

Curriculum Units by  
Fellows of the  
Yale-New Haven Teachers Institute  
Guide  
2020

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## Contents

	<i>Page</i>
Preface.....	v
<b><i>I. The Place of Woman: Home, Economy, and Politics</i></b>	
Introduction by Frances McCall Rosenbluth, Damon Wells Professor of Political Science .....	1
Synopses of the Curriculum Units .....	5
<b><i>II. Chemistry of Food and Cooking</i></b>	
Introduction by Elsa Chui-Ying Yan, Professor of Chemistry .....	11
Synopses of the Curriculum Units .....	13
Curriculum Units by Fellows of the Yale-New Haven Teachers Institute, 1978-2020.....	17



## *Preface*

In February 2020 teachers from New Haven Public Schools became Fellows of the Yale-New Haven Teachers Institute® to deepen their knowledge of the subjects they teach and to develop new curricular material to engage and educate the students in their school courses. Founded in 1978, the Institute is a partnership of Yale University and the New Haven Public Schools, designed to strengthen teaching and improve learning of the humanities and STEM fields in our community's schools. Through the Institute, Yale faculty members and Public Schools teachers join in a collegial relationship. The Institute is also an interschool and interdisciplinary forum for teachers to work together.

The Teachers Institute has repeatedly received recognition as a pioneering model of university-school collaboration that integrates curriculum development with intellectual renewal for teachers. Between 1998 and 2003 it conducted a National Demonstration Project that showed the approach the Institute had taken for twenty years in New Haven could be tailored to establish similar university-school partnerships under different circumstances in other cities. Based on the success of that Project, in 2004 the Institute announced the Yale National Initiative to strengthen teaching in public schools®, a long-term endeavor to influence public policy on teacher professional development, in part by establishing in states around the country exemplary Teachers Institutes following the approach developed in New Haven and implemented elsewhere. 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.

Teachers had primary responsibility for identifying the subjects on which the Institute would offer seminars in 2020. Between October and December 2019, teachers who served as Institute Representatives and Contacts canvassed their colleagues in New Haven public schools to determine the subjects they wanted the Institute to address. The Institute then circulated descriptions of seminars that encompassed teachers' interests. In applying to the Institute, teachers described unit topics on which they proposed to work and the relationship of those topics both to Institute seminars and to courses they teach. Their principals verified that their unit topics were consistent with district academic standards and significant for school curricula and plans, and that they would be assigned courses or grade levels in which to teach their units during the following school year.

Through this process two seminars were organized, corresponding to the principal themes that emerged during the canvassing. The seminars were:

- “The Place of Woman: Home, Economy, and Politics,” led by Frances McCall Rosenbluth, Damon Wells Professor of Political Science; and

- “Chemistry of Food and Cooking,” led by Elsa Chui-Ying Yan, Professor of Chemistry.

Between February and July, Fellows participated in seminar meetings, studied the seminar subject and their unit topics, and attended a series of talks by Yale faculty members. The seminars and talks began in person and moved online in March. The curriculum units Fellows wrote are their own; they are presented in a volume for each seminar. The units, which were written in stages over time, contain five elements: content objectives, teaching strategies, examples of classroom activities, lists of resources for teachers and students, and an appendix on the academic standards the unit implements. They are intended primarily for use by Institute Fellows and their colleagues who teach in New Haven.

This *Guide* to the 2020 units contains introductions by the Yale faculty members who led the seminars, followed by synopses written by the authors of the individual units. The Fellows indicate the courses and grade levels for which they developed their units and other places in the school curriculum where the units may be applicable. Copies of the units are deposited in New Haven schools and are online at [teachersinstitute.yale.edu](http://teachersinstitute.yale.edu). A list of the 229 volumes of units the Institute has published between 1978 and 2020 appears in the back of this *Guide*.

The Yale-New Haven Teachers Institute is a permanently endowed academic unit of Yale University that works in partnership with the New Haven Public Schools.

James R. Vivian

New Haven  
August 2020

## *I. The Place of Woman: Home, Economy, and Politics*

### **Introduction**

Teachers seek both to educate and to inspire, two goals that are sometimes in tension. Nowhere is this tension sharper than in teaching about the place of women in our world today—in politics, the economy, and society. Educating students entails opening their eyes to persistent gender inequalities in political representation, in income, and in leadership roles, which is no easy matter when some students have internalized many of these inequalities as common sense. How can teachers inspire students to be excited about their future lives when sexism still abounds? How can they help students see possibilities for themselves that their families may not embrace? How can they think about gender inequality in ways that are sensitive to even greater racial inequalities in America today? How do people experience gender inequality and racism at the same time?

An amazing group of New Haven public school teachers took up these challenges in this seminar on The Place of Woman. Their units show sensitivity and warmth towards students of diverse backgrounds, they engage both boys and girls in a celebration of gender equality and fluidity, and they lay out strategies for students to grow in self-awareness and acceptance of themselves and others.

Girls are more likely than boys to have heard that they should be empathetic, modest, and well behaved. These are all good qualities, and perhaps the gender imbalance is in their favor. But girls are also often taught that they are destined for motherhood and the family work that entails. Their parents may have demonstrated a gendered division of labor in the home, even if both parents work. In America, mothers spend more time cooking, cleaning, and caring for children than fathers do; and this gendered division of labor is even starker in many other societies around the world. For children from immigrant families, these other traditions remain strongly present in their lives. Teachers seek to affirm students' diverse backgrounds, while also preparing them for lives in American society where we, at least aspirationally, embrace gender equality and sexual tolerance.

Another challenge for teachers is that, as students approach puberty and depending on their sexual orientation, girls and boys may seek to be attractive to each other. Girls who come from relatively gender-equal families, a growing body of literature tells us, may experience unequal expectations of their time and likely career trajectories when they have, or anticipate having, children of their own. Only then, for many people, will they realize that gendered family roles can stand in the way of career ambitions (if they have not already shrunk those dreams down to acceptable size).

