

Curriculum Units by  
Fellows of the  
Yale-New Haven Teachers Institute  
Guide  
2017

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## *Preface*

In February 2017, twenty-four teachers from thirteen 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 2017. Between October and December 2016, teachers who served as Institute Representatives and Contacts canvassed their colleagues in each New Haven public school to determine the subjects they wanted the Institute to address. The Institute then circulated descriptions of seminars that encompassed most 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:

- “Adapting Literature,” led by Dudley Andrew, R. Selden Rose Professor of Comparative Literature and of Film Studies; and
- “Watershed Science,” led by Peter A. Raymond, Professor of Ecosystem Ecology.

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 curriculum units Fellows wrote are their own; they are presented in two volumes, one 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. They are disseminated on Web sites at [teachersinstitute.yale.edu](http://teachersinstitute.yale.edu) and [teachers.yale.edu](http://teachers.yale.edu). We encourage teachers who use the units to submit comments at [teachers.yale.edu](http://teachers.yale.edu).

This *Guide* to the 2017 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 222 volumes of units the Institute has published between 1978 and 2017 appears in the back of this *Guide*.

The Yale-New Haven Teachers Institute is a permanently endowed academic unit of Yale University. The New Haven Public Schools, Yale's partner in the Institute, has supported the program annually since its inception.

James R. Vivian

New Haven  
August 2017

## I. *Adapting Literature*

### Introduction

The New Haven teachers (charged with grades seven through twelve) who joined this seminar understood far better than I the attraction that audio-visual stories—movies—hold for their students. Long past are the days when principals or colleagues or parents had to be convinced that films can be crucial texts in the classroom, both to ignite discussion of topics they treat, and as potentially important cultural artifacts in themselves. The premise in the title “adapting literature” insists that films can bring to life (realize) some important “source,” and that they then become instances in which that source breaks into contemporary life. Take Shakespeare, everyone’s favorite example; his plays are indisputably worth knowing better, something to which every filmed version of them can contribute. At the same time, each Shakespeare film interprets the bard through the lens of its own concerns. The adaptation can be looked at as a document of its society, or of the personality of the filmmakers behind it. Teaching Orson Welles’ *Macbeth* or Akira Kurosawa’s *Throne of Blood*, especially in tandem, exposes Shakespeare to the light of cinema; meanwhile Shakespeare illuminates the values and concerns these film artists express in other films they have made. Even through a Japanese version, students learn to read Shakespearean verse better, since Kurosawa builds staggering imagery of birds, horses, ghosts and so on, all of which strikingly vivify the original language. Students experience a visceral sense of the depth of Shakespearean themes, which Kurosawa delivers in an audacious manner, insisting on an even bleaker conclusion than the original. Kurosawa’s world view can be treated with the same respect as Shakespeare’s. After all, he became a cultural spokesperson for a society punished for its warmongering, but punished like no nation before it, with nuclear weapons. *Macbeth*’s horrific vision of the violence engendered by dreams of power seems especially appropriate to the Japanese; while Japanese history and imagery can help students plumb the depths of tragedy in a play they might otherwise merely read through.

Our seminar kept this kind of binocular vision from start to finish. Sometimes we emphasized the contemporary version over its source, as in the case of Amy Heckerling’s *Clueless*, the re-imagining of Jane Austen’s *Emma* in the world of 1990s Beverly Hills High. At other times, we allowed various film versions of classic fiction to probe the structural core of their sources, as in *Dr. Jekyll and Mr. Hyde* and *Wuthering Heights*. We insisted that every case be treated as two cases, every adaptation as the reworking of a source embodied in a certain way, with a certain style. The only participant in our group who was not a language arts teacher (she teaches history) brought this issue nakedly before us via the 1960 film epic *Spartacus*, whose sources are the multiple Roman accounts by Livy, Cicero, Plutarch and others. This film, it became plain, is not only an evocative, if dubious, secondary document representing the slave revolt that occurred nearly two hundred years before Christ. Its value to history goes beyond the particular version of events that those Roman historians had interpreted in different ways; for it also

stands as a primary document of its own moment in American history, which included both the onset of the civil rights movement and the denouement of the witch hunt carried out by the House Un-American Activities Committee. *Spartacus* is an adaptation of the history of slavery by a writer, Dalton Trumbo, who had been jailed during the Hollywood Blacklist. Thus the past and the present collude in every adaptation, whether from a literary or an historical source. This brings literature and history directly into the present moment.

