**Purpose of Science Curriculum Maps**

This map is meant to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025.  It is a resource for organizing instruction around the TN State Standards, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content—the major work of the grade (scope)—and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

 The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice.  In fact, our goal is not to merely “cover the curriculum,” but rather to “uncover” it by developing students’ deep understanding of the content and mastery of the standards.  Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices.  However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable.  We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

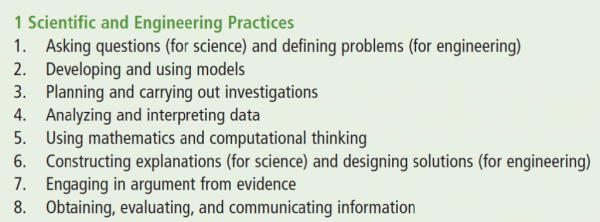
**Introduction**

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality, College and Career Ready standards-aligned instruction. The Tennessee State Standards provide a common set of expectations for what students will know and be able to do at the end of a grade. College and Career Ready Standards are rooted in the knowledge and skills students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curriculum provides instructional planning designed to help students reach these outcomes. **The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness.**  Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

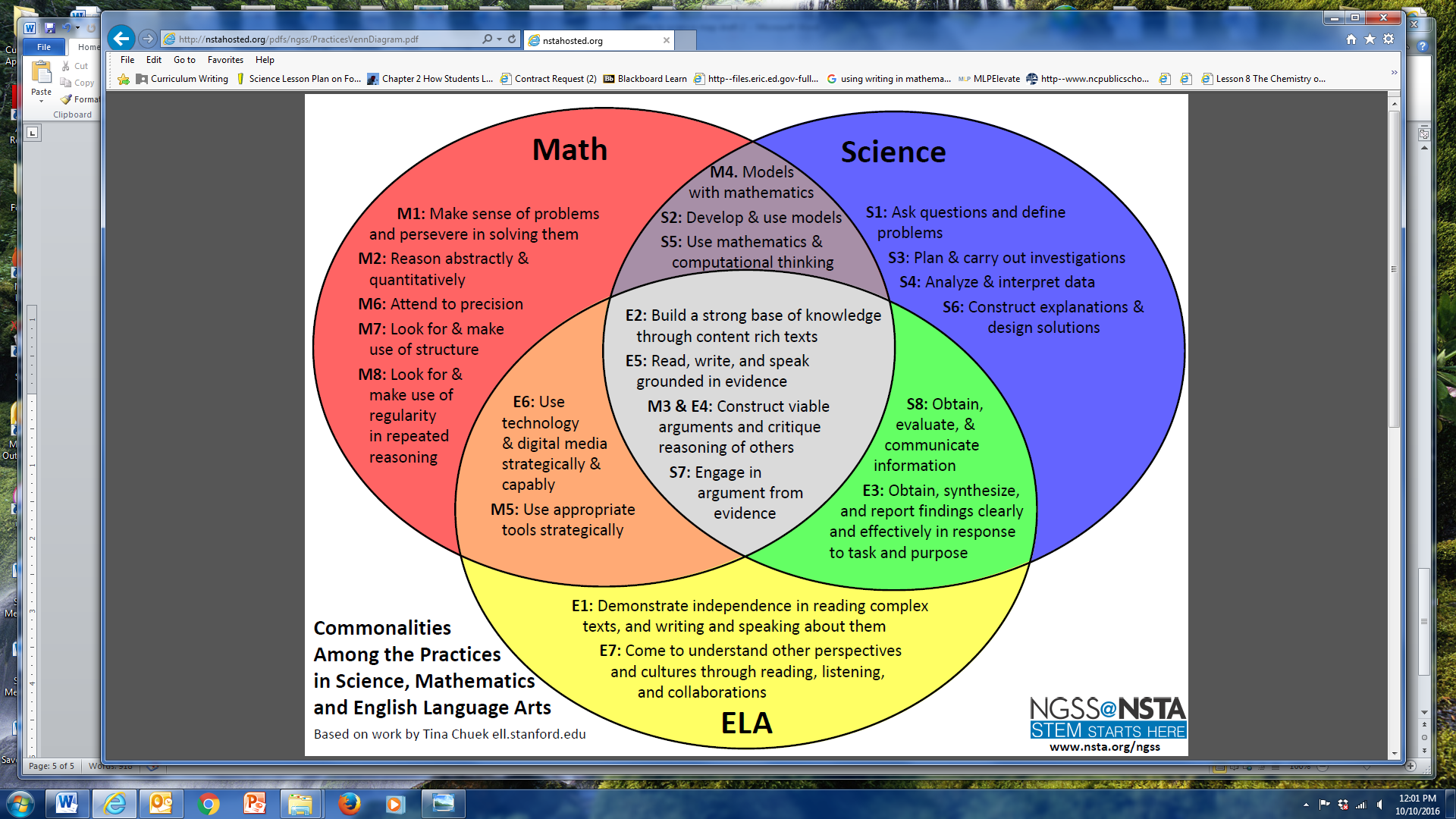
Our collective goal is to ensure our students graduate ready for college and career. The standards for science practice describe varieties of expertise that science educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in science education. The Science Framework emphasizes process standards of which include planning investigations, using models, asking questions and communicating information**. The science maps contain components to ensure that instruction focuses students toward college and career readiness. The maps are centered around four basic components: the state standards and framework (Tennessee Curriculum Center), components of the 5E instructional model (performance tasks), scientific investigations (real world experiences), and informational text (specific writing activities).**

*The Science Framework for K-12 Science Education* provides the blueprint for developing the effective science practices*.* The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices.