This seminar invited Fellows to reduce the tension between education and inspiration, by building pathways towards equality and self-actualization, based on strong social science

knowledge and analysis of why the genders are unequal in practice. Students can help to make the world a better place, but they first need to know a great deal about what ails the world, and why.

### **Introducing the Fellows' Units:**

This document arranges the Fellows' units by the intended age group of students, because teaching about gender necessarily follows students' relevant experiences and preparedness. Teachers encourage school children in their early years to think about the world as a friendly, inspiring, and welcoming place. Challenges and setbacks are presented as background for inspiring stories of perseverance. As students approach puberty, they can handle more hard truths, but the emphasis is on exploration, self-acceptance, and empathy. Other students are prepared to understand the world in its complexity and, sometimes, in its unfairness. Teachers of these other groups of students are prepared to explore some of the saddest events of history, but also think with students about strategies for how to make the world a better place.

**Carol Boynton** offers a lively and imaginative unit for young children on how to become good leaders. She begins with three of Vashti Harrison's picture books (*Little Dreamers: Visionary Women Around the World*; *Little Leaders: Bold Women in Black History*; and *Little Leaders: Exceptional Men in Black History*) to model for students the obstacles leaders have overcome to be the people we admire today. As is appropriate for this age, the accent is on learning historical knowledge, and on inspiration. By focusing on remarkable people, rather than on women per se, Boynton appeals to all students in the classroom.

**Daniel Croteau** is a gifted writer who teaches his craft to seventh and eighth graders. In this unit, he gives students deep insights into how power inequality infuses relationships between men and women around the world. With a selection of short stories by women writers, he guides his students to grapple with the depictions of gender that the authors describe and invites his students to question their own assumptions about the place of woman in the world. Why are relationships the way they are, and what can be done about them? His unit guides students to become astute readers, skilled writers, and empathetic human beings.

**Felicia Fountain**, who teaches social studies to seventh- and eighth-grade students, has developed a powerful unit aiming to both educate students about the human cruelty of racism, and inspire students to recognize ways, in whatever straitened circumstances they find themselves, to be forces for good. Her initial thought was to focus on women who fought Apartheid in South Africa as a way to explore the intersectional challenges of Black African women. Partly because the Black Lives Matter movement brought persistent American racism sharply into public view, Fountain broadened her aims to



consider parallels between Apartheid, historical Jim Crow, and today's America. She deftly uses this grim material to focus on models of human empathy and leadership.

**Taniesha Granger** is one of three Fellows who use Sandra Cisneros's classic and powerful coming of age book, *The House on Mango Street*, to help guide her students through puberty to mature social awareness. Granger aims high: understanding that her eighth graders come from a range of family and cultural backgrounds, she uses this and other texts to aid self-discovery, self-acceptance, and personal transformation. Granger's unit is in some ways the most ambitious of all our units: While inculcating her students with deep appreciation and gratitude towards their families, she also wants to empower them to develop their own values and priorities in service of life-affirming and independent lives.

**Cheryl Canino** also assigns Cisneros's *Mango Street* in her middle school English Language Arts classes. Canino helps students read this and other texts to recognize models and critiques of stereotypical femininity. Canino is particularly sensitive to the cultural experiences of LatinX students and aims to teach them both self-respect and empathy towards others. Affording her students a deeper understanding of the forces that make us who we are, Canino gives them opportunities for personal growth and a greater range of choices.

**Eden Stein** powerfully deploys Cisneros's *Mango Street*, along with other texts, to help students navigate puberty and young adulthood in a healthy, life-affirming way. After a segment of the unit in which students learn about the history of gender inequality and the women's movements fighting them, Stein assigns *Mango Street* and other coming-of-age books. Stein asks her students to join Cisneros in writing about their own experiences, or those of an imagined person, to develop both their writing skills as well as their appreciation of the life-shaping effects of context.

**Danny Roque** employs his school's theme of CRAIGs (Compassion, Respect, Action, Integrity, and Greatness) to introduce ninth graders to women who embody these impressive attributes. Roque's unit piques student interest with five case studies of remarkable women whose exemplary lives have much to teach about each of the CRAIG's qualities. He then invites students to develop the research skills with which to uncover other people with these remarkable traits. In the process of these explorations, students will have both learned about world history and become inspired by remarkable people who overcame obstacles to live admirable lives.

**Sean Gorman** offers more mature students, grades 10-12, a rich exploration of the effects of the global economy on the economic and social lives of women. The first part of the unit tracks the growth of female employment in rich democracies in the 20th century, and the connection between women's personal income and their authority within the home. His unit then draws students' attention to the more complicated effects of

globalization on women of the global south. Where women's wages are insufficient to afford an independent livelihood, as for some groups of working women in India for example, cultural mores such as femicide can persist or even accelerate. Gorman guides his students through these complex dynamics and the reasons behind them.

**William McKinney** offers a highly sophisticated course that explains why it is important to consider gender as an integral part of AP economics: if we consider individual utility rather than family utility as the unit for maximization, the gendered division of labor (whereby women stay at home and men work) has systematically negative effects on the wages and job prospects of *all* women. McKinney unpacks the logic of statistical discrimination and related concepts that relate also to racism today. McKinney helps his students understand how discrimination is a form of market failure, what role the government plays in correcting market failures, and to understand unintended negative consequences of poorly designed policies.

**Barbara Sasso** offers a feast of erudition for advanced students. Taking political inequality as her starting point, Sasso takes students on a romp through English literature and history for examples of women who rise above their circumstances. Beginning with ancient Greek drama and medieval fiction, she ends with modern fiction that explores "women's work" and marginalization, and what women did about it. Sasso invites students to understand why plagues and natural disasters amplified women's voices, concluding with lessons from the COVID disaster of our own times.