Our seminar proceeded through case studies that sampled a number of categories of adaptation. Some examples such as *Beauty and the Beast* gave us a chance to look at several historical moments and cultures when this fairy tale became relevant in one way or another: in France just at the end of WWII, in the USA in 1991, and, fortunately for us, in the worldwide blockbuster that came out just this past Spring 2017. Few spectators care if the new Disney film traduced Mme. de Villeneuve's 18th century "original"; more pertinent may be its rapport with its 1991 animated predecessor, or with Jean Cocteau's elegant 1946 art film. The fact that all were popular and critical successes allowed us to look more deeply into the expressive properties and limitations of animation and live action spiced up with trick photography. This story's origin is not sacred in the way that *Macbeth*'s is, and so later artists in many media feel quite justified in "borrowing" it for their own purposes and in their own style. Myths operate as part of the cultural pool.

Fairy tales like "Little Red Riding Hood" crop up as the hidden backbone of a great many films, but, as this case reveals upon study, they appeared independently in multiple oral cultures, not all of which wrote them down so memorably as did Charles Perrault in France. We needn't honor Perrault the way we honor Shakespeare. The latter is updated only with great trepidation; whereas the former stands out merely as the most well-known source of similar stories available in Austria, Italy, England, and even China. Fairy tales take us quickly beyond the Film-Literature dyad of adaptation, since there exist versions of "Little Red Riding Hood" and other such tales in graphic novels, musicals, comic books, animations, and TV programs. Adaptation in this light is an engine that powers cultural productions of all sorts.

In sum, fairy tales, always a great resource for teaching narrative structure and themes, may have been memorably formulated in words by specific authors (Perrault, Andersen, the Grimm brothers), but these can be seen as way-stations or plateaus, places of momentary repose, where oral versions found their footing, only later to go forward in ballets, films, and other visual media. Especially when a source lies in the public imagination like this, one can inquire, on the one hand, about the deep-seated issues that fund its fertility and, on the other, about the way its plot, characters, and themes can exercise the capabilities of different artforms, and do so at various times and places. For adaptation naturally elicits questions of comparative media and comparative arts. Comparisons are natural between the literary and the visual, but they can also be made amongst different visual forms. Our seminar engaged with what school-aged children are



most keen on: graphic novels, comic books, musical theater, TV. What are the attractions of each, and how does a given “public tale” take its shape within one or several media? One unit delves deeply into the phenomenon of anime, via multiple Japanese versions of epic heroes with clear ties to Odysseus. Students will be drawn to learn about the Greek hero as they also learn about an artform they consider their own. Another unit samples various genres of “classic” literary sources by exploring popular and relevant “re-imaginings” such as *Monty Python and the Holy Grail*. More than one unit explicitly aims to recover a lost taste for reading via strategies that make the topics of timeless books and tales pertinent and exciting. “Adaptation” is the global name for these strategies.

In the spectrum of the uses of literary classics, adaptation can operate as allusion, or repurposing. One participant looked at the way a fairy tale, “The Snow Queen,” was embedded within a young-adult novel. The structure and themes of the tale by Andersen, relatively easy to analyze, permit the examination of the more complex structure and thematic relevance of the novel. Moreover, this same unit located a film adjacent to the novel that allowed a comparison of themes without any concern over fidelity. In short, we used adaptation as a way into the understanding of aspects of narratology (story and discourse; character hierarchy, plot construction). Looking at stories side by side, particularly in distinct media, lets students realize how they are made. They can be led to retell their own versions of a favorite or important literary work in one or another medium (oral, theatrical, graphic, mini-film).