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term “practices” instead of a term such as “skills” to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practicesover each grade band**.** This guide provides specific goals for science learning in the form of grade level expectations*,* statements about what students should know and be able to do at each grade level.



Science is not taught in isolation. There are commonalities among the practices of science (science and engineering), mathematics (practices), and English Language Arts (student portraits). There is an early focus on informative writing in ELA and science. There’s a common core in all of the standards documents (ELA, Math, and Science). At the core is: reasoning with evidence; building arguments and critiquing the arguments of others; and participating in reasoning-oriented practices with others. The standards in science, math, and ELA provide opportunities for students to make sense of the content through solving problems in science and mathematics by reading, speaking, listening, and writing. Early writing in science can focus on topic specific details as well use of domain specific vocabulary. Scaffold up as students begin writing arguments using evidence during middle school. In the early grades, science and mathematics aligns as students are learning to use measurements as well as representing and gathering data. As students’ progress into middle school, their use of variables and relationships between variables will be reinforced consistently in science class. Elements of the commonalities between science, mathematics and ELA are embedded in the standards, outcomes, content, and connections sections of the curriculum maps.



An instructional model or learning cycle, such as the 5E model is a sequence of stages teachers may go through to help students develop a full understanding of a lesson concept. Instructional models are a form of scaffolding, a technique a teacher uses that enables a student to go beyond what he or she could do independently. Some instructional models are based on the constructivist approach to learning, which says that learners build or construct new ideas on top of their old ideas. Engage captures the students’ attention. Gets the students focused on a situation, event, demonstration, of problem that involves the content and abilities that are the goals of instruction. In the explore phase, students participate in activities that provide the time and an opportunity to conducts activities, predicts, and forms hypotheses or makes generalizations. The explain phase connects students’ prior knowledge and background to new discoveries. Students explain their observations and findings in their own words. Elaborate, in this phase the students are involved in learning experience that expand and enrich the concepts and abilities developed in the prior phases. Evaluate, in this phase, teachers and students receive feedback on the adequacy of their explanations and abilities. The components of instructional models are found in the content and connection columns of the curriculum maps.



**Science Curriculum Maps Overview**

**The science maps contain components to ensure that instruction focuses students toward college and career readiness. The maps are centered around four basic components: the state standards and framework (Tennessee Curriculum Center), components of the 5E instructional model (performance tasks), scientific investigations (real world experiences), informational text (specific writing activities), and NGSS (science practices).**

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

**How to Use the Science Curriculum Maps**

**Tennessee State Standards**

The TN State Standards are located in the first three columns. Each content standard is identified as the following: grade level expectations, embedded standards, and outcomes of the grade/subject. Embedded standards are standards that allow students to apply science practices. Therefore, you will see embedded standards that support all science content. It is the teachers' responsibility to examine the standards and skills needed in order to ensure student mastery of the indicated standard.

**Content**

The performance tasks blend content, practices, and concepts in science with mathematics and literacy. Performance tasks should be included in your plans. These can be found under the column content and/or connections. Best practices tell us that making objectives measureable increases student mastery.

**Connections**

District and web-based resources have been provided in the Instructional Support and Resources column. The additional resources provided are supplementary and should be used as needed for content support and differentiation.

(More Academic Vocabulary support can be found at the following link: <http://www.berkeleyschools.net/wp-content/uploads/2013/05/BUSD_Academic_Vocabulary.pdf>)

Following the vocabulary development work of Beck, McKeown and Kucan, the CCSS references three tiers of words that are vital to academic achievement:

* Tier One words are the words of everyday speech usually learned in the early grades… Tier Two words (what the Standards refer to as general academic words) are far more likely to appear in written texts than in speech. They appear in all sorts of texts: informational texts (words such as relative, vary, formulate, specificity, and accumulate), technical texts (calibrate, itemize, periphery), and literary texts (dignified, faltered).
* Tier Two words often represent subtle or precise ways to say relatively simple things—saunter instead of walk, for example. Because Tier Two words are found across many types of texts, they are highly generalizable.
* Tier Three words (what the Standards refer to as domain-specific words) are specific to a domain or field of study (lava, legislature, circumference, aorta) and key to understanding a new concept within a text… Recognized as new and “hard” words for most readers (particularly student readers), they are often explicitly defined by the author of a text, repeatedly used, and otherwise heavily scaffolded (e.g., made a part of a glossary).

It is important to target specific instruction on Tier 2 and Tier 3 vocabulary words to help students develop deep understanding that cannot be acquired through independent reading. Since Tier 3 words are typically targeted in content specific instruction, it's particularly important and challenging to identify and target Tier 2 words, since they appear across all disciplines.