**Aron Meyer** engages his students to understand not only gender inequality, but the meaning and construction of gender itself. In this life-affirming unit, Meyer guides his students through core texts (Alice Walker's *The Color Purple* and Lorraine Hansberry's *A Raisin in the Sun*) to consider how people can be trapped in constructions of gender that don't match with how they feel about themselves, and what to do about it. While teaching the core language arts skills of reading for understanding and writing for clarity and beauty, Meyer also teaches self-knowledge and empathy.

Frances McCall Rosenbluth

## Synopses of the Curriculum Units

### 20.01.01

#### **Visionaries Can Change the World, by Carol P. Boynton**

Young children often have a natural curiosity about people around them. They are fascinated to learn about what “grown-ups” do! In this six-week curriculum unit, primary students will explore the lives of men and women who, through the course of history, have accomplished similar goals amid a variety of obstacles. Essential questions for focus include: *What makes a good leader? How do members of a community help each other? What can we learn from each other that that helps make ours and others’ lives better?*

Vashti Harrison’s picture book, *Little Dreamers: Visionary Women Around the World*, *Little Leaders: Bold Women in Black History* and *Little Leaders: Exceptional Men in Black History* serve as anchor texts for this unit. They highlight the life histories and achievements of curious and resourceful women and men. The parallel accomplishments of the women and men we study encourage students to view the world as a place that both men and women are equally capable of leadership roles.

Students will use the lives of these figures to consider ideas and goals for themselves. The culminating project is for students to use the biographical format of the *Little Dreamers* texts as a model their own plan which becomes a class book, *Future Little Leaders: Kindergarteners at Edgewood*.

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

### 20.01.02

#### **Voices Carry: The Power of Writing to Create Change, by Daniel S. Croteau**

In this unit, students will study a variety of female authors who’s work delves into social issues that are important to them and their world. While examining the works of these women, the students will be asked to consider the author’s background in determining why this issue might be important. In the process of exploring the works of others, the students will be asked to respond to the readings by using the self directed writing strategy. At the end of the unit, the students will produce a culminating piece based on the writing they’ve done throughout the unit. Overall, the purpose of my unit is for students to find their own voice to express what is important to them.

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

### **20.01.03**

#### **Women in Africa during the Time of Apartheid: From Trauma to Transition, 2020, by Felicia S. Fountain**

Through work in this unit, students should come away with connections between societies—namely the United States and South Africa. This unit was designed to expand the knowledge of students about the rich history of Africa, which is often not taught in depth or glossed over. Usually the focus of units on Africa stay centered on ancient Egypt, its pharaohs and rich natural resources. Time to give in-depth instruction is missing and the results are ill-prepared history / Social Studies students. Designed to allow students to view or learn about the country that they live in and relate it to the experiences of those who lived on another continent. It is the hope that students will not see the history of their country or Africa (South Africa) as being isolated or totally foreign. While the languages that we speak in society or throughout the world may be different, many people have or have had similar experiences—some of which occur today. This unit allow opportunities for extended learning that is crucial to understanding African history beyond learning about the Egyptian culture, ancient hieroglyphics and the Nile River. Learners will also analyze the development of “peoples,” systemic racism and the influences of government and society on its people. Most importantly, this unit will allow for an in-depth study of Apartheid in South Africa through a careful study of women in the Anti-Apartheid and Civil Rights Movements.

(Developed for Social Studies, grades 6-8; recommended for Social Studies, grade 5; and for World History, African American Studies, and History of Africa, grades 9-12)

### **20.01.04**

#### **Then and Now: Fueling the Next Generation to Establish New Expectations and Traditions, by Taniesha Granger**

As students outgrow family and cultural expectations that have already predetermined their future, these topics have become more urgent in the classroom. Depending on the structure of their family, these expectations may be based on outdated traditions that may need to be abandoned because they are a mismatch for young generations. Therefore, the priority goal for this unit is to fuel the next generation to maintain and establish expectations that best suit them.

Reflection on personal identity will enable students to identify, confront, analyze, and critique gender stereotypes in Sandra Cisneros’ coming-of-age novel, *The House on Mango Street*. The characters represent an assortment of struggles and past experiences that will naturally foster personal connections and engage students in student-led discussions.

Each lesson in this unit will serve as a checkpoint for students to continuously work toward their own definition of identity. Connecting the reading to students' embeddedness in family will help them see the importance of being thankful, despite adversity. Most favorably, students will learn how to give back, beginning with those who have helped them.

(Developed for Language and Literature, grade 8; recommended for Individuals and Societies, grade 8)

### **20.01.05**

#### **They Weren't Always Mad, Sad, or Bad: Transitions into Womanhood, by Cheryl A. Canino**

How do we help students tell the story of who they are? What definitions of female are they bringing when they come to school? How have they processed these images or definitions? As observers of students, what definitions and/or biases do we bring and use to judge them in our classrooms? Are we objective? At the end of the day, what is the "correct" point of view to project to a classroom of diverse students? Is there an ideal or standard of womanhood that we should inform our students about? This unit aims to provide a framework for exploring the fluid construct of female (gender) and its intersectionality as an instructional strategy supporting ELA discussion and comprehension skills. The unit will utilize a foundational text as a launchpad for a shared literary experience and development academic discussions involving small and whole groups. Applying asset pedagogies, students are expected to communicate about the text/concept of gender that is reflective of a nonwhite cultural point of view. The goal of the unit is to maximize student capital by maximizing how students interact with the text while minimizing student costs by mandating scripted language before discussion protocols are learned.