Tabulating the chief theoretical issues that the subject of adaptation brought up, we found a) ethical problems involving actual or historical people and situations; b) aesthetic problems involving the specificity of each medium/artform; and c) cultural problems of fidelity to—or the carefree use of—a treasured source text. “Fidelity” is a capacious term, capable of interrogating every aspect of adaptation and doing so with a great deal of moral value behind it. The term has come under tremendous scrutiny, providing the reason to look intently at certain adaptations that seem to want to “transform” the experience of an original while retaining its power. Our clearest example was *The Innocents*, the excellent 1961 film made from Henry James’ *The Turn of the Screw*. The position that the film had to take in regard to the putative existence of ghosts helped us assess the powers and pleasures of both literature and cinema. Interestingly, this story also became both a play and an opera, though we did not look into these versions. Effort spent examining “transformations” can greatly improve our (and our students’) understanding of the original work and of the properties and powers of film and of verbal language to deliver a fiction. We also studied *The Color Purple*, whose Broadway musical version vies with the Spielberg film as a way of extending, even multiplying Alice Walker’s novel. The sociology of the various audiences addressed by these works cannot be ignored.

But the stakes of the question are far higher when the scope of the term is widened. “Adaptation” is the name for Darwinian processes by which species survive the changing circumstances of their environment. The word can be found in the cultural as well as biological sphere too. Individuals, families, and large social groups *adapt* during the normal course of their life cycles, as when middle school children must adjust to changing classrooms, leaving the womb of their home classroom and the security of a single teacher. More dramatically, individuals and groups can be forced to *adapt*—or else to atrophy—when history brings them into sudden contact with an unexpected situation. Many immigrant children probably have a hard time adapting to the brusque social mores that operate in urban schools in the U.S.

We concluded our seminar with a thorough discussion of the self-reflexive 2002 film entitled *Adaptation*, where questions of narrative theory, of authorship and originality, of botany and human variability, play out in an engaging, stylish, and puzzling manner. This film helped us realize that the subject of our seminar, a subject which may seem at first as nothing more than a commercial practice in the film industry, can extend as far as you like in the humanities, social sciences, and sciences. The units that were written while all these topics were being discussed suggest some of the range of possibilities for adaptation study in the classroom.

Dudley Andrew

## **Curriculum Units**

### **17.01.01**

#### **Recapturing Our Lost Youth: Using “Little Red Riding Hood” to Engage Reluctant Readers, by Aaron J. Brenner**

Too many of our teenagers were not read to when they were little and therefore have no nostalgic attachment to nor any interest in reading now. Simply telling them that reading is important to their success will not help these students form the socio-emotional connections to literature they did not make when they were younger. We have to give them the skills to make comprehension and complex literary analysis more gratifying than the mindless consumption of whatever easy entertainment their televisions and computers offer. If we can get them to need stories, and poems, and essays in the same way they seem to need the applications on their cell phones, then we can restore what was lost to the distractions, shortcomings, and traumas of their less than perfect childhoods. To do so, we must make reading feel fun and meaningful again (or for the first time) – rather than something that tortures our students and exposes their ignorance. This unit offers a multicultural exploration of the classic folktale “Little Red Riding Hood” as a path toward nurturing the bonds that literature creates between people and communities, giving us a sense of security, belonging, and purpose.

(Developed for English 3, grade 11, and Creative Writing, grades 11-12; recommended for English, History, Humanities, and Creative Writing, grades 5-12)

### **17.01.02**

#### **Accommodatio et Transformatio: Spartacus, Slavery, and the Red Scare, by Jessica L. Cormier**

Primary source documents serve as the bedrock of all reliable social studies. They provide firsthand facts, descriptions, opinions, and accounts which illuminate the distant world of the past while allowing us to better understand the present. To many students, however, primary source documents are foreign, verbose, and tedious.

In order to reach out to these students, a history teacher’s best weapon is often adaptation, especially through the medium of film. Passionate actors, perceptive directors, witty screenwriters, and elaborate costumes bring dusty historical documents back to life through an immersive audiovisual experience.

Yet with a bit of inspection, these cinematic adaptations of history can reveal much more than secondary historical details. By analyzing these films as primary source documents themselves, audiences can gain insight into the time period in which the movies were made.

This curriculum unit considers the story of Spartacus—the celebrated hero of ancient history and the 1960 film directed by Stanley Kubrick—as both a primary and secondary source of history. How does *Spartacus* compare to the ancient sources recorded before the common era? And how does *Spartacus* reveal the political and social turmoil which afflicted the United States throughout the 1950’s and 1960’s?