Basic Guidelines for effective structured language practice strategies:

* Make the target language rigorous, and mandatory.
* Never use structured language practice strategies with language that hasn’t been explicitly taught first.
* Post the graphic organizers or word banks and sentence frames that you’ve taught. Require students to use them during the activity and continuously remind them to focus on their use of the language.
* Use a timer, chime, or other signal to mark the beginning, transitions, and ending of the activity. Keep it moving! Don’t adjust your pace to allow all students to finish. If you use these strategies regularly, students will increase their speed to match your snappy pace.
* Circulate to monitor for participation as well as accuracy. Provide targeted support as needed.
* Take it to writing. A brief written product (sentence(s) in a journal, language log, note sheet, poster, post-it, exit ticket…) helps hold all students accountable.

Strategies include

* Classroom Instructional Strategy - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>
* Word Webs - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>
* Academic Vocabulary Log - <https://drive.google.com/drive/folders/0B_iyFfHv_OU6Z1FHOWN2TFFpdDQ>

| **Content** | **Embedded**  **Standards** | **Outcomes** | **Content** | | **Connections** |
| --- | --- | --- | --- | --- | --- |
| **Standard 5 – Energy Resources and Consumption – 2 Weeks** | | | | | |
| CLE 3260.4.3 Compare and contrast preservation and conservation.  CLE 3260.4.4 Evaluate the impact of human activities on natural resources.  CLE 3260.5.2 Analyze the past and present use of energy resources.  CLE 3260.5.3 Predict future trends in energy resource use. | CLE 3260.T/E.3 Explain the relationship between the properties of a material and the use of the material in the application of a technology.  CLE 3260.T/E.4 Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.  CLE.I 3260 Inq.6 Communicate and defend scientific findings. | List six forms of renewable energy, and compare their advantages and disadvantages.  Describe the differences between passive solar heating, active solar heating, and photovoltaic energy.  Describe the current state of wind energy technology.  Explain the differences in biomass fuel use between developed and developing nations.  Describe how hydroelectric energy, geothermal energy, and geothermal heat pumps work.  Describe three alternative energy technologies.  Identify two ways that hydrogen could be used as a fuel source in the future.  Explain the difference between energy efficiency and energy conservation.  Describe two forms of energy-efficient transportation.  Identify three ways that you can conserve energy in your daily life. | **HRW Environmental Science – Renewable Energy -Chapter 18**  18.1Renewable Energy Today  18.2 Alternative Energy and Conservation  **Activities/Labs**  Active Readings, CRF Ch. 18 Sect. 18.1 and 18.2, cite the location of the answer, i.e. line, paragraph  Map Skills:   * Hydroelectric Power, CRF Ch. 18 p. 11 * Wind Power in the United States p. 514   Case Study:   * A Super-Efficient Home, pp. 492-493   Exploration Labs   * Blowing in The Wind, pp. 512-513 * Relating Window Shading and Temperature, CRF Ch. 18 pp.36-40 * Modeling A Passive Solar Home, CRF, pp.24-27 * Converting Water Power into Electricity, CRF Ch.18 pp. 28-31 * Calculating Calories in Sunlight, CRF Ch. 18 pp. 32-35   Group Activities   * Cooking with The Sun p.492 * Measuring Wind Power Potential p. 495 * Biomass Survey p. 496   Quick Lab – Hydrolysis p. 502  **Teaching Resources:**  Do Now Transparencies, CRF Ch. 18 Sect.18.1 and 18.2  PowerPoint Presentations, Sect. 18.1 and 18.2  Teaching Transparencies:   * A Passive-Solar Home * Active Solar Energy & PV Cells * World Use of Wood Fuels * How Hydropower Works * Geothermal Energy & Geothermal Heat Pumps * Tidal Power & OTEC * Fuel Cells and Hybrid Cells   **Chapter Reviews and Assessments**   * Section Reviews p.499 and p.505 * Chapter Review pp. 507-509 * Standardized Test Prep pp. 510-511 * Concept Review CRF Ch. 18 pp.1-2 * Critical Thinking CRF Ch. 18 pp. 3-6 * Alternative Assessments p. 499 and p.505   **Websites**  [www.scilinks.org](http://www.scilinks.org)   * Renewable Sources of Energy HE 4093 * Fuel Cells HE 4046 * Mass Transit HE 4063 * Energy Conservation HE 4033   <http://www.aurumscience.com/env_science.html>   * Renewable Energy | | **Academic Vocabulary**  Renewable energy, passive solar heating, active solar heating, biomass, hydroelectric energy, geothermal energy, alternative energy, ocean thermal energy conversion (OTEC), fuel cell, energy efficiency, energy conservation  **Performance Tasks**  **Critical Thinking – Applying Ideas –** Currently, only about 1 percent of the homes built in this country have energy efficient designs. Research energy efficient homes and using the evidence from the research, cite information on what can be done to increase the percentage.  **Environmental Friendly Vehicles**  Students are to write a persuasive advertisement encouraging people to buy environmentally friendly alternative-fuel vehicles. Students should include the advantages and disadvantages of both fossil-fuel and alternative-fuel vehicles. Students should consider how people make choices and how those choices can be influenced.  C:\Users\moorerf\Desktop\Dropbox\Screenshots\Screenshot 2016-10-28 11.30.10.png (Sign-in)  **Sunshine State Shows the Way**  Students will read the article and  explain the advantages and disadvantages of the different kinds of renewable energy discussed in the lesson. Back up your answer with facts and details. |
