the ways that some artists seek to disrupt that power through an engagement in advertising content and techniques.

(Developed for English, grade 10 and grade 10 Honors; recommended for English, grades 11-12, and U. S. History, grade 11)

22.03.03

The Resiliency of the African American Financial Narrative Presented through Multiple Media of Art, by Sean Means

The following unit surveys the struggles and triumphs within the African American economic narrative through the medium of art: photography, film, television, and theater. *Financial security* is a pursuit shared by every race, religion, and gender. Although it has often been considered taboo at the dinner table, it remains a constant in our 9-5 routines. Our finances impact the quality of healthcare we receive, the type of roof that rests over our heads, and the quality of education provided for our closest kin. The following unit tells several stories connected to this reality as it examines the psychology and sociology connected to the African American struggles, depicting various artists' attempts to communicate economic themes through several media. The unit pushes students to think critically about the idea of college and the financial implications connected to the careers they pursue. How does it help, and what degrees provide different levels of lifestyles? How do minorities handle being alone at tables of influence, and how can they use their power to pull others up, giving back to those whom society has often seen as unfit to have equal access to Kid Cudi's and Will Smith's "Pursuit of Happiness"? The content provides a narrative with an opening blueprint to a sounder financial foundation. The various readings within the curriculum provide lessons on financial literacy that students can use to create, plan, and apply in their life pursuits. Students will also have the chance to look at works of art from Gordon Parks, Titus Kaphar, and Noah Davis in order to dissect the visual interpretations of the situation and its consequences.

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

22.03.04

Art as Advocacy: Explorations into Literary and Visual Art to Provoke Change, by Perrine Punwani

Given the loss of funding for the arts in many schools, it is imperative that other subject areas provide young people with opportunities to meaningfully engage in art. This unit dives into contemporary art from the United States and around the world that has been used to advocate a message. Students will begin by reading an essay about the dangers of silence by Audre Lorde, considering poetry from two writers, informational texts, and several works of visual art and new media. Throughout the unit, they will learn how to make meaning of art for themselves by internalizing thinking routines and building confidence in skills as critics and consumers of art. Further, they will study the creation

of a historic art collective and its principles of design. Students will then apply this knowledge to create their own artist collectives and their own art based on the principles they collaboratively create. Their final audience for their art will be local and national changemakers who will be invited to an exhibit of their work.

(Developed for English Language Arts, grade 8; recommended for Visual Arts, Social Justice, English Language Arts, and Social Studies, grades 8-12)

22.03.05

Struggle, Defiance, and Triumph: Black Photographers and Their Magic, by Katherine Steiner

This high-school-level unit addresses the art of contemporary Black photographers, designed to be taught in 90-minute class periods consisting of both looking at contemporary art and making art. This is a photography unit, encouraging students to use their cameras and/or phones as tools and not adding any filters or editing to their raw photos. This curriculum unit covers four weeks, roughly eight 90-minute class periods, and will address homophobia/transphobia, celebration of queer lives, police and/or domestic violence, fighting for justice and local issues, and triumph over oppression, but is also open to the experiences of the students and flexible in terms of what photographs are used. Photographers studied include: Zanele Muholi, Nicole Fleetwood, Hank Willis Thomas, Fabrice Monteiro, and Charles “Teenie” Harris. Standards addressed include synthesizing and relating knowledge and personal experiences to make art (#VA:Cn10.1,) and relating artistic ideas and works with societal, cultural, and historical context to deepen understanding (#VA:Cn11.1.)