(Developed for History Through Film, grades 11-12; recommend for History Through Film, grades 11-12)

### **17.01.03**

#### **Anime and the Art of Storytelling, by Richard Cuminale**

This unit is a joint exploration of the genre of Japanese animation (“anime”) and Homer’s epic poem, *The Odyssey*. The unit begins by questioning how stories work in general and what makes a narrative “epic” in particular. After establishing the foundations of narrative analysis and a set of concrete expectations for reading epic stories, the unit dives into the story of Odysseus, pairing it with similar anime narratives. Odysseus is a man who faces extraordinary obstacles, and this theme occurs in many anime series and movies, including *Attack on Titan*, *Evangelion*, *Spirited Away*, and many others. Students will study the content, looking at how the same kind of story is told in different ways with different implications, and they will also look at form: how Homer’s poetry and anime work in their own ways to achieve distinct aesthetic goals. Just as Homer’s poet shines with brilliance, there is also an enormous amount of creativity to bring to the drawn and moving image. By the end of this unit, students will have performed many exercises in close reading and analysis, culminating in their own experiment in the anime form and epic genre.

(Developed for English 3, grade 11; recommended for English 2, grade 10, and English 4, grade 12)

### **17.01.04**

#### **Women and Power in Adaptations of *Macbeth*, by Nia Rokas**

Adaptation is a vital topic of study because students, like texts, are always already in process of adapting themselves to their environments. Texts and students change over time according to place, ideology, expectation, medium. New Haven’s achievement gap concerns me like so many other teachers in New Haven: I propose to involve students’ subjectivities and political alertnesses with studies of power and violence, here in Orson Welles’ and Akira Kurosawa’s adaptations of *Macbeth*. My students have always responded passionately to the play, particularly to the questions of gender it invokes. I propose to study shifts in power and gender roles in the play and the two films. I expect students to finally locate themselves, their imaginations, their critical lenses, their

ideologies, their roles, their subjectivities as these elements play themselves out in the narratives I have chosen.

(Developed for English 2, grade 10; recommended for English/Shakespeare, grades 10-12)

### **17.01.05**

#### **Re-imagining Reading Using Modern Film Updates of Classic Stories, by Robert M. Schwartz**

If words are creativity, then they are art. This is where the discipline of creative writing comes in, as well as that of screenwriting and therefore film-making. The two forms of media, while wholly different, are inextricably linked by that foundational, historic art form – storytelling. In a modern educational landscape where screen is preferred to page, it may be advantageous to stress the importance of both. There are lessons we can get from reading words that no screen will show us; as there are artistic things that can be done with images that could never be accomplished on the page. It is imperative, therefore, to make it clear for students that it is not *better* to see the movie, but to see the movie *too*. The simultaneous study of original, written story and its film adaptation can be a powerful learning tool, especially when the film in question is a vast re-imagining, paying concrete due to the original classic story while updating it for the modern imagination and culture. This curricular unit explores this consideration for several classic stories and their modern, reimagined film counterparts, with the intention of allowing students to apply their study of adaptation to their own independent reading.

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

### **17.01.06**

#### **The Power of Stories in Literature and Film, by Eden C. Stein**

Storytelling is the oldest form of transmitting knowledge. Students in the 21st century need to be able to analyze and interpret stories in film as well as written text. In this unit students will analyze and compare four texts which contain embedded stories and magical realism, two narrative structures that can trouble readers but offer extraordinary riches. The central novel of the unit is the award-winning *Kit's Wilderness* by David Almond which alludes to the fairy tale *The Snow Queen* by Hans Christian Andersen, a complex story that is actually taken up at the start of the unit. *Kit's Wilderness* draws on the healing power of stories interwoven with topics of geology and dementia. The central film of the unit is *The Secret of Roan Inish* by John Sayles. A masterful work, it will provide a forum for analyzing cinematography as well as storytelling. Students can compare the use of magical realism and embedded stories in the novel and the film.

Students will then create their own stories, framing a fairy tale within it. They will also choose a novel and compare it to its adaptation.

