

Teacher Resource Guide



RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

For High School Units of Study

1.0 INTRODUCTION

The Infinite Power of Texas Units of Study were developed by the Texas State Energy Conservation Office (SECO) to provide educational resources for K-12 teachers on renewable energy and energy efficiency. The Units introduce students to concepts such as solar, wind and biomass energy, and energy conservation in the home. The Units were created to address three grade-level groups: grades 4 and 5 (elementary Units), grades 6, 7 and 8 (middle school Units) and grades 9, 10, 11 and 12 (high school Units). This document provides an overview of the High School Units of Study. It describes the general structure of the Units; explains in

more detail some instructions provided in the Units; offers safety guidelines; identifies Texas Essential Knowledge and Skills (TEKS) addressed by each Unit; provides resources needed to complete the Units, including recommended Internet and other resources; and presents guidelines for creating rubrics.

1.1 Structure of the Units

The Units of Study are classified in the black bar on the top of every page according to whom the content is geared: the teacher (Teacher Overview or Teacher Answer Key) or the student (Reading Passage or Student Data Sheet). The following table summarizes the content of each section:

TABLE 1. Organization of Units

TEACHER OVERVIEW	
SECTION	DESCRIPTION
Overview	Summarizes the topic of the lesson and the activities involved
Objectives	Refers teacher to Teacher Resource Guide for TEKS objectives
Suggested Timeframe	Provides a breakdown of activities involved in the Unit that includes the amount of time each activity requires, the activity title and the subject. Teacher should note that the amounts of time printed are simply guidelines that often reflect the upper limit. Actual times will vary and may be shorter.
Required Materials	Materials needed for the various activities included in the Unit
Background Information for Teacher	Provides information to the teacher that will be useful for teaching the unit (conducting the lab, follow up and/or additional activities). The teacher can use this information when introducing the unit to the class.
Summary of Activities	Detailed instructions of each activity involved in the Unit. Typical structure is: <ul style="list-style-type: none"> • Introduction and Reading Passage – includes vocabulary and reading assignment • Lab Activity • Recommendations and/or Expected Observations (if applicable) • Assessment • Follow Up Labs – additional lab or other activity that expands upon the main Lab Activity
Additional Activity	Other ways to expand students' knowledge about the Unit's topic
STUDENT DATA SHEETS	
Reading Passage	3-page write-up of the Unit's topic
Understanding the Reading Passage	Questions pertaining to information contained in the Reading Passage that students are required to answer to ascertain comprehension
Vocabulary	A list of key vocabulary words either contained in the Reading Passage or relevant to the Lab Activity
Lab Activity	Instructions for students detailing how to conduct the activity for the Unit (when applicable includes Data Tables and data summary questions)
Assessment Questions	A list of questions to be photocopied and distributed to each student to assess what the student has learned about the Unit's topic
Follow Up Activity	Activity that expands on the Unit's main activity and may include additional background information, materials needed, activity instruction, and data summary questions.
TEACHER ANSWER KEY	
Includes answers to Understanding the Reading Passage Questions, Lab Activity Data Summary, Assessment Questions, Vocabulary definitions, and Follow Up data summary questions.	

2.0 GUIDELINES

Although the Units were designed to be stand-alone lessons, teachers are encouraged to complete Unit No. 16 before proceeding to higher Units. Unit No. 16 provides an overview of renewable energy technologies that are feasible in Texas. The later Units cover more in-depth information about the individual types of renewable energy technologies. Once Unit No. 16 has been completed, the remaining Units can be completed in any order. In general, the teacher should review the entire Unit beforehand. It is highly recommended that the teacher conduct the activity before the class does. Although a materials list is provided, the availability of materials may vary, which would require modifications to the setup and instructions that should be presented to the class.

All of the activities can be modified to be more general or more involved depending on the skill level and grade of the class. The Follow Up Lab and Additional Activity sections were included to provide teachers with the opportunity to explore a topic further. Often the additional activities offer alternative teaching methods to convey the Unit's subject and offer the students a chance to be more creative. These activities are listed after the Assessment and are therefore not covered in the Assessment Questions.

Most of the Units provide background information for the teacher about the topic taught in the Unit. This information is typically geared to inform the teacher about specific concepts that are discussed either in the Reading Passage or the Lab. The teacher can use this information when introducing the topic to the class.

The following sections address specific elements in the Units of Study.