Keywords: Gender, Critical Race Theory, Latinx/Critical Race Theory (LatCrit), Discussion Literature Analysis, Woman, Identity

(Developed for English Language Arts, grades 7-8, and may be used collaboratively and for high school grades; recommended for English, grade 9)

### **20.01.06**

#### **Leaving Mango Street and Stereotyped Gender Roles Behind, by Eden C. Stein**

This unit utilizes an array of fiction and nonfiction texts to explore the prevalence and consequences of gender role stereotypes and expectations in literature and society and encourages students to imagine a world free from those stereotypes. The first section of the unit helps students to define terms and list gender role stereotypes they have observed in their worlds. The students read nonfiction articles to learn about the history, incidence,

and consequences of those stereotypes. In the second section the class briefly studies the history of feminism in the United States. The third and fourth sections focus on literary analysis of *The House on Mango Street* by Sandra Cisneros, while the students also select diverse independent reading books with similar thematic content. In response to self-selected independent reading novels the students will take on the role of a character to write creatively from the first-person viewpoint. Finally, there is a culminating creative writing task in which students write a series of vignettes in a style similar to that of Cisneros, exploring the breaking away from societal and parental expectations.

(Developed for English Language Arts, grade 8; recommended for English Literature, grades 9-12)

### **20.01.07**

#### **Case Studies on Women and Their Impact on Society: Using Powerful Narratives of Women to Teach the CRAIGs, by Danny Roque**

Many studies have suggested that the 9th grader is the most critical in the success of adolescents and as they make their transition not only into high school but to an environment for which seemingly represents a microcosm of adulthood. Schools have created courses specifically designed to help these students and these seminar-type courses have specific curriculums that will make this transition easier while teaching students the culture of the school. At my school, this culture is referred to as the CRAIGs or, Compassion, Respect, Action, Integrity, and Greatness.

Thus, the goal of this seminar class is to not only encourage and teach students to change their mindsets and behaviors but to also help them develop a better understanding of their world and themselves. This curriculum unit will teach students each of the CRAIGs through five cases with the hope that at the end of the unit, the final product will be in the form a research project that will ask students to choose from a list of influential figures and conduct their own case study to discuss and present how their historical figure shows the CRAIGs. Students will be allowed to show their projects through several project types.

(Developed for Freshmen Seminar, grade 9; recommended for English Seminar, grade 9)

### **20.01.08**

#### **International Trade and Its Implications for Female Empowerment, by Sean M. Gorman**

This unit will consider the social implications of the theoretical economic concepts that interconnect the modern world by analyzing the outcomes it has in women's lives. The focus will be balanced in two parts—between the opportunities afforded to American women in the expanding service sector and the women in developing nations breaking

traditions by leaving the household for manufacturing jobs. These case studies will not only highlight the positive economic opportunities globalization has afforded women, but also inject nuance into class discussions by noting the challenges that women still face participating in their respective societies. By the conclusion of this unit, students will launch their own investigative research projects profiling the changing positionality of women within an economy we have not discussed in class; in this assessment, students will be required to apply key terms introduced as vocabulary in this unit and cite real-world evidence in preparation for an in-class debate activity. The focus on women throughout this unit will, ideally, serve to drive home the dynamic, border-transcending societal implications of globalization as women find themselves uniquely propelled and stunted by these economic developments that have taken place in such a relatively short amount of time.

(Developed for International Issues, grade 10; recommended for Economics and Contemporary Issues, grades 10-12)

### **20.01.09**

#### **Not So Pretty in Pink: An Analysis of Woman in the Economy, 2020, by William L. McKinney**

This unit introduces students to the economics of gender inequality. The unit utilizes a series of interactive simulations and discussions to gauge students' tacit understandings of productivity, equity, and fairness, as well as providing male students an entry point to better understand the female perspective. All activities are mapped to AP units so the unit aligns with the AP Microeconomics standards and sequencing.

This unit begins by examining how social revolutions driven by comparative advantage gave rise to gender inequality. It then examines the relationship between marriage and game theory. The bulk of this unit examines labor markets and the wage gap. Finally, the unit examines gender-biased laws that show how inefficient government regulation leads to greater social inefficiency.

The essential questions of the unit are

1. What social inefficiencies naturally arise in American product and labor markets?
2. What role does the government play in correcting market failures?
3. How can society and the government change current legislature and policy to promote gender equality in the product and labor markets?

(Developed for AP Microeconomics, grades 10-12; recommended for AP Microeconomics, grades 11-12)

### **20.01.10**

#### **Women in Fiction / Women in Fact: Power and Worth Exposed by Pandemics, by Barbara A. Sasso**

Women have always had power and worth, even behind masks of weakness forced upon them by society. Indeed, in primitive hunter-gatherer societies, women and men had equal roles. Historically, war and pandemics have precipitated more power for women in societies where their rights were limited.

While women's voices may have been silenced in politics, in history, and as artists, their social, artistic, and economic power was always felt behind the scenes, and portrayed vividly, not in historical documents, but in fictional voices. Ultimately, women in fiction are based on women in life, in real stories, and in families. This unit will touch on plays from ancient Greece, and examine the power of women in medieval fiction, where their voices were amplified after plagues, and encourage students to reflect on the value and importance of "women's work" – and the essential work of all marginalized people – that was exposed by the COVID-19 quarantine, which started just as the seminar for this unit began.

(Developed for AP Literature and Composition, grade 12; recommended for AP Literature and Composition, Women's Literature, Literature Survey Course, and Medieval Literature and History, grades 11-12)

### **20.01.11**

#### **Born Naked: Gender Roles in Literature and Life, by Aron S. Meyer**

In this unit, students in a grade 12 English class will read and discuss the social implications of two literary classics, Alice Walker's *The Color Purple* and Lorraine Hansberry's *A Raisin in the Sun*. Prior to reading these texts, learners will define and discuss the concept of gender as a social construction. Students will engage in activities that ask them to reconsider and challenge notions of what is "normal," and to think about how societal norms dictate a person's behavior and self-perception. While reading and discussing both core texts for this unit, students will seek to identify the extent to which individuals are able to subvert the expectations that society has placed upon them based on gender. To demonstrate their mastery of key concepts in the unit, learners will work independently and in small groups to create written arguments and multimedia projects exploring the actions and decisions of characters in the texts and trends in the real world. In doing so, students will develop an understanding that gender is not a concrete indicator of a person's abilities or potential, and that challenging societal norms can allow individuals greater freedom of expression, as well as empathy and compassion toward one another.