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

### **17.01.07**

#### **Approaches to Thinking about Film and Literature: Adapting Literature to Capture Authentic Understandings, by Carolyn L. Streets**

Students who are authentically engaged in reading ask questions about the text, make their own interpretations, and connect the stories they read to their own lives. Moving from written works to their film counterparts opens the original piece to different kinds of interpretations. My unit focuses on creating a space in which students read through different lenses, produce different meanings, outcomes, and understandings in order to strengthen critical thinking skills and to build an infinite capacity for meaning. By examining the underlying embedded themes and then seeing how those ideas are adapted into other media, students will be better positioned to make higher ordered inferences. What impact might a documentary, movie, or animated version have on the readers? What might students notice that they otherwise may have missed in the text version? What connections can students make between text and film versions? Adaptation, the transformation of text to film, is apropos to this unit tentatively titled Adapting Literature to Capture Authentic Understandings as it seeks to present strategies to help students use select literary devices in order to help them understand implied universal themes.

(Developed for English Language Arts, grade 7; recommended for English Language Arts, grades 9-10)

### **17.01.08**

#### **Jekyll and Hide: Repressing Society's Undesirables, by Valerie Vollono**

Teenagers often feel the need to hide their true identity deep inside, but the mask that gains them acceptance can also crush their spirit. This unit examines façade, personal repression, and societal oppression via the aptly titled book, *Bottled Up* by Jaye Murray. *Bottled Up* is the story of Pip, a teenage screw up, who represses everything he feels until a book assigned in English class tears away his mask. Reading Stevenson's novel, Pip realizes he's living out his own *Jekyll and Hyde* story. Eventually, he manages to shirk society's restrictions, balance his impulses, and release the truth of his soul. Murray's book provides an opportunity to delve into some of the many powerful adaptations of a classic story, while also serving as the foundation for a socially progressive unit. During this unit students will track the consequences of repression in various *Jekyll and Hyde* adaptations. They will explore socio-cultural influences on each version while building analytical skills to deal with written and filmed texts. In addition, and perhaps more

importantly, students will question the repressions our current society demands, evaluate the consequences, and ask themselves what they can do as citizens to right some of the world's injustices.

(Developed for English 1, grade 9; recommended for English Literature, grades 9-10, and Reading, grades 8-9)





## II. Watershed Science

### Introduction

A watershed is an area of land where all the rainfall and streams drain to a common point. Watersheds are determined by elevation and the contours of land, which determine the direction that water moves once it hits land as it forced by gravity back to the sea. Ridges and mountains and other high elevation points can often be the divide, separating one watershed from another. Watersheds can be small, such as those sustaining a headwater stream or small pond, or very large, when hundreds of small watersheds and their streams combine to form a river and its associated watershed.

Watershed science is a combination of applied and basic research. One strength of watershed science is leveraging the watershed unit. Since the boundaries of a watershed are clear it allows one to perform accurate budgets for things like water and pollutants. One simply needs to determine the amount of a pollutant coming in with rainfall and the amount going out with streamflow and important insights can be gained. Furthermore, one can compare watersheds with different disturbance to try and constrain how these disturbances impact a pollutant. Comparing two neighboring watersheds with very different densities of suburban houses, for instance, can help with the management of watershed.

Water is also considered a human right and an important part of watershed science is trying to understand how to manage and improve the amount and quality of water draining watersheds. Many cities, for example, obtain their water from watersheds that drain into reservoirs. Understanding how to manage watersheds to improve water quality is therefore critical for human wellbeing and the economy. Finally, all other organisms also depend on water and how we manage watersheds is an important ecological consideration.

This seminar was an introduction to watershed science. The reading list heavily utilized the *Encyclopedia of Inland Waters*, and occasionally the primary literature. We started by going over some of the consideration of the watershed as a spatial unit and leveraging watersheds to do budgets. Particular attention was paid to the processes that impact the water budget and understanding how scientists estimate watershed water budgets. We then also spent time discussing watersheds, lakes and streams as ecological systems. The next part of our seminar focused on the cycles of different elements and compounds in watersheds. In addition to water, the seminar focused on nitrogen, phosphorus, and trace metals. We spent considerable time talking about how some forms of land management (e.g., agriculture) lead to excess pollutants in and impacts on inland waters. Finally we ended by reviewing and discussing different ways inland waters can be managed to protect against deleterious impacts.