2.1 Teacher Introduction

The first activity involves introducing the Unit's topic of study to the class. In order to encourage an introduction that is thought-provoking and makes the subject relevant for the class, most units include an interesting quote about a different topic but is relevant to the Unit's topic. Teachers can also use an "attention-getter" activity or anticipatory set in order to spark the class' attention about the upcoming subject. Examples of ways to spark the class' attention include: a quick experiment or demonstration of the technology or theories taught in the Unit; bringing in gadgets reflecting the technology taught in the Unit such as a model solar car or mini-wind turbine (see Resources section for websites to get such gadgets); expert speaker "show & tell" (request a speaker to bring an interesting demonstration about the subject being taught that will motivate the class to learn more about the subject; should be very brief and interactive); brief video about the particular concept or technology being taught; or a field trip to a facility that is involved in the technology taught in the Unit. Once the class is engaged and ready to learn more, the teacher should summarize the activities involved in the Unit so the class will have an idea what to expect over the next few days.

2.2 Alternative Vocabulary Work

The traditional approach to learning vocabulary words relevant to the Unit's subject is included in the activity description. However, as an alternative, teachers can also instruct students to create meaningful sentences using the words during class. Remind students that sentences beginning with "Biomass is..." or "Renewable energy is..." are not considered meaningful and will not receive credit. As a homework assignment, instruct students to create a paragraph or two incorporating all of the vocabulary words. This assignment can also be incorporated into the instructions for writing down predictions about the Lab Activity if the teacher so desires. Any additional activities will need to be added to the rubric template at the end of this document.

2.3 Lab Activity

Before beginning the Lab, the teacher should review with the class the entire Lab Activity so they will understand the purpose and the goals. To enhance the class' scientific inquiry in the Units, instruct students to develop statements for the following:

- hypothesis
- predictions
- conclusions
- significance/implications.

Note that the hypothesis and predictions should be made before beginning the Lab Activity. Students can record their hypotheses and predictions in their notebooks, on the board or on overhead transparency with the teacher.

Many of the labs instruct students to graph their collected data to make conclusions about the experiment they conducted. The individual Units provide examples of graphs that can be created and indicate variables to be graphed on the x- and y-axes as well as suggest graph types. So that students understand how graphs can effectively convey information, before beginning the lab have a discussion about the following: potential variables that can be plotted on the graph in order to effectively communicate the results of the lab; which variable is best plotted on the x-axis and which variable is best plotted on the y-axis; the most appropriate type of graph for the results obtained (bar, line, pie, etc.); and how the representation of the results may be changed by either plotting different variables or using a different graph type. Instruct students to pre-plan the variables they will be changing and WHY they are changing those variables, making predictions about how those variables will affect the outcome in advance. Instruct the students to write those predictions and give supporting statements about why they are making those predictions. Prior to beginning the lab, the teacher can review their predictions or discuss them as a class. Their selected variables to graph can be compared to the suggested variables in the Unit.

After the class has completed the Lab Activity, teachers should review students' results, graphs, data sheets and conclusions. Discussion should continue the scientific inquiry by asking

GENERAL GUIDELINES

such questions as: How is this science? Why is experimentation important in science? What hypotheses were supported and what ones were refuted? Why? What predictions were supported and what predictions were refuted? Why? Are mistakes a necessary part of science? Did everyone's data set look the same? Why or why not? According to research in the classroom, it is important that students discuss these items in order to understand the nature of science. Generally, these discussions must explicitly bring these points to the students' attention, as they will not tend to make these correlations on their own. Research conclusively tells us that teachers need to have guided discussions about the nature of science.

Following are some examples of discussion questions that address further implications about the topic taught:

Unit No. 16, Renewable Energy Guide for Buildings:

After completing the Follow Up Activity, ask the class some questions relating to why there are minimum and maximum summer and winter altitudes. Why is this information useful in building a home? How can you use this information when designing an outside structure? What causes the changes in the seasons?

Unit No. 18, Introduction to Photovoltaic Systems:

After completing the Follow Up Activity, ask students: How can we use the sun's energy other than in solar cells? What are some other ways to collect the sun's energy? What are the costs to use this kind of energy? What are the benefits?

Another technology that could be brought to the student's attention during this Unit is geothermal ac/heating units that use the sun's energy to heat water and create heat in homes as well as cool them in the summer.

Unit No. 19, Estimating PV System Size and Cost:

After completing the Follow Up Activity, ask more probing questions as to why the meter readings changed. How did the sun affect the photovoltaic cell? What does sunlight do to the electrons? Why did you have to use copper in this experiment? Why wouldn't stainless steel work? Why did the copper change colors? Is heat always required for this to happen? Would regular tap water, or distilled water work for this laboratory (instead of saltwater)? Why or why not? Why was the positive terminal the copper strip and the negative terminal the copper oxide strip? Could they be reversed? Why or why not?