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



## *II. Chemistry of Food and Cooking*

### **Introduction**

In this volume, we use our everyday experiences of food and cooking in teaching science in grade-school classroom. We view cooking as running chemical reactions by considering ingredients as reactants and final dishes as products. We aim to understand how molecules in food transform during the cooking process that leads to new chemical compositions and how changes in the chemical compositions give favors and texture of dishes.

In March-July 2020, we discussed in our seminars the basic concept of atomic and molecular structures. Using this basic concept as a foundation, we covered the chemical and physical properties of three important molecules in food: carbohydrates, fat, and protein. Subsequently, we went through the principles of rate of chemical reaction and energy exchange. This fundamental knowledge enables us to answer many questions related to chemistry of food and cooking. For examples, why do we need to cook beef stew for 2 hours on a stove but only 15 mins in a high-pressure cooker? Why do almost all recipes call for a baking temperature higher than 285°F? How can ramen noodle taste so good? Why do you need to wait for a bread dough to rise when you use yeast as a leavening agent but not baking powder? How can we mix oil and vinegar when making salad dressing?

Conducting the seminar in 2020 has been challenging due to the COVID-19 pandemic. However, five fellows have successfully completed the seminar. Each of them contributes a teaching unit to this volume. These units cover a wide range of topics:

The first unit is by Somi Akella. This unit teaches chemical structures and biological functions of biomolecules, including protein, carbohydrate, and lipid. Somi has linked the basic knowledge of biochemistry to nutrition and energy in food. Her goal is to use the content to help students understand the importance of balanced diets. The unit is expected to have lasting impact in students' dietary choice and help them establish a healthy living style.

The second unit is by Nick Farrell. It discusses energy that is stored in food and energy that can be dissipated by doing exercise. Based on first law of thermodynamics, the unit requires students to practice quantitative skills. They will calculate amounts of energy in various forms, such as potential energy and kinetic energy. The unit also includes experiments, in which students can measure thermal diffusion constant of food. These experiments are highly feasible and can be readily implemented in a high-school classroom setting.

Third, Michael Petrescu has written a unit covering general and organic chemistry. It discusses molecules in food and uses them as examples to distinguish chemical and physical processes. The unit also systematically introduces functional groups, a basic topic in organic chemistry. The goal is to prepare students for general and organic chemistry courses that they will take after entering colleges. Indeed, many college students feel that organic chemistry is exceedingly difficult and thus decide not to take advanced courses in chemistry. This unit is designed to help them succeed in science classes upon entering colleges.

The fourth unit by Lianne Samalot's is on electromagnetic waves. The unit uses microwave oven and conventional ovens to demonstrate how electromagnetic waves are applied in our daily life. Lianne has derived some innovative methods in teaching advanced concepts in molecular dynamics and statistical thermodynamics. For example, she will provide students with Styrofoam balls and pipe cleaners to make a model of water molecule. The students will then use the models to illustrate different molecular motions, including translation, rotation, and vibration. This type of class activities will be effective to instill the abstract concept that relates temperature and thermal energy at the molecular level.

Finally, Jason Ward's unit is to explore with his second-graders the best recipe of making playdough. In introducing the major ingredients in the recipes, Jason will discuss the concepts of atoms and molecules. He will also implement hands-on experiments and thereby engage his students in learning chemistry behind making playdough. The unit also requires his students to play a role of an engineer. They will use organized methods and systematic approaches to record notes and observations. While teaching and learning science and engineering, Jason and his second-graders will certainly enjoy every minute of the class!

I am sure that these units will be a good starting point to engage students in learning various topics in science. I hope that the students will appreciate our fellows' time and effort in developing the units and other grade-school teachers will find the units useful in their own classrooms.

Elsa Chui-Ying Yan

## Synopses of the Curriculum Units

### 20.02.01

#### **We Are What We Eat! The Importance of Nutritional Facts Labels and Balanced Diet in Making Healthy Food Choices, by Somi Devi Akella**

The main ideas behind this unit include (1) to introduce the concepts of biological molecules, their structure, function, and the types of food that contain these molecules, (2) to understand how different living organisms obtain their food and convert it into energy that they need for survival, (3) to introduce the importance of reading the Nutritional Facts Labels and understanding the valuable information in the labels about the foods that we consume, and (4) to utilize the My Plate Concept to emphasize the importance of a balanced diet and create menus that are catered to students' daily energy needs. Inner-city students could be tremendously benefitted from the My Plate concept as it will help them make healthy food choices and maintain healthy lifestyles. This unit can be modified for students at middle-school and elementary-school levels. The content knowledge in this unit couples with the Next Generation Science Standards (NGSS) practices, such as asking questions, conducting research, collecting, analyzing, and interpreting data, finding answers to questions, and designing solutions. The unit thus addresses the New Haven Public School District, the State of Connecticut, and the Next Generation Science Standards (NGSS).