The Fellows used this knowledge to pursue a range of topics. Some focused on the budget aspects of watersheds. Terry Bella focused his unit on evapotranspiration, an amazing way in which plants shape watershed water budgets. Carol Boynton followed a molecule of water through the complete water cycle. Kaitlyn Wuetrich leveraged watershed budgets to teach concepts in statistics. Michael Petrescu focused on both the cycles of water and carbon within a watershed. Jason Ward's unit was on how water can create landforms. Others focused more on some of the impacts of humans on watersheds and water quality. Raphael Varnado looked at the cycling of nutrients and how they impact the Long Island Sound. Others looked at how watersheds and water quality can impact the ecology of inland waters. Laura Carroll-Koch focused on the interaction between watersheds and migratory fish of Connecticut. Larissa Spreng looked at factors that influenced the Long Island Sound lobster die-off. Andrea Zullo produced a unit on the impact of water quality on human health. Many of the Fellows used this as an opportunity to educate on local systems. This was also exemplified in Amanda Weires's unit that focused on the issues associated with the watersheds of New Haven.

Peter A. Raymond

## Curriculum Units

### 17.02.01

#### **Evapotranspiration: Gravity Defying Water, by Terry M. Bella**

This unit focuses on the movement of water through a plant and how it is driven by transpiration at the leaf. The unit is applicable to both a physical science classroom as it focuses on the properties of water as well as other physical science topics such as pressure, fluid flow, and surface area to volume relationships. The unit is also applicable to a biology curriculum as it covers the phenomenon of water movement through a plant. Many structures and adaptations are discussed that allow plants to achieve this process. The unit dives deep into the properties of water and how unique plant structures take advantage of said properties to move water from the ground to heights over 300 feet. There are classroom activities included as well as demonstrations mentioned throughout the text.

The phenomenon, or hook, for this unit is the movement of water against the pull of gravity, in particular to the top of our giant trees such as the *Sequoia semperivens* (giant redwood) which reach heights of over 300 feet. Teaching around a phenomenon is the current trend with the States adoption of the Next Generation Science Standards (NGSS). The use of water transport in plants is an effective phenomenon because not only is easy for students to grasp the oddity of water moving against gravity but also because the understanding of this action requires students to grasp scientific concepts from multiple disciplines.

(Developed for Phy-Chem, grade 9, and AP Biology, grade 10; recommended for Biology and Earth Science, grades 9-10)

### 17.02.02

#### **Follow the Water, by Carol Boynton**

This six-week curriculum unit is designed for students in the second grade as they follow a water molecule through a watershed. The unit begins with *Follow the Water from Brook to Ocean*, a picture book by Arthur Dorros that introduces to primary-level students how water moves and how it has shaped our earth over time. The young scientists will use their skills of inquiry to understand the structure of a watershed, investigate human impact, and participate in activities and experiments throughout. Students will use journals to document their learning as they build vocabulary, identify stream order, discover how materials dissolve or not in our waters, create an aquifer, and design a game that simulates the pollution entering our watershed.

(Developed for Science, grade 2; recommended for Science, grades 1-4)

### **17.02.03**

#### **The Extraordinary Life and Journey of Migratory Fish, through the Connecticut Watershed, the Long Island Sound, and the Atlantic Ocean, by Laura Carroll-Koch**

In this unit, students will learn about multiple ecosystems and the human impact to these systems as they follow migratory fish through their life cycles. As students study migratory fish, they will learn about the ecosystems of the rivers, Long Island Sound estuary, and the Atlantic Ocean. In this way, students will develop an understanding of the complex interactions between these ecosystems as well as their interdependent relationships in our global water system enabling the survival of these world travelers. This engaging thematic curriculum unit is designed for students of 3rd through 6th grades to explore the more complex ecosystems of the Long Island Sound watershed. This unit builds upon a prior unit I wrote called, “Just Ask! Exploring Marine Life of Long Island Sound.” <http://teachersinstitute.yale.edu/curriculum/units/2013/4/13.04.02.x.html>

Through this study, students will learn the fundamental principles and interactions between multiple ecosystems and the marine creatures that swim within them. As students develop an appreciation and deeper understanding of these marine creatures and each ecosystem, students will more fully understand the significance of the human impact of these systems and be inspired to invest in potential solutions. This problem based unit will build core knowledge of watershed science, our global water system, and the migratory fish that move through these marine environments as students ask questions, read, write and investigate these topics.