(Developed for Introduction to Visual Arts, grades 9-12; recommended for Art, African American History, Social Justice, and Social Activism, grades 6-12)

22.03.06

Things Fall Apart: Piecing It All Back Together Using Contemporary Black Art, by Tara Waugh

What do you do when things fall apart? When students read the African novel Chinua Achebe’s *Things Fall Apart*, they struggle to understand the Nigerian culture of Umuofia and the character of Okonkwo, but by the end and through the use of cultural context, they find value and common ground with this community. All of this is ripped away when they find out the District Commissioner reduces Okonkwo’s life to just a paragraph in his book about this “primitive” tribe. Students come away from this reading feeling defeated, but understand the importance of who tells the story, and they recognize, now, that it is the colonizer who controls the dominant narrative. By analyzing art work by Kehinde Wiley, Yinka Shonibare, and Hew Locke, this unit will show students how modern Black artists are tearing apart the colonist narrative and how they are piecing

back together a narrative that empowers the colonized and reclaims their story. After close reading, art analysis, and in-class writing, students will create a fictional portrait that fuses Achebe's text and the styles of the artists studied to do the very same thing for the fictional world of Umuofia -- decolonizing the narrative and putting it all back together.

(Developed for Advanced English II IB-MYP, grade 10; recommended for AP Language and Composition, grade 11)

IV. Alien Earths

Introduction

“Are we alone?” and “Are there other planets like the Earth?” are two questions that are often asked. The “Alien Earths” seminar tried to address these questions. In the seminar, we examined other planets in the solar system and compared and contrasted them to Earth to examine if any of those could be habitable. We discussed how planets around other stars, exoplanets, are detected and characterized. We talked about the “Goldilocks zone” around stars where we might expect planets to harbor life. But before all of this, we pondered how one could define “life” so that we can recognize life on an alien planet. Turns out, that is not easy, given that we only know of life on Earth and all life-forms on Earth share the same genetic code. We discussed the question of habitability of a planet, and examined how spectroscopy would allow us to determine the constituents of an exoplanets atmosphere to gauge habitability. And then looked into the idea of “biosignatures,” spectroscopic signatures of chemicals that would indicate the presence of life. In a happy coincidence, the first James Webb Space Telescope detection of the presence of water on an exoplanet was released while the seminar was going on. This gave us ample time and opportunity to discuss the results and how they were obtained. This seminar has resulted in the creation of seven curriculum units covering grades 2 to 6; they cover a vast range of topics.

We start with the unit written by Lauren Freeman, an English Language and Arts teacher who will use material discussed in the seminar to teach her students about our solar system and exoplanet systems and use that to increase their vocabulary and introduce them to writing science fiction where the students can let their imaginations soar. Emily Turner uses exoplanetary systems as a backdrop to discuss life and habitability, and branches into ecosystems. On the way, her unit discusses the characteristics of life and its requirements and takes a detour to describe how constituents of exoplanetary atmospheres are studied. The unit is designed to teach language, science and mathematics with activities integrated into the whole day.

Elizabeth Isaac’s unit introduces her students to planets within, and beyond, our solar system. Targeted mainly towards students on the Diné Nation, this unit connects modern astronomy to Navajo mythology about the solar system and the Universe.

Valerie Schwarz’s unit discusses planet formation, planets and dwarf planets in the solar system as well as exoplanets; the unit also discusses habitability. Data in planets is used to teach students how to compare different quantities. Malcolm McConner also introduces solar-system planets and exoplanets, and then discusses the Goldilocks zone; he also examines the possible habitability of solar-system moons Titan and Europa.

Karen Cameron's units covers the characteristics of life on Earth and Earth's geological and biological history. She also compares and contrasts Earth and Mars and their atmospheres.

The last unit in this volume, that by Lisa Yau is quite different. In the unit, Lisa talks of gravity — the force that led to the formation of the solar system and its planets, and the force that keeps us bound to the Earth. She also delves into the effects of microgravity, usually called weightlessness, on human physiology.

The seven units in this volume are a testament to the dedication and hard work of all the Fellows. I hope these will be as useful to other teachers that they will be to the authors of the units.

Sarbani Basu

Synopses of the Curriculum Units

22.04.01

To Infinity and Beyond: Using Non-Fiction Text and Study to Promote Science-Fiction Writing, by Lauren Freeman

Young children have always dreamt about space and all of its heavenly bodies. The sun and stars, the moon, our planets and whatever else their imagination will generate. The wonders of our solar system and others have the tendency to become buried amongst district curriculum at this grade level. The truth is that there are vast amounts of information that can now offer the immensity of our entire universe to children of all ages in a manner that is developmentally appropriate, and fun at the same time.