| **Standard 6 – Waste Production and Pollution - 2 Weeks** | | | | | |
| CLE 3255.6.3 Evaluate the impact of personal actions on the environment.  CLE 3255.6.4 Identify and explain choices you can make to lessen your impact on the environment.  CLE 3260.6.1 Investigate the causes, environmental effects, and methods for controlling/preventing land, air and water pollution  CLE 3260.6.2 Apply case studies to relate land, air, and water pollution to human health issues.  CLE 3260.6.3 Explore methods used for remediation of land, air and water pollution.  CLE 3260.6.4 Research local and national environmental legislation related to protecting land, air and water resources.  CLE 3260.6.5 Research local and state methods used for solid waste reduction, recycling and disposal; compare them to methods used in other developed countries.  CLE 3260.7.1 Explain how consumer choices in Tennessee impact jobs, resources, pollution and waste here and around the world. | CLE 3260.5.1 Compare and contrast various energy resources.  CLE 3260.5.2 Analyze the past and present use of energy resources.  CLE 3260.5.3 Predict future trends in energy resource use. | Name one characteristic that makes a material biodegradable.  Identify two types of solid waste.  Describe how a modern landfill works.  Name two environmental problems caused by landfills.  Identify three ways you can produce less waste.  Describe how you can use your consumer buying power to reduce solid waste.  List the steps that an item must go through to be recycled.  List down the benefits of composting.  Name the advantages and disadvantages of producing degradable plastic.  Name two characteristics of hazardous waste.  Describe one law that governs hazardous waste.  Describe two ways in which hazardous waste is disposed. | **HRW Environmental Science Waste - Chapter 19**  19.1 Solid Waste  19.2 Reducing Solid Waste  19.3 Hazardous Waste  **Activities/Labs**  Active Readings CRF Ch. 19 Sect.19.1, 19.2, and 19.3, cite the location of the answer, i.e. line, paragraph  Map Skills:   * Recycling Centers, CRF Ch. 19 p. 13   Case Studies:   * Paper or Plastic pp.526-527 * Green Chemistry pp.532-533   Exploration Labs:   * Solid Waste in Your Lunch Box pp 542-543 * Neutralizing Hazardous Waste p. 531 * Modeling Sanitary Landfills and Garbage Dumps, CRF Ch. 19 pp.31-34 * Super-Eco, the Environmentally Friendly Store, CRF Ch. 19 pp. 39-42 * Best Composting, CRF Ch. 19 pp. 27-30   Group Activities:   * Field Activity: Is It Really Recyclable? p. 525 * Creating A School Recycling Program p. 526 * Designing A “Recycle” Brochure for The Community * Internet Activities: Research local recycling efforts, investigate any hazardous waste spills in your area (truck or railroad) * Household Hazardous Waste Disposal p. 534   **Teaching Resources**  Do Now Transparencies, CRF Ch. 19 Sect. 19.1, 19.2, and 19.3  PowerPoint Presentations Sect 19.1, 19.2, and 19.3  Teaching Transparencies:   * Sanitary Landfills * How a Solid-Waste Incinerator Works * Superfund Sites * Hazardous-Waste Deep-Well Injection * Film Viewing: The Story of Stuff www.thestoryofstuff.com     **Chapter Reviews and Assessments**   * Section Reviews p. 523, p.528, p. 535 * Chapter Review pp. 537-539 * Standardized Test Prep pp. 540-541 * Concept Review, CRF Ch. 19 pp. 1-2 * Critical Thinking, CRF Ch. 19 pp. 3-6 * Alternative Assessments, p.523, p. 528, p. 535   **Websites**  [www.scilinks.org](http://www.scilinks.org)   * Solid Waste HE4102 * Biodegradable and Non-biodegradable Materials HE4128 * Waste Prevention HE4120 * Hazardous Waste HE4054   <http://www.aurumscience.com/env_science.html>   * Hazardous Waste, Landfills, and Sewage | **Academic Vocabulary**  Solid waste, biodegradable, municipal solid waste, landfill, leaches, source reduction, recycling, compost, hazardous waste, deep-wall injection, surface impoundment.  **Performance Tasks**  **Natural and Synthetic Materials**  Have students create an illustration, a poem, or a short story to contrast natural and synthetic materials.  **Group Activity – Recycling Education Campaign-**  Working together in small groups, students will develop a campaign to educate the rest of the school about the importance of recycling. Encourage students to think of innovative ways to reduce the number or resources they need to complete their project. For example, a pamphlet could be copied onto recycled paper. Then rather than distributing one pamphlet to each student, students could install a “take-one” display that includes limited numbers of the pamphlet at various locations in the school.  **Student Opportunities –** Community Involvement  The solution to waste management problems often begin with citizen participation. Students will research waste management problems or hazardous waste problems in their community. Have students contact local community organization to see what, if anything is being done about the problems. Then, have students design a plan to get involved in addressing on of the problems. | |