(Developed for Biology, grade 10; recommended for Human Physiology and Public Health, grades 9-12; Life Science, grades 6-8; and Science, grades K-5)

### 20.02.02

#### **The Physics of Cooking: How Energy Conservation and Thermodynamics Can Improve the Lives of Millions, by Nicholas J. Farrell**

Food is an important part of our lives, yet there is a lack of understanding around the energy contained in food and how to properly prepare it. With the adult obesity rate above 42% in the United States and approximately 48 million cases of food poisoning each year, there is an apparent need for education around our eating and cooking practices. The application of physics can help solve these problems and the focus on food can make physics topics more engaging for students. This unit is designed for 11th and 12th grade physics students as a culminating activity for the topics of energy and thermodynamics. Prerequisite knowledge for this unit includes vectors, forces, work, energy, kinetic energy, and potential energy. Working in small groups, students must apply their knowledge of the topics listed above along with their newly acquired knowledge on thermodynamics to calculate the energy contained in a food sample, the amount of exercise to expend an equal amount of energy, and to experimentally determine the thermal diffusion constant of their food sample. Students will also be

required to individually discuss the significance of their investigations and the limitations of their experiment in a concise, one-page summary paper.

(Developed for Science and Sustainability, grade 11; recommended for Physics, grade 12)

### **20.02.03**

#### **Introduction to Chemistry of Food and Cooking, by Michael Petrescu**

The process of cooking, baking, and preparing food is essentially an applied science. It changes the chemical and physical nature of the food, during which molecules in ingredients react to form new compounds and/or change in physical states, bringing new textures and flavors. This unit will inform high school students about some fundamental concepts in an important area of science - food chemistry. The students will review differences between chemical compounds and mixtures (solutions, suspensions, colloids, and emulsions). They will learn about common chemical reactions (e.g., Maillard reaction), and physical changes (e.g., emulsification) in food processing. They will then focus on organic chemistry by studying various functional groups, such as alcohol, aldehyde, ketone, carboxylic acid, etc. They will examine these functional groups in molecules that are commonly found in food, including carbohydrates, proteins, and fats. This unit is for high school Chemistry and Physical Science classes. It requires about 12 class periods in roughly 2.5 weeks. The goal is to strengthen students' knowledge in organic and general chemistry to prepare them for college biochemistry, general chemistry, and organic chemistry classes. The unit can be used also for middle-school 7th- and 8th-grader as an introduction to physical and chemical processes.

(Developed for Chemistry, grade 10; recommended for Chemistry, grade 10, and AP Chemistry, grade 11)

### **20.02.04**

#### **How Do We Use Electromagnetic Waves to Cook Food? by Lianne M. Samalot**

This curriculum unit is designed for 9th-grade students to learn about electromagnetic waves. The unit uses microwave and conventional ovens as examples to illustrate how electromagnetic waves are applied in daily life. In this two-week unit, students will learn the physics and chemistry behind how a microwave oven uses microwave radiation and a conventional oven uses infrared radiation to make their food hot. The students will first learn what heat is by discussing kinetic energy and molecular motions that include translational, rotational, and vibrational motions. Then, the unit will focus on how food is heated up in a microwave oven. Students will learn about rotational motion of water and the frequency of the rotational motion. Finally, the students will explore how a microwave oven works differently from a conventional oven with an emphasis on identifying the microwave and infrared regions in the electromagnetic spectrum and

noticing their relative difference in energy. To engage students in exploring these questions, the unit will include three activities: (1) measuring the wavelength of microwaves, (2) discovering what actually is heated up in the microwave, and (3) modeling how the heating process in the ovens happens at the molecular level.

(Developed for PhyChem, grade 9; recommended for Electromagnetic Waves, grades 9-12)

### **20.02.05**

#### **The Chemistry of Playdough, by Jason J. Ward**

This five-lesson unit was designed to introduce elementary students to the basic chemistry behind making playdough as they take on the role of a chemical engineer and endeavor to develop a process (or recipe) for making playdough. Moreover, it will inject fundamental knowledge of chemistry. Students will use this knowledge to improve consistency in producing high-quality playdough comparable to retail brand “Play-Doh” in texture, elasticity, and pliability. Along the way, students will learn the role of each ingredient and the reasoning behind each step of the process (mixing, kneading, and applying heat). There will also be room for experimentation as students explore various ingredients and/or different preparation processes. Students will record their measured ingredients and procedures used for each batch in a chemical engineering journal and present their best final product to the class. The unit promotes an introduction to chemistry and engineering, and using an organized method to record notes and observations. Not only that, but making playdough is a lot of fun! Fair warning – students will be excited, and some results may come out sticky and messy! The unit is designed to take five one-hour sessions but can be extended or shortened at the discretion of the teacher.

(Developed for STEM Lab, grade 2; recommended for Science, grades K-5)



**Curriculum Units by Fellows of the  
Yale-New Haven Teachers Institute  
1978-2020**

	<b>2020</b>	
Volume I		The Place of Woman: Home, Economy, and Politics
Volume II		Chemistry of Food and Cooking
	<b>2019</b>	
Volume I		Digital Lives
Volume II		Teaching about Race and Racism Across the Disciplines
Volume III		Human Centered Design of Biotechnology
	<b>2018</b>	
Volume I		An Introduction to Income Inequality in America: Economics, History, Law
Volume II		Engineering Solutions to 21st-Century Environmental Problems
	<b>2017</b>	
Volume I		Adapting Literature
Volume II		Watershed Science
	<b>2016</b>	
Volume I		Shakespeare and the Scenes of Instruction
Volume II		Literature and Identity
Volume III		Citizenship, Identity, and Democracy
Volume IV		Physical Science and Physical Chemistry
	<b>2015</b>	
Volume I		Teaching Native American Studies
Volume II		American Culture in the Long 20th Century
Volume III		Physics and Chemistry of the Earth's Atmosphere and Climate
Volume IV		Big Molecules, Big Problems
	<b>2014</b>	
Volume I		Picture Writing
Volume II		Exploring Community through Ethnographic Nonfiction, Fiction, and Film
Volume III		Race and American Law, 1850-Present
Volume IV		Engineering in Biology, Health and Medicine

## Curriculum Units by Fellows (continued)

### 2013

Volume I	Literature and Information
Volume II	Immigration and Migration and the Making of a Modern American City
Volume III	Sustainability: Means or Ends?
Volume IV	Asking Questions in Biology: Discovery versus Knowledge