To Infinity and Beyond: using in-depth, non-fiction text and study to promote science-fiction writing, intends to deliver useful and fascinating information to children at the third-grade level while integrating non-fiction reading practice, creative writing within the science fiction genre as well as loads of scientific facts regarding our solar system and beyond. Using standards from Common Core and the state of Pennsylvania’s ELA and Science categories, students will be immersed in a rich and robust learning atmosphere in which they will produce fact-based, creative writing science fiction pieces and scripts for their classmates and other peers to enjoy. This captivating and stimulating unit is adaptable up to sixth grade and mindful of all levels and abilities of the children involved.

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

22.04.02

The Alien in Your Backyard: Using Exoplanetary Science to Explore the Ecosystems of Earth, by Emily Turner

“The Alien in Your Backyard: Using Exoplanetary Science to Explore the Ecosystems of Earth” is a cross-curricular unit for third grade, though its content can easily be adapted for other grades.

This unit will explore the following big questions:

- What is life?
- What is required for life to exist and thrive on Earth?
- How do organisms, communities, and populations of living things adapt to their specific ecosystems?
- What happens when changes to an ecosystem – regardless of their origin – produce fundamental changes to the habitability of that system?

The unit culminates in a collaborative group research project and presentation. In this project, students take on the role of an alien scientist on a research mission to Earth, tasked to study and report back on how living things survive and thrive across a range of terrestrial and aquatic ecosystems. The bulk of the content background is focused on the Virginia Science Standards of Learning (SOLs), specifically the 2018 Science SOLs 3.4, 3.5, and 3.8. However, students will also engage in analysis of fictional story elements, creative writing, and mathematical computation and problem-solving activities, encompassing the 2017 English SOLs 3.2, 3.5, 3.8, 3.9, and 3.10 and 2016 Mathematics SOLs 3.3 and 3.4.

(Developed for Science, Language Arts, and Mathematics, grade 3; recommended for Science and Language Arts, grades 3-8, and Mathematics, grades 3-12)

22.04.03

Using Out of This World Knowledge to Build Literacy Skills! Space Writer on Board!, by Elizabeth Isaac

The Universe is a vast space many many of galaxies consisting of billions of stars, comets, asteroids, planets, and exoplanets. Some are not visible even through a gigantic telescope or satellite. Within our Galaxy, the Milky Way, our solar system lies in the outer regions. We are just a speck of dirt. So then, are we alone? We can only ponder on what is out there. Our imagination will fill with images of creatures, aliens, and a technological advance world of the unknown.

This unit focuses on students exploring the earth and beyond our solar system. It is developed for third-grade students, but can be modified for any grade level. This unit targets students who reside on the Navajo Reservation, where they hear stories of the Universe connected to their culture. The lessons involve reading and writing activities based on science fiction. Students will participate in viewing videos or images of the universe and our galaxy. Objectives are aligned to the 3rd grade Arizona State Standards for Science, ELA, and Writing. Topics include the solar system, the universe, earth, life, exoplanets, terrestrial, character traits, science fiction, and the Native American perspective on the Universe particularly, the Navajo tribe.

(Developed for ELA, Writing, and Science, grade 3; recommended for ELA, Writing, and Science, grades 2-8)

22.04.04

There's No "Space" Like Home, by Valerie Schwarz

The curriculum unit titled, *There's No "Space" Like Home* examines our solar system and beyond. The recent images from the James Webb Space Telescope shed light on how little we really know about our universe and the space frontier. Planets orbit most stars in the sky and with the thousands of galaxies revealed in the photo, it seems unlikely that

we are alone. What makes a planet habitable? Are other planets, moons, or dwarf planets in the solar system habitable? And for that matter, what is life?