| **Standard 6 – Waste Production and Pollution – 3 Weeks** | | | | | |
| CLE 3260.6.2 Apply case studies to relate land, air, and water pollution to human health issues.  CLE 3260.6.4 Research local and national environmental legislation related to protecting land, air and water resources.  CLE 3260.6.5 Research local and state methods used for solid waste reduction, recycling and disposal; compare them to methods used in other developed countries. | CLE 3260.Inq.5 Compare experimental evidence and conclusions with those drawn by others about the same testable question.  CLE 3260.Inq.12 Develop a logical argument about cause-and-effect relationships in an experiment.  CLE 3260.T/E.1 Explore the impact of technology on social, political, and economic systems. | List five pollutants, their sources, and their possible effects on human health.  Explain how scientists use toxicology and epidemiology.  Explain how pollution can come from both natural sources and human activities.  Describe the relationship between waste, pollution, and human health.  Explain why the environment is an important factor in the spread of cholera.  List two changes to the environment that can lead to the spread of infectious diseases.  Explain what scientists mean when they say that certain viruses are emerging. | **HRW Environmental Science – The Environment and Human Health - Chapter 20**  20.1 Pollution and Human Health  20.2 Biological Hazards  **Activities/Labs**  Active Readings: CRF Ch. 20 Sect. 20.1 and 20.2, cite the location of the answer, i.e. line, paragraph  Map Skills:   * Disease Distribution, CRF Ch. 20 p. 11 * Lyme Disease Risk, p. 570   Case Study:   * Chemicals that Disrupt Hormones pp. 554-555   Exploration Lab:   * Lead Poisoning and Mental Ability, pp. 568-569 * Simulating an Epidemic, p.558 * Determining the Effective Half-life of Iodine-131 in the Human Body, CRF Ch. 20 pp. 28-33 * Experimenting with Hand Cleaners, CRF Ch. 20 pp.34-36 * Inferring Patterns of Disease Spread, CRF Ch. 20 pp.37-39 * Communicating Disease Information, CRF Ch. 20 pp.24-27   Group Activities   * Field Activity: Sources of Pollution, p. 553 * Eliminating Everyday Mercury, p. 551 * Testing The Air, p. 552 * Pollution Diary, p.553 * Forest Clearing and Disease, p. 559 * Report: Emerging Diseases   **Teaching Resources**  Do Now Transparencies, CRF Ch. 20 Sect. 20.1 and 20.2  PowerPoint Presentations, Sect. 20.1 and 20.2  Teaching Transparencies   * A Typical Dose-Response Curve * A Model of Air-Pollutant Movement Through a City * A Model of Increase in Malaria Risk Due to Climate Change * Health TEACHING TRANSPARENCY * Lyme Disease Risk   **Chapter Review and Assessments**   * Section Reviews, p. 556 and p. 561 * Chapter Review, pp. 563-565 * Standardized Test Prep, pp. 566-567 * Concept Reviews, CRF Ch. 20 pp. 1-2 * Critical Thinking, CRF Ch. 20 pp. 3-   **Websites**  [www.scilinks.org](http://www.scilinks.org)   * Toxicology HE4082 * Toxic Waste HE4114 * Emerging Viruses HE403   <http://www.aurumscience.com/env_science.html>   * Environmental Health Issues Diseases and Toxins | **Academic Vocabulary**  Toxicology, dose, dose-response curve, epidemiology, risk assessment, particulates, pathogen, host, vector  **Performance Tasks**  **The Case of the Mysterious Outbreak**  Have students write a detective story about a disease that was caused by environmental factors. Have students make sure that their detective uses epidemiological techniques to solve the case.  **Emerging Stories**  Organize students into groups of threes. Each group will produce a news story about an emerging disease such as he hantavirus or the West Nile virus. Have students report on where the disease first emerged, how it is spread, and how it affects human health. Have the groups videotape their report for presentation to the class.  **Water and Human Health**  Have each student write an essay that evaluates whether the lack of access to uncontaminated water is the most important human health problem in the world today. Have students include information about the effects of waterborne microbes, pesticides, hormone disrupters and heavy metals. Have students include data, graphs and tables (with sources) to defend their thesis. | |