### 2012

Volume I	Understanding History and Society through Visual Art, 1776 to 1914
Volume II	The Art of Biography
Volume III	Anatomy, Health, and Disease: From the Skeletal System to Cardiovascular Fitness
Volume IV	Engineering in the K-12 Classroom: Math and Science Education for the 21st-Century Workforce

### 2011

Volume I	Writing with Words and Images
Volume II	What History Teaches
Volume III	The Sound of Words: An Introduction to Poetry
Volume IV	Energy, Environment, and Health

### 2010

Volume I	Interdisciplinary Approaches to Consumer Culture
Volume II	The Art of Reading People: Character, Expression, Interpretation
Volume III	Geomicrobiology: How Microbes Shape Our Planet
Volume IV	Renewable Energy

### 2009

Volume I	Writing, Knowing, Seeing
Volume II	The Modern World in Literature and the Arts
Volume III	Science and Engineering in the Kitchen
Volume IV	How We Learn about the Brain
Volume V	Evolutionary Medicine



## Curriculum Units by Fellows (continued)

### 2008

Volume I	Controlling War by Law
Volume II	Storytelling: Fictional Narratives, Imaginary People, and the Reader's Real Life
Volume III	Pride of Place: New Haven Material and Visual Culture
Volume IV	Representations of Democracy in Literature, History and Film
Volume V	Forces of Nature: Using Earth and Planetary Science for Teaching Physical Science
Volume VI	Depicting and Analyzing Data: Enriching Science and Math Curricula through Graphical Displays and Mapping

### 2007

Volume I	American Voices: Listening to Fiction, Poetry, and Prose
Volume II	Voyages in World History before 1500
Volume III	The Physics, Astronomy and Mathematics of the Solar System
Volume IV	The Science of Natural Disasters
Volume V	Health and the Human Machine

### 2006

Volume I	Photographing America: A Cultural History, 1840-1970
Volume II	Latino Cultures and Communities
Volume III	Postwar America: 1945-1963
Volume IV	Math in the Beauty and Realization of Architecture
Volume V	Engineering in Modern Medicine
Volume VI	Anatomy and Art: How We See and Understand

### 2005

Volume I	Stories around the World in Film and Literature
Volume II	The Challenge of Intersecting Identities in American Society: Race/Ethnicity, Gender and Nation
Volume III	History in the American Landscape: Place, Memory, Poetry
Volume IV	The Sun and Its Effects on Earth
Volume V	Ecology and Biodiversity Conservation

## Curriculum Units by Fellows (continued)

### 2004

Volume I	The Supreme Court in American Political History
Volume II	Children's Literature in the Classroom
Volume III	Representations of American Culture, 1760-1960: Art and Literature
Volume IV	Energy, Engines, and the Environment
Volume V	The Craft of Word Problems

### 2003

Volume I	Geography through Film and Literature
Volume II	Everyday Life in Early America
Volume III	Teaching Poetry in the Primary and Secondary Schools
Volume IV	Physics in Everyday Life
Volume V	Water in the 21st Century

### 2002

Volume I	Survival Stories
Volume II	Exploring the Middle East: Hands-On Approaches
Volume III	War and Peace in the Twentieth Century and Beyond
Volume IV	The Craft of Writing
Volume V	Food, Environmental Quality and Health
Volume VI	Biology and History of Ethnic Violence and Sexual Oppression

### 2001

Volume I	Medicine, Ethics and Law
Volume II	Art as Evidence: The Interpretation of Objects
Volume III	Reading and Writing Poetry
Volume IV	Race and Ethnicity in Contemporary American Art and Literature
Volume V	Bridges: Human Links and Innovations
Volume VI	Intelligence: Theories and Developmental Origins

## **Curriculum Units by Fellows (continued)**

### **2000**

Volume I	Women Writers in Latin America
Volume II	Crime and Punishment
Volume III	Constitutional and Statutory Privacy Protections in the 21st Century
Volume IV	Ethnicity and Dissent in American Literature and Art
Volume V	Sound and Sensibility: Acoustics in Architecture, Music, and the Environment
Volume VI	The Chemistry of Photosynthesis
Volume VII	Bioethics

### **1999**

Volume I	Women's Voices in Fiction
Volume II	Art and Identity in Mexico, from the Olmec to Modern Times
Volume III	Immigration and American Life
Volume IV	Detective Fiction: Its Use as Literature and as History
Volume V	How Do You Know? The Experimental Basis of Chemical Knowledge
Volume VI	Human-Environment Relations: International Perspectives from History, Science, Politics, and Ethics
Volume VII	Electronics in the 20th Century: Nature, Technology, People, Companies, and the Marketplace

### **1998**

Volume I	The Use and Abuse of History in Film and Video
Volume II	Cultures and Their Myths
Volume III	Art and Artifacts: The Cultural Meaning of Objects
Volume IV	American Political Thought
Volume V	Reading Across the Cultures
Volume VI	Selected Topics in Contemporary Astronomy and Space Science
Volume VII	The Population Explosion

### **1997**

Volume I	Twentieth Century Latin American Writing
Volume II	American Children's Literature
Volume III	American Maid: Growing Up Female in Life and Literature
Volume IV	Student Diversity and Its Contribution to Their Learning
Volume V	The Blues Impulse
Volume VI	Global Change, Humans and the Coastal Ocean
Volume VII	Environmental Quality in the 21st Century

## Curriculum Units by Fellows (continued)

### 1996

Volume I	Multiculturalism and the Law
Volume II	Environmental and Occupational Health: What We Know; How We Know; What We Can Do
Volume III	Race and Representation in American Cinema
Volume IV	Remaking America: Contemporary U.S. Immigration
Volume V	Genetics in the 21st Century: Destiny, Chance or Choice
Volume VI	Selected Topics in Astronomy and Space Studies