The unit will use modeling and measurement to create a scale model of the eight planets. Students will compare and contrast the planets, moons, and dwarf planets. Students will also use Design Thinking to create and launch a rocket. The unit can be adapted for grades 3-6 and focuses on science content. This unit covers NGSS standard MS-ESS1-2 and Virginia Standards of Science: 4.5, 4.6, and 4.1.

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

22.04.05

An Alien Earth, Far, Far Away!, by Malcolm McConner

In the unit “Alien Earths,” students will engage and explore our solar system and celestial bodies outside of our solar system. This unit is written for 5th grade students but may be adapted for 4th and 6th grades. Students will gain extensive background on the order of the eight planets (from closest to farthest) that revolve around the sun and understand the definition of astronomical units, which are used to calculate the distance between objects in space. Students will engage in computer simulations of planets to learn the composition and atmosphere of each planet. Students will learn the similarities and differences between terrestrial planets, gas giants, and dwarf planets. Students will define key terms such as “the Goldilocks Zone”, “exoplanets” and learn about other alien earths in our planetary system. Students will study Jupiter’s moon, Europa, and Saturn’s moon, Titan, and how they show signs of habitability. At the end of the unit, students will create their own scale model of the distance between planets and from the Sun. The students will also represent the diameters of the planets and Pluto to scale. This unit addresses Next Generation Science Standards 5-ESS1-1 and MS-ESS1-2.

(Developed for Earth Science, grade 5; recommended for Earth Science, grades 4 and 6)

22.04.06

Exploration: A Mission to the Next Habitable Planet, by Karen Cameron

This unit outlines the criteria of what is needed for a planet to be considered habitable. As students learn the requirements for determining the biosignatures of exoplanets they will engage in activities of discovery and inquiry to solidify their understanding. This unit is designed for middle school students but can also be taught to freshmen and sophomore students. The NGSS standards that we’ll be using are MS. ESS1.B, MS. ESS1-2 and MS.ESS1-3. Students will learn about life and habitability. This unit will examine the evolution of life on Earth over billions of years through a timeline of unicellular and multicellular organisms and how they survived on Earth. We will

consider life being in human form as we now know it. The unit compares Earth and Mars and as well as extra-solar planets (exoplanets), in particular gas giants and water worlds. For the purpose of the identification of habitable planets, we will use the type host star, temperature regulation, thickness of the atmosphere, water sources and the elements nitrogen and oxygen.

(Developed for Space Science, grade 7; recommended for General Science, grade 5)

22.04.07

How Gravity Impacts Life, by Lisa Yuk Kuen Yau

Without gravity, the Universe as we know it, would not exist; there would be no Sun, no Earth, no life... period! Because gravity determines the curvature of space-time, according to one physicist, the Universe would be a “completely flat and featureless” wasteland.¹ This interdisciplinary unit (ten lessons) is designed to teach students about the micro and macro impacts of gravity, from space exploration to cell development to the possibility of alien life.

Students will focus on three essential questions: 1) What is gravity? 2) How does gravity affect life and space travel? 3) Does gravity play a role in evolution? The crosscutting science concepts will guide students to articulate the cause and effect of gravity on human health, build a scaled Solar System model as an example of a gravitational system, look for patterns of life, and support arguments explaining the advantages and disadvantages of living on a more massive (heavier) or less massive (lighter) Earth-like exoplanet.

This unit will incorporate 5th to 8th grade Next Generation Science Standards (MS-ESS1-2, MS-PS2-1, MS-PS2-2, MS-PS2-4, and MS-PS2-5) with the Math Standard on the conversions of measurement units (5.MD.A.1), and the ELA Standards on writing opinion pieces (W.5.1).

Keywords: gravity, microgravity, weightlessness, evolution, astrobiology, exoplanets, Kepler’s laws, Newton’s laws, Einstein's law of relativity.