Unit No. 20, Clean Energy from Texas Landfills: After completing the Follow Up Activity, ask students: What does the organic slurry represent? What are some things that could be used as organic slurry? Why does it have to be organic? Why couldn't newspapers be used as organic

slurry? (This reiterates the role that bacteria play in this process.) Ask students to describe what is happening in the "landfill." Why is this happening? What are the byproducts of this process and how can they be beneficial for our use?

Unit No. 21, Rural Renewable Applications: After completing the lab, discuss with the class questions such as the following: How does the wet cell work? Why is the copper wire required? Foil? Electrolytes? How did the baking soda affect the current? (Aluminum foil oxidizes and positive aluminum ions go into solution, leaving an excess of electrons on the aluminum electrode. The citric acid electrolyte facilitates the electron flow; the electrolyte is needed in order for the transfer of electrons to take place. Without an electrolyte, the electrons cannot move and current would not be produced. Electrons flow from areas with higher concentration to areas with lower concentration of electrons). Students can make a drawing of this concept, labeling the appropriate parts and providing their own explanation of how the wet cell actually works.

2.5 Library Research and Internet Research

Some Units include library or Internet research as either the main or additional activity. Before assigning students library research, meet with the librarian to determine the location and the type of books that are available regarding energy, the environment and sustainability. Additional resources are provided in this Guide; you may decide to order some of these publications for your library.

Before assigning students Internet research, learn about your school's Internet access including any filters that might be installed to prevent access to inappropriate websites. Most Internet research is assigned as group work to allow students to collaborate together and learn cooperative group skills. The teacher can determine the optimal number of students for a group depending on logistics of the computer lab, the number of computers and the class's skills.

The teacher should review with the class basic instructions on using search engines and provide search tips such as the use of quotations around word phrases or specifying the domain (.edu, .gov, etc.). Most search engines have options to perform advanced searches that provide a template for users to input specific information. Teacher can review the advanced options of a search engine with the class to refine their searches.

Suggested search engines:

www.google.com
www.altavista.com
www.yahoo.com
www.hotbot.com
www.ask.com

SAFETY GUIDELINES

3.0 SAFETY GUIDELINES

Standard science and lab safety guidelines should be followed if the teacher or school already has some in place. To take safety further, the teacher can develop a safety chart and safety contract listing basic expectations that would be signed by students individually.

The following laboratory management techniques are taken from the Texas Safety Standards for K-12 included in the Science TEKS Toolkits developed by the Charles A. Dana Center at the University of Texas.

1. Maintain fair and consistent classroom discipline to prevent unsafe conditions from being created during laboratory investigations.
2. Establish routine procedures for conducting a laboratory investigation that promote an orderly and safe environment. Ask different students in each laboratory group to obtain materials from a supply area, return materials at the completion of a laboratory investigation, and record data, if class data are needed.
3. Explain and post the expectations for orderly conduct in the classroom, laboratory, and field. Teachers should always model appropriate classroom, laboratory, and field procedures.
4. Explain and post safety rules for the classroom, laboratory, and field. Students and parents should complete and return a signed safety contract before students begin investigations.
5. Explain the consequences of unsafe behavior.
6. Before each laboratory investigation, review the safety rules for using laboratory equipment and facilities.
7. Prior to the investigation, arrange for the proper disposal of wastes.
8. Keep up with current information on safety and class procedures, and practice those procedures consistently.
9. Examine laboratory investigations and equipment for appropriateness and safety.
10. Review with the students the procedures for using the laboratory. Discuss safety rules and precautions before the investigation begins.
11. Promote a positive attitude. Students should not fear doing experiments, using reagents, or using equipment, but should have a positive attitude toward safe laboratory procedures.
12. Adjust procedures for students with emotional, physical, or educational problems to capitalize on the contributions they are able to make.
13. When a substitute teacher is in charge, create an alternate lesson plan that does not involve laboratory work.
14. Monitor continuously for maximized learning and safe conditions.
15. Plan post-lab activities for after the laboratory work has been completed.
16. Clean the work areas thoroughly and regularly.
17. Develop procedures to be followed in case of an accident.
18. Establish procedures for asking students to leave the laboratory when they demonstrate unacceptable behavior.