| **Standard 7 – Global Change and Civic Responsibility --- 2 Weeks** | | | | | |
| CLE 3255.7.1. Explain how consumer choices in Tennessee impact jobs, resources, pollution and waste here and around the world..  CLE 3260.7.2 Compare and contrast methods used by various governments to protect biodiversity,  CLE 3260.7.3 Explain how human activity is related to ozone depletion and climate change..  CLE 3260.7.4 Summarize the scientific explanation for average global temperature increase. |  | * Describe some of the challenges to achieving sustainability. * Describe several major international meetings and treaties relating to the environment.   Explain how economics and environmental science are related.  Compare two different approaches to regulation.  Give an example of a private effort to address environmental problems  Describe two major developments in U.S. environmental history.  Give examples of three federal agencies that have environmental responsibilities.  Explain the purpose of Environmental Impact Statements.  Give an example of how citizens can affect environmental policy at each level of government—local, state, and national.  Evaluate the media as a source of information about the environment.  Give examples of individuals who have influenced environmental history.  Identify ways in which the choices that you make as an individual may affect the environment.  . | **HRW Environmental Science – Economics, Policy, and the Future Chapter 21**  21.1 Economics and International Cooperation  21.2 Environmental Policies in the United States  21.3 The Importance the Individual  **Activities/Labs**  Active Readings, CRF Ch. 21 Sect. 21.1, 21.2 and 21.3, cite the location of the answer, i.e. line, paragraph  Map Skills:   * National Parks, CRF Ch. 21 p. 13   Case Study   * International Whaling, p. 576   Exploration Labs   * Be an Environmental Scientist, pp. 594-595 * Making A Decision, p. 586 * Recommending River Clean-up Strategies, CRF Ch. 21 pp.35-38 * Proposing Environmental Laws, CRF Ch. 21 pp. 27-30 * Analyzing the Local Impact of Environmental Legislation, CRF Ch. 21 pp.31-34   Group Activities   * Whose Issue, p. 579 * Advertising Campaign, p. 581 * The Impact of an EIS, p.581 * Local Policies, p. 582 * Local Politics, p. 582 * How Does a City Council Work, p .582 * Internet Activities * UN Documentation, p. 575 * Making Conservation Profitable, p. 577 * U.S. Agencies, p. 580 * Researching Influential Individuals, p. 585 * Hunting laws and poaching. Find the TWRA poaching hotline numbers * Projects   + Research assigned endangered species and present to class. * Comparison of five Conservation Organizations' effectiveness. Rate them.   **Teaching Resources**  Do Now Transparencies, CRF Ch. 21 Sect. 21.1, 21.2, and 21.3  PowerPoint Presentations, Sect. 21.1, 21.2 and 21.3  Teaching Transparencies   * Major International Environmental Agreements * Economic Systems Within the Biosphere * U.S. Agencies and Environmental Laws   **Chapter Reviews and Assessments**   * Section Reviews, p. 578, p. 583, and p.587 * Chapter Review, pp. 589-591 * Standardized Test Prep, pp. 592-593 * Concept Reviews, CRF pp. 1-2 * Critical Thinking, CRF pp. 3-6   **Websites**  [www.scilinks.org](http://www.scilinks.org)   * Sustainable Development HE4108 * United Nations HE4117 * US National Parks HE4116 * Earth Day HE4022 | | **Academic Vocabulary.**  Sustainability, economics, Environmental Impact Statement, lobbying  **Performance Tasks**  **New Discoveries**  Ask students to write a proposal for a new scientific body that would conduct research on and suggest environmental policy options for all the nations of the world. Students should describe the organization’s responsibilities, the way its members would be selected, and the skills and information needed by members of the organization to do the job. Ask students to detail the procedures the organization would use to make decisions.  **Concept Mapping –** Have groups of students identify broad environmental issues addressed by the agreements, meetings, and organizations in **Tables 1** and **2** on **pp. 574-575.** For example, students might list ocean pollution, endangered species, and forest conservation. Then, ask each group to create a concept map that links the various treaties and issues. Display the maps in the room, and have students add details as they learn more about international agreements related to these issues.  **Group Activity – The Impact of an EIS –** Have teams of two students research an EIS that was conducted in Tennessee or Memphis. They should be able to obtain a copy of the report from the agencies involved. Have students create a poster, video, or news article reporting on the process and outcome of the EIS.  **Environmental Stories –**Have students create a children’s book that deals with a theme from Chapter 21. Tell students to fully illustrate their book. Students will share their book with the class and share with a nearby elementary school. |