(Developed for Science, Math, ELA, and Writing; recommended for grades 5-8)

V. Fires, Floods, and Droughts: Impacts of Climate Change in the U.S.

Introduction

A variety of climate-driven environmental, economic, and human health-associated problems will continue to arise over the next 50 years. While mitigating the emission of greenhouse gasses will require a coordinated global effort, the societal impacts of climate change are not equally distributed by geography or population. This seminar addressed the different ways in which climate change impacts the US, but did so through the perspective of how the lives of local students could be affected. Scientific focus was placed on understanding and identifying statistical trends in climate and environmental data, and we investigated local engineering solutions and adaptations.

The individual units that resulted cover a variety of climate impacts across a broad geography. They include a physics unit focused on the thermodynamics of tropical cyclones and a biology unit that covers climate-based extinction of mammals as a way to understand natural selection. A group of units address food security by tracking the drought in the Western US and exploring changes in the productivity of our acidifying oceans. One unit tackles urban heat islands and how an extended growing season increases exposure to pollen.

While the volume of topics are diverse, they follow central themes that include providing student's opportunities to evaluate and understand large data sets, teaching fundamental science and math skills through contemporary problems, and engaging students in science, statistics, and engineering through solving local environmental problems that will adversely impact their generation.

Jordan Peccia

Synopses of the Curriculum Units

22.05.01

New Castle and Climate Change – Causes, Evidence, Impacts, and Potential Solutions, by Michael A. Doody

This unit, designed to span three weeks of instruction in AP Environmental Science, is a comprehensive overview of climate change, its impacts, and potential solutions. It covers the basics of climate change, including what it is, why it is happening, and how we know it is happening. Students learn about the multi-scale impacts of climate change, learning first about an overview of global scale impacts, then zooming into national and regional level impacts, and spending significant time learning about the local impacts on the state of Delaware. Students also learn about mitigation strategies for avoiding the worst impacts of climate change and adaptation strategies for preparing for those impacts we cannot avoid. Classroom activities include an analysis of historical temperature and precipitation data for the state of Delaware, mapping the impacts of climate change, and reading text excerpts from personal and fictional accounts of climate change and its impacts. This unit satisfies AP-ES standards STB-4.E, STB-4.F, and AP-ES STB-1.

(Developed for AP Environmental Science, grades 11-12, and Environmental Science Issues, grades 10-11; recommended for Environmental Science Issues, grades 10-11, and Integrated Earth Science, grades 11-12)

22.05.02

Energy Dynamics of Tropical Cyclones: The impacts of climate change, by Zachary Meyers

Humanity faces an unprecedented global climate crisis within the next turn of the century. The potential economic and humanitarian consequences threaten our global infrastructure and our children's future, with the most adverse consequences affecting vulnerable populations. Today the District of Columbia experiences frequent flooding events from severe weather. Atlantic tropical cyclones like hurricane Sandy are threatening the east coast as sea surface temperatures continue to warm. It is imperative that students are educated on the complex dynamics of climate shift and the potential socioeconomic outfalls that could arise. In this two-to-three-week unit students will investigate the thermodynamic principles involved in tropical cyclones within the Atlantic Basin as well as analyze correlations associated with tropical cyclone frequency and intensity with sea surface temperatures. Understanding the mechanism associated with heat-exchange coupled with weather development may allow them to grasp additional nuances associated with climate change which will better prepare them for a tumultuous future.

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

22.05.03

The Chemistry of Ocean Acidification and its Impacts on Marine Ecosystems, by Eric Lindley

Climate change continues to have a range of negative environmental and human health impacts on different regions of the United States. This unit focuses on one of these impacts, ocean acidification, and the effects that continually decreasing pH has on marine ecosystems. Although it is written as a chemistry unit, sections of this unit can be adapted for use in physical science, biology, ecology, environmental science, or elementary school science classrooms. Through the unit, which is written to take approximately nine 90 minute class periods, students will engage with multiple laboratory activities and demonstrations in order to better understand some of the scientific principles behind ocean acidification and its effects on marine organisms including but not limited to: pH, acids and bases, combustion of fuels, formation and dissolution of marine shells, and coral reef ecosystems. This unit also has a data retrieval and analysis component to demonstrate how to access quality climate change data and to instill the importance of analyzing data to determine trends and patterns. This unit connects to the following Virginia Standards of Learning for Chemistry: CH.1 a-f, CH.5 b and d.