(Developed for Science, Writing, Reading, and Social Studies, grade 6; recommended for Science and Writing, grades 3-5)

### **17.02.04**

#### **Chemistry of Inland Waters, by Michael Petrescu**

This unit exposes students to basic concepts of hydrology, like the hydrological cycle, water budget of a river and chemistry of carbon in freshwaters. Students will explore and study the components of the hydrological cycle, the factors that influence this cycle, investigate the water budget equation and compare and contrast two watersheds that have similar overall amount of precipitation, but differ in terms of temperature and climate.

Students will also learn about pollutants in fresh waters, pH and pOH of water and its influence on the ecosystem, chemistry of carbon and heavy metals and how does a sewage treatment plant work. As a part of their curriculum, a field trip to a local sewage treatment plant is highly recommended for students and teachers.

Each lesson will be accompanied by a lesson plan. Depending on lesson, also included will be examples and applications (problems to be solved by students using concepts presented in the lesson).

The unit is intended to be taught in 10th or 11th grade Physical and Environmental Science classes, but it can be used also by middle school 7th and 8th grade Science teachers to expose students to concepts related to physical, chemical properties of water, states of matter, physical and chemical change, water cycle and basic geology.

The unit will last approximately three weeks.

(Developed for Engineering, grade 8; recommended for Physical Science, grade 10, and Environmental Science, grade 11)

### **17.02.05**

#### **Lobster Die-off in the Long Island Sound, by Larissa Spreng**

This unit will allow students to investigate the 1999 die-off of lobsters in the Long Island Sound. Students will understand the changes in the Long Island ecosystems over the years. They will also gain a deeper understanding of how systems are connected, particularly land and sea ecosystems, and the types of environmental influences that can influence the lobster population. This will allow students to gain a deeper understanding about the environment around them, develop scientific inquiry skills, and enhance their problem-solving skills.

This curriculum unit will allow students to learn about the role a variety of factors play in a watershed by examining the lobster die-off in the Long Island Sound. Students will become experts on the six major factors that scientists believe may have contributed to the lobster die-off including: bacterial infections that cause the breakdown of the exoskeleton, a parasite that attacks the nervous system, higher than normal water temperatures, environmental effects of pesticide and insecticide use, pollution, and changes in dissolved oxygen levels.

After learning about the various potential causes of the lobster die-off students will develop their own explanation citing evidence in order to defend what they believe caused this die-off.

(Developed for General Science, grade 5; recommended for General Science, grades 4-7)

**17.02.06****Watersheds and the Cycles of Matter, by Raphael Varnado**

Watersheds are areas of land that drain rain, water, or snow into one location such as a stream, lake or wetland. It is a subject that has a number of interconnected parts that rely and function together to maintain the health of the watershed. In order to understand how watersheds behave and the impact they can have on the environment and how our actions affect them, one needs to understand the budgets of water, carbon, phosphorous, and nitrogen within watersheds. We will first breakdown the idea of the watershed into the cycles that make it up. From there, we will look at the environmental impact that each cycle has and how human involvement can affect the life forms that live within the cycles. Watersheds have the important roles of supplying water and food to the surrounding population. Learning more about how they function and becoming knowledgeable about the ways we can preserve and protect watersheds is a good way the preserve and keep up a high quality of life.

(Developed for Phy-Chem, grade 9; recommended for Environmental Science, grades 9-10)

**17.02.07****Stream Table Science: How Water Changes the Land, by Jason Ward**

This unit is designed to help second grade level students develop an understanding of the effects of weathering and erosion caused by water, specifically the creation of identifiable landforms. Students will explore and test the creation of a variety of landforms using both a community stream table and personal stream tables. Students will be able to conduct a series of investigations related to water erosion. This unit focuses on these specific landforms: braided channel, canyon, cliff, delta, meandering stream, oxbow lake, and valley. Students will also use Google Earth to explore the location of these types of landforms both locally and globally.

(Developed for Science, STEM lab, grade 2; recommended for Earth Science, grade 4)

**17.02.08****New Haven Watershed Problems in 2017, by Amanda Weires**

This is a unit on local watersheds in the New Haven, CT area. It is designed for high school students to ask questions about their local watersheds, research information, collect data and observations, and use that new knowledge in a community service project to benefit their watershed or community.