| **TOOLBOX** | |
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| **Unit 4.1 Mineral and Energy Resources/Renewable Energy – 2 Weeks** | |
| **Plans** | After completing this unit, students will learn to examine an energy/environmental issue using a five-step, decision-making model, explain basic facts about various renewable energy sources, identify the advantages and disadvantages of renewable energy sources, explain basic economic concepts used to analyze energy issues and understand that public policy decisions involve trade-offs among social goals. Download the unit plan: <http://www.rhfleet.org/sites/default/files/files/lesson-plans/tw_TheIssueofRenewableEnergy.pdf>  Lesson plans courtesy of the National Energy Education Development (NEED) Project. <http://www.eia.gov/kids/energy.cfm?page=activities_secondary>  Teachers register for Smart-Note Book, select Smart Exchange, then search for lessons per topic for each chapter. You will have access to lessons that include objectives, Teacher notes, and interactive lessons for the students, vocabulary, illustrations, animations, and closing questions.  The Minerals Education Coalition’s (MEC) mission is to identify, produce and disseminate fact-based K-12 minerals education lessons and activities and to inform and educate the general public about the importance of mining in their everyday lives. These are pdf files and YouTube films of the units included in its website:  <https://www.youtube.com/watch?v=uVZ7UpBCgfw&feature=youtu.be>  <https://www.youtube.com/watch?v=Z9wuRQhgGgk&feature=youtu.be>  This website offers free lesson plans on Coal, its properties, origin new technologies in mining, mining careers, mine safety and uses of coal.  <http://www.coaleducation.org/lessons/second.htm> |
| **Background for Teachers** | Renewable-energysources.com is an on-line guide to renewable energy sources. This renewable energy reference guide covers "The Sources of Renewable Energy"; "Types, Sources & Uses of Energy"; Solar, Hydroelectric Power, & Wind Energy Basics, "Geothermal Energy Guide", and "Using Biomass as a Renewable Energy Source". <http://www.renewable-energysources.com/>  Energy explained—an online guide to understanding energy of all types. <http://www.eia.gov/energyexplained/index.cfm> |
| **Student Activities** | What uses more energy in our homes — heating, cooling, lighting, or powering electronics like TVs, computers, and MP3 players? And, do houses in the United States use more electricity or natural gas? <http://www.eia.gov/kids/energy.cfm?page=us_energy_homes-basics>  The purpose of this booklet is to provide high school students with a variety of projects to broaden their knowledge of science, in particular renewable energy, and the scientific method. Projects are available in these areas of renewable energy: biofuels, wind, and solar. <http://www1.eere.energy.gov/biomass/pdfs/highschool_projects.pdf>  There’s nothing like hands-on learning to help the students get the idea. This website contains a collection of activities help you the teachers deliver lessons on rocks and minerals that stick! Click this site:  <http://www.pdac.ca/mining-matters/resources/education/activities-and-lesson-plans> |
| **Other Resources** | A huge array of information and activities on energy sorted by level of difficulty, as well as resources for parents and teachers (including downloadable activities in PDF format). <http://www.energyquest.ca.gov/index.html>  Geothermal Education Office site with education and classroom resources, information on what geothermal energy is, how and where it's being used worldwide, activities and experiments. <http://geothermal.marin.org/> |
| **Unit 4.2 Mineral and Energy Resources/Waste 2 Weeks** | |
| **Plans** | The purpose of this unit is to make students aware of the amount of trash they generate, the problems that result, and possible solutions. Students will investigate household trash, biodegradability, packaging, and recycling. After completing these activities, many students will show interest in these and other local environmental issues. This interest often translates into the type of involvement needed to solve modern problems. <http://www.accessexcellence.org/AE/AEPC/WWC/1991/waste.php>  Students will be able to identify ways recyclable materials can be separated and sorted at a materials recovery facility (MRF), including these four: conveyor belts, blowers, flotation, and magnetism. <http://www.cleansweepusa.org/educators/RecyclingRules051304jk.pdf>  The purpose of this lesson is to engage students in thinking about solid waste and what we do with it. You can click on the lesson plan to download it; then, expand on the lesson by downloading worksheets, puzzles, extensions and quizzes in the categories below. <http://www.thinkgreen.com/lesson-plan&lid=114>  Teachers register for SmartNote Book, select SmartExchange, and then search for lessons per topic for each chapter. You will have access to lessons that include objectives, Teacher notes, and interactive lessons for the students, vocabulary, illustrations, animations, and closing questions. |
| **Background for Teachers** | Consumer's Handbook for Reducing Solid Waste Practical steps that families can take to reduce the amount and toxicity of garbage. <http://www.epa.gov/osw/wycd/catbook/index.htm>  A comprehensive guide for teachers interested in guiding students' research projects on composting. The book was selected by the National Science Teachers Association to be included in 'Recommends', a collection of the best science education books. <http://compost.css.cornell.edu/schools.html> |
| **Student Activities** | To demonstrate where groundwater is located and how we get it to the surface. To visualize the movement of polluted groundwater through the earth. Download this lab activity at <http://cwmi.css.cornell.edu/TrashGoesToSchool/Groundwater.html>  Waste Site Activity - Visit an interactive Superfund hazardous waste site activity to learn about four different types of hazardous waste and how to clean them up. <http://www.epa.gov/superfund/students/wastsite/index.htm>  Scavenger Hunt - An activity in which students search through the Superfund website for information. <http://www.epa.gov/superfund/students/clas_act/scavengr.htm>  The latest research news is found at http:// www.ScienceDaily.com. Enter the topic per the chapter and/or section to read the related stories, journals, watch featured videos, and a wealth of each is available. The articles have the save/print options. Archives of news are available with options to select 30 days, 90 days, 1, 5, and 10 year(s) options. Mobile options are iPhone, Android, and the Web. Additional access includes Facebook, Twitter, and Google+. Write your opinion, whether you agree or disagree with the news, and why?  This website contains information and hands-on activities to teach students about hydrogen as a transportation fuel  <http://energy.gov/eere/education/downloads/h2-educate-9-activities> |