(Developed for Chemistry, grade 10; recommended for Chemistry, Environmental Science, and Ecology, all grades)

22.05.04

Will They Survive? Climate Change and its Impact on Biodiversity, by Robert L. Boughner

Climate change is going to have massive impacts on everything that we do in the future, and biodiversity is going to be particularly impacted. Animals that have been well-adapted to their ecological niche face major changes to their habitats, alterations of their food sources, and new invasive species. These animals face a challenge: somehow adapt to the new environment, shift their geographical range, or go extinct. Many examples of each will be seen in the future.

This month-long unit was written for Middle-School Science classes as well as Biology. It is used to supplement teaching on natural selection. Traditionally students are taught about the processes of natural selection and about how nature selects individual traits (adaptations) that allow the animals to survive and reproduce in their specific ecological niche. This unit asks students to consider how specific animals will be impacted by climate change and potential outcomes for the species.

(Developed for Science, grade 8; recommended for Science, grade 8, and Biology, grade 9)

22.05.05**Graphing the Urban Health Impacts of Rising Temperature, Air Quality and Increased Pollen, by Shamira Underwood**

The historical practices of redlining in urban areas, like Pittsburgh, PA, have made it more likely that African American students and other vulnerable populations will live in undesirable urban areas. This practice has been linked to poor health outcomes for respiratory illness and asthma. In this unit, students will learn how climate change impacts are contributing to the rise in allergies and asthma severity in some urban areas. Students will learn how to track, analyze, and represent data related to respiratory health, including local daily temperature, pollen count, and the Air Quality Index (AQI) using tally charts, tables, pictographs, line plots, or bar graphs. The unit will cover the 3rd Grade Pennsylvania Standard CC.2.4.3.A.4 which states “Pennsylvania’s public schools shall teach, challenge, and support every student to realize his or her maximum potential and to acquire the knowledge and skills needed to represent and interpret data using tally charts, tables, pictographs, line plots, and bar graphs.”

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

22.05.06**“To ‘iina ‘ate: Water is Life,” Navajo Farming During a Drought, by Jennifer Tsosie**

The Southwest is in a historical drought that is made more severe due to climate change. The drought continues to have negative impacts on the people, animals and vegetation in the region. This curriculum unit is designed for 6th grade elementary students on the Navajo Nation. Students will be collecting data and research to create solutions on how to farm and adapt in a changing climate. The unit will touch on science, mathematics, and include treatment of state and local foreign and language standards, while incorporating culturally responsive relevancy. Students will learn about their community’s water system, precipitation patterns on the Navajo Nation, the problem of soil erosion, and how they all affect agriculture and the growth of traditional foods. They will listen to cultural stories and the history of their people, to make connections as to why agriculture is an important part of the Peoples’ lives and for future generations. This unit satisfies the Navajo Nation standards and the Arizona World and Native Language, Science and Mathematics standards. This curriculum unit will help students to be able to take what they’ve learned and help educate and make an awareness of climate change.

(Developed for Diné Studies, grade 6; recommended for Diné Studies and Science, grade 6)

22.05.07**Climate Change Impact on Agriculture in California, by Jhansi Sunkerneni**

Climate change effects are being felt across the United States. In the Southwest, impacts include increasing temperatures and changing precipitation patterns that increase drought severity. The focus of this unit is the impact of climate change on agriculture in California and it is designed to bring awareness to students about how climate change will impact their food supply and costs in the future. In order to get a real-world experience, students will visit our on-campus kitchen garden where they will learn about how food scraps from the school cafeteria are composted and used for the crops in the garden. Later, they will conduct two hands on experiments to learn about the importance of having adequate water and temperature for growing crops. Students will conclude their learnings from this unit by collecting data, analyzing data, and drawing a conclusion about how water supply and irrigation techniques benefit the growth of a healthy plant. This unit is designed to meet the Next Generation Science Standards and the content relates to Ecosystems and Engineering.

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