(Developed for Phy-Chem/Water Cycle, grade 9; recommended for Middle School Physical Science, grades 6-8, and Environmental Science, grades 11-12)

### **17.02.09**

#### **The Statistics of Watershed Science, by Kaitlyn Wuetrich**

This unit is a multidisciplinary unit created for a high school math classroom, designed to combine statistics and hydrology. In this unit, students will learn about the water cycle and water budgets within the watershed. The unit starts with learning about basic budgeting in a watershed, comparable to financial budgeting, and expands to creating linear regressions based on the relationship between precipitation, discharge, and evapotranspiration in a watershed system. Students will be able to synthesize the information they learn about the watershed to learn about topics such as graphing points, lines, creating scatterplots, and creating linear regressions for the line of best fit. By teaching statistics through the lens of the watershed, the primary objective is to facilitate active, engaged learners who understand how math can be usefully applied to various contexts in the world around us while gaining a deeper appreciation for the water resources on Earth.

This was designed for a Geometry classroom, but could be modified for Pre-Algebra-Statistics based on student needs and interest level.

(Developed for Geometry, grade 10; recommended for Algebra 1, grade 9, and Statistics, grades 10-11)

### **17.02.10**

#### **Cheers to Your Health: The Connection between Water Sources and Disease, by Andrea Zullo**

The health of the watershed has a direct impact on the health of those that use it. This unit introduces students to the concept that imbalances and contaminants in the watershed can cause disease and infection in humans. The first part of this unit begins with an introduction to the major concept of a watershed and how humans can have a direct impact on the chemicals and organic matter that are carried within. Students study how chemical contaminants including mercury, nitrogen, arsenic, and lead are introduced into the watershed and the clinical presentation of these contaminants in humans. Each contaminant includes real-world case studies—including the arsenic ground-water contamination in Bangladesh and the lead pipe incident in Washington DC.

Students will also learn about microbial pathogens including coliform bacterial species, *Naegleria fowleri*, and *Cryptosporidium*. All pathogens include examples of how they are introduced into the watershed, how they infect humans, and how to remediate these

pathogens. Sample case study formats for the presentation of this material are included in the activities section, along with labs that students can perform.

(Developed for B.I., grade 12; recommended for Anatomy, Physiology, and Medical Science, grades 10-12)



**Curriculum Units by Fellows of the  
Yale-New Haven Teachers Institute  
1978-2017**

|             |   |
|-------------|---|
| <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,<br>and Film                       |
| Volume III  | Race and American Law, 1850-Present   |
| Volume IV   | Engineering in Biology, Health and Medicine   |
| <b>2013</b> |   |
| Volume I    | Literature and Information  |
| Volume II   | Immigration and Migration and the Making of a Modern American<br>City                           |
| Volume III  | Sustainability: Means or Ends?  |
| Volume IV   | Asking Questions in Biology: Discovery versus Knowledge   |
| <b>2012</b> |   |
| Volume I    | Understanding History and Society through Visual Art, 1776 to<br>1914                           |
| Volume II   | The Art of Biography  |
| Volume III  | Anatomy, Health, and Disease: From the Skeletal System to<br>Cardiovascular Fitness             |
| Volume IV   | Engineering in the K-12 Classroom: Math and Science Education<br>for the 21st-Century Workforce |

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

### **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                       |

### **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                           |

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

|           |  |
|-----------|--|
| 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:<br>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  |

#### **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<br>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 |

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

|           |  |
|-----------|--|
| Volume V  | Bridges: Human Links and Innovations             |
| Volume VI | Intelligence: Theories and Developmental Origins |

#### **2000**

|            |  |
|------------|--|
| Volume I   | Women Writers in Latin America   |
| Volume II  | Crime and Punishment   |
| Volume III | Constitutional and Statutory Privacy Protections in the 21 <sup>st</sup> 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  |

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

Volume VI                      Global Change, Humans and the Coastal Ocean  
Volume VII                    Environmental Quality in the 21st Century

#### **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

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

|           |   |
|-----------|---|
| Volume IV | The National Experience: American Art and Culture |
| Volume V  | Ecosystems: Tools for Science and Math Teachers   |

#### **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<br>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<br>America                                |
| Volume III | Topics in Western Civilization: Ideals of Community and the<br>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<br>Autobiography                               |
| Volume IV   | History as Fiction in Central and South America   |
| Volume V    | Odysseys: Nineteenth and Twentieth-Century African-American<br>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  |

### **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  |



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

|           |                                    |
|-----------|------------------------------------|
| 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 |