### 1995

Volume I	Gender, Race, and Milieu in Detective Fiction
Volume II	Film and Literature
Volume III	The Constitution and Criminal Justice
Volume IV	Coming of Age in Ethnic America
Volume V	The Geological Environment of Connecticut

### 1994

Volume I	Family Law, Family Lives: New View of Parents, Children and the State
Volume II	Poetry in the Classroom: Incentive and Dramatization
Volume III	Understanding the Ancient Americas: Foundation, Flourishing, and Survival
Volume IV	Racism and Nativism in American Political Culture
Volume V	The Atmosphere and the Ocean

### 1993

Volume I	The Symbolic Language of Architecture and Public Monuments
Volume II	Folktales
Volume III	Twentieth-Century Multicultural Theater
Volume IV	The Minority Artist in America
Volume V	Environmental Science

### 1992

Volume I	The Constitution, Courts and Public Schools
Volume II	Writing and Re-writings of the Discovery and Conquest of America
Volume III	Reading and Writing the City
Volume IV	The National Experience: American Art and Culture
Volume V	Ecosystems: Tools for Science and Math Teachers

## Curriculum Units by Fellows (continued)

### 1991

Volume I	Regions and Regionalism in the United States: Studies in the History and Cultures of the South, The Northeast and the American Southwest
Volume II	The Family in Art and Material Culture
Volume III	Afro-American Autobiography
Volume IV	Recent American Poetry: Expanding the Canon
Volume V	Adolescence/Adolescents' Health
Volume VI	Global Change

### 1990

Volume I	The Autobiographical Mode in Latin American Literature
Volume II	Contemporary American Drama: Scripts and Performance
Volume III	The U.S. National Parks Movement
Volume IV	American Family Portraits (Section I)
Volume V	American Family Portraits (Section II)
Volume VI	Genetics
Volume VII	What Makes Airplanes Fly? History, Science and Applications of Aerodynamics

### 1989

Volume I	American Communities, 1880-1980
Volume II	Poetry
Volume III	Family Ties in Latin American Fiction
Volume IV	Detective Fiction: Its Use as Literature and History
Volume V	America as Myth
Volume VI	Crystals in Science, Math, and Technology
Volume VII	Electricity

### 1988

Volume I	The Constitution in Public Schools
Volume II	Immigrants and American Identity
Volume III	Autobiography in America
Volume IV	Responding to American Words and Images
Volume V	Hormones and Reproduction
Volume VI	An Introduction to Aerodynamics

## Curriculum Units by Fellows (continued)

### 1987

Volume I	The Modern Short Story in Latin America
Volume II	Epic, Romance and the American Dream
Volume III	Writing About American Culture
Volume IV	The Writing of History: History as Literature
Volume V	Human Nature, Biology, and Social Structure: A Critical Look at What Science Can Tell Us About Society
Volume VI	Science, Technology, and Society

### 1986

Volume I	The Family in Literature
Volume II	Writings and Re-Writings of the Discovery and Conquest of America
Volume III	Topics in Western Civilization: Ideals of Community and the Development of Urban Life, 1250-1700
Volume IV	The Process of Writing
Volume V	The Measurement of Adolescents, II
Volume VI	Fossil Fuels: Occurrence; Production; Use; Impacts on Air Quality

### 1985

Volume I	Poetry
Volume II	American Musical Theater
Volume III	Twentieth Century American Fiction, Biography, and Autobiography
Volume IV	History as Fiction in Central and South America
Volume V	Odysseys: Nineteenth and Twentieth-Century African-American History Through Personal Narrative
Volume VI	Time Machines: Artifacts and Culture
Volume VII	Skeletal Materials-Biomineralization
Volume VIII	The Measurement of Adolescents

### 1984

Volume I	Elements of Architecture, Part II
Volume II	Greek Civilization
Volume III	Hispanic Minorities in the United States
Volume IV	The Oral Tradition
Volume V	American Adolescents in the Public Eye
Volume VI	Geology and the Industrial History of Connecticut

## Curriculum Units by Fellows (continued)

### 1983

Volume I	Elements of Architecture
Volume II	Greek and Roman Mythology
Volume III	Reading the Twentieth Century Short Story
Volume IV	America in the Sixties: Culture and Counter-Culture
Volume V	Drama
Volume VI	Cross-Cultural Variation in Children and Families
Volume VII	Medical Imaging

### 1982

Volume I	Society and the Detective Novel
Volume II	Autobiography
Volume III	The Constitution in American History
Volume IV	An Unstable World: The West in Decline?
Volume V	Society and Literature in Latin America
Volume VI	The Changing American Family: Historical and Comparative Perspectives
Volume VII	Human Fetal Development

### 1981

Volume I	The “City” in American Literature and Culture
Volume II	An Interdisciplinary Approach to British Studies
Volume III	Human Sexuality and Human Society
Volume IV	Writing Across the Curriculum
Volume V	The Human Environment: Energy
Volume VI	Computing

### 1980

Volume I	Adolescence and Narrative: Strategies for Teaching Fiction
Volume II	Art, Artifacts, and Material Culture
Volume III	Drama
Volume IV	Language and Writing
Volume V	Man and the Environment
Volume VI	The Present as History
Volume VII	Problem Solving

## **Curriculum Units by Fellows (continued)**

### **1979**

Volume I	The Stranger and Modern Fiction: A Portrait in Black and White
Volume II	Themes in Twentieth Century American Culture
Volume III	Remarkable City: Industrial New Haven and the Nation, 1800-1900
Volume IV	Language and Writing
Volume V	Strategies for Teaching Literature
Volume VI	Natural History and Biology

### **1978**

Volume I	Language and Writing
Volume II	20th Century Afro-American Culture
Volume III	20th Century American History and Literature
Volume IV	Colonial American History and Material Culture