| **Other Resources** | To encourage [students](http://cwmi.css.cornell.edu/TrashGoesToSchool/Mock.html) to understand our legal system and note the seriousness of environmental crime, have them engage in this mock trial. <http://cwmi.css.cornell.edu/TrashGoesToSchool/Mock.html>  Find out how to recycle or dispose of household items in an environmentally responsible way. <http://www.thinkgreen.com/> |
| **Unit 4.3.Our Health and Our Future/ The Environment and Our Future – 3 Weeks** | |
| **Plans** | This curriculum guide is designed to assist urban high school students develop a sense of personal responsibility for their own environment. <http://watersheded.com/resources/learning-stormwater-curriculum-and-activity-guide-urban-schools>  An activity for the class trying to figure out who is responsible for the water pollution and who has to pay for the cleanup in the town of Riverville. <http://water.epa.gov/learn/kids/drinkingwater/upload/2005_03_10_kids_activity_grades_9-12_trackingpollution.pdf> |
| **Background for Teachers** | This environmental education program explains the water management cycle using a balanced approach showing how it affects all aspects of the environment. All activities contain hands-on investigations, fact sheets, reference materials, and a glossary of terms. Activities are organized by objectives, materials needed, background information, advance preparation, procedures, and resources. <http://water.epa.gov/learn/kids/drinkingwater/upload/The-Water-Sourcebooks-Grade-Level-9-12.pdf> |
| **Student Activities** | This experiment illustrates the basic properties of a watershed: how water flows from higher elevations to lower elevations, and how watersheds are interconnected. The students will understand how the placement of buildings, roads, and parking lots can be important to watershed runoff, and how careless use and disposal of harmful contaminants can have a serious effect on downstream watershed denizens. <http://water.epa.gov/learn/kids/drinkingwater/activity_grades_9-12_buildyourownwatershed.cfm>  Interactive Question & Answer Game\* - A flash animated game that gives the Answer and you have to choose the correct Question from three possible answers. The game lets you know instantly if you have the right answer. <http://water.epa.gov/learn/kids/drinkingwater/kids_9-12.cfm>  The latest research news is found at http:// www.ScienceDaily.com. Enter the topic per the chapter and/or section to read the related stories, journals, watch featured videos, and a wealth of each is available. The articles have the save/print options. Archives of news are available with options to select 30 days, 90 days, 1, 5, and 10 year(s) options. Mobile options are iPhone, Android, and the Web. Additional access includes Facebook, Twitter, and Google+. Write your opinion, whether you agree or disagree with the news, and why? |
| **Other Resources** | China's radical blue-sky measures during the 2008 Olympics actually improved Beijingers' cardiovascular health -- if only for a few weeks. Read “Your Heart on Air Pollution: An Olympic Case Study” at <http://www.theatlantic.com/health/archive/2012/05/your-heart-on-air-pollution-an-olympic-case-study/257236/>  Protecting America's Public Health - Safe Drinking Water Act - This web site contains an informative poster and CD-ROM that illustrates how everything we do can affect our drinking water. <http://water.epa.gov/action/protect/landscapeposter.cfm> |
| **Unit 4.4 Our Health and Our Future/Economics, Policy, and the Future --- 2 Weeks** | |
| **Plans** | This Lesson Plan was developed to provide elementary through high school teachers with a special resource to facilitate their classroom instruction of endangered species conservation. It has been created with a multiple-lesson format, enabling instructors to cover the subject in a week-long sequence or other appropriate combination.  Each day’s topic features three activities, including one or more in-class exercises and one for outside the classroom. Also included are hand-out materials and homework assignments. Suggested resources are provided at the end of the lesson plan. <http://stopextinction.org/esd/EndangeredSpeciesDayLessonPlan.pdf>  The purpose of this lesson is to explore the Endangered Species Act and the work of scientists who strive to protect species.  <http://sciencenetlinks.com/lessons/endangered-species-2/>  Students research and create a brochure project on an endangered species of their choice. Students are also encouraged to make connections between the activities of the human population and their effect on the natural world. <http://alex.state.al.us/lesson_view.php?id=23965>  Teachers register for SmartNote Book, select SmartExchange, and then search for lessons per topic for each chapter. You will have access to lessons that include objectives, Teacher notes, and interactive lessons for the students, vocabulary, illustrations, animations, and closing questions. |
| **Background for Teachers** | When Congress passed the Endangered Species Act (ESA) in 1973, it recognized that our rich natural heritage is of “esthetic, ecological, educational, recreational, and scientific value to our Nation and its people.” It further expressed concern that many of our nation’s native plants and animals were in danger of becoming extinct. <http://www.fws.gov/endangered/laws-policies/>  All about air toxics in a concise, readable format. <http://www.epa.gov/air/toxicair/newtoxics.html> |
| **Student Activities** | This site has multiple pages for exploring Mountain Gorillas, their biology and habitat and why there are endangered. Simulation activities ask students to evaluate social, economic, and environmental factors affecting gorilla survival and to make recommendations. <http://www.cotf.edu/ete/modules/mgorilla/mgorilla.html>  Studies have shown a close link between local climate characteristics and the occurrence of disease. We also know that many environmental conditions affect human health, and climate and weather can greatly these conditions. <http://www.cotf.edu/ete/gcc/?/healtheffects/>  Sea Otters: California's Threatened Treasures is full of information about sea otters' habitat, life cycle, and why they are endangered. The site was created by high school students, and also includes a link to a live "otter cam." <http://library.thinkquest.org/J0111704/>  The latest research news is found at http:// www.ScienceDaily.com. Enter the topic per the chapter and/or section to read the related stories, journals, watch featured videos, and a wealth of each is available. The articles have the save/print options. Archives of news are available with options to select 30 days, 90 days, 1, 5, and 10 year(s) options. Mobile options are iPhone, Android, and the Web. Additional access includes Facebook, Twitter, and Google+. Write your opinion, whether you agree or disagree with the news, and why? |
| **Other Resources** | Explanation of the history and purpose of the Endangered Species Act. <http://www.nwf.org/wildlife/wildlife-conservation/endangered-species-act.aspx>  World Wildlife Fund's Virtual Wildlife offers information about endangered carnivores, herbivores, and omnivores and their habitats. Another section profiles some remarkable animals and the myths that surround them. <http://www.panda.org/news_facts/education/virtual_wildlife/> |