TEKS – HIGH SCHOOL

4.0 TEXAS ESSENTIAL KNOWLEDGE AND SKILLS

TABLE 2. High School TEKS addressed

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
INTEGRATED PHYSICS & CHEMISTRY								
1	Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.							
	(A) demonstrate safe practices during field and laboratory investigations; and	x	x	x	x	x	x	x
	(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.	x	x	x	x	x	x	x
2	Scientific processes. The student uses scientific methods during field and laboratory investigations.							
	(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;	x	x	x	x	x	x	x
	(B) collect data and make measurements with precision;	x	x	x	x	x	x	x
	(C) organize, analyze, evaluate, make inferences, and predict trends from data; and	x	x	x	x	x	x	x
	(D) communicate valid conclusions.	x	x	x	x	x	x	x
3	Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.							
	(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;	x	x	x	x	x	x	x
	(C) evaluate the impact of research on scientific thought, society, and the environment;	x	x	x	x	x	x	x
	(D) describe connections between physics and chemistry, and future careers; and	x	x	x	x	x	x	x
4	Science concepts. The student knows concepts of force and motion evident in everyday life.							
	(D) investigate and demonstrate mechanical advantage and efficiency of various machines such as levers, motors, wheels and axles, pulleys, and ramps.		x					
6	Science concepts. The student knows the impact of energy transformations in everyday life.							
	(B) investigate and demonstrate the movement of heat through solids, liquids, and gases by convection, conduction, and radiation;	x						
	(C) analyze the efficiency of energy conversions that are responsible for the production of electricity such as from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind;	x	x	x	x	x	x	x
	(D) investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells;			x	x		x	x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
INTEGRATED PHYSICS & CHEMISTRY								
	(E) measure the thermal and electrical conductivity of various materials and explain results;	x		x	x			
	(F) investigate and compare series and parallel circuits;				x			
	(H) analyze the effects of heating and cooling processes in systems such as weather, living, and mechanical.	x	x					
8	Science concepts. The student knows that changes in matter affect everyday life.							
	(A) distinguish between physical and chemical changes in matter such as oxidation, digestion, changes in states, and stages in the rock cycle;				x			
ENVIRONMENTAL SCIENCE								
1	Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.							
	(A) demonstrate safe practices during field and laboratory investigations; and	x	x	x	x	x	x	x
	(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.	x	x	x	x	x	x	x
2	Scientific processes. The student uses scientific methods during field and laboratory investigations.							
	(A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;	x	x	x	x	x	x	x
	(B) collect data and make measurements with precision;	x	x	x	x	x	x	x
	(C) organize, analyze, evaluate, make inferences, and predict trends from data; and	x	x	x	x	x	x	x
	(D) communicate valid conclusions.	x	x	x	x	x	x	x
3	Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.							
	(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;	x	x	x	x	x	x	x
	(B) make responsible choices in selecting everyday products and services using scientific information;	x	x	x	x	x	x	x
	(C) evaluate the impact of research on scientific thought, society, and the environment;	x	x	x	x	x	x	x
5	Science concepts. The student knows the interrelationships among the resources within the local environmental system.							
	(C) document the use and conservation of both renewable and non-renewable resources;	x	x	x	x	x	x	x
	(D) identify renewable and non-renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy;	x	x	x	x	x	x	x

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ENVIRONMENTAL SCIENCE								
6	Science concepts. The student knows the sources and flow of energy through an environmental system.							
	(A) summarize forms and sources of energy;	x	x	x	x	x	x	x
PHYSICS								
1	Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices.							
	(A) demonstrate safe practices during field and laboratory investigations; and	x	x	x		x		
	(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.	x	x	x		x		
2	Scientific processes. The student uses scientific methods during field and laboratory investigations.							
	(A) plan and implement experimental procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology;	x	x	x		x		
	(B) make quantitative observations and measurements with precision;	x	x	x		x		
	(C) organize, analyze, evaluate, make inferences, and predict trends from data;	x	x	x		x		
	(D) communicate valid conclusions;	x	x	x		x		
	(E) graph data to observe and identify relationships between variables; and	x				x		
	(F) read the scale on scientific instruments with precision.	x	x	x		x		
3	Scientific processes. The student uses critical thinking and scientific problem solving to make informed decisions.							
	(A) analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information;	x	x	x		x	x	
	(B) express laws symbolically and employ mathematical procedures including vector addition and right-triangle geometry to solve physical problems;	x						
4	Science concepts. The student knows the laws governing motion.							
	(A) generate and interpret graphs describing motion including the use of real-time technology;		x					
	(B) analyze examples of uniform and accelerated motion including linear, projectile, and circular;		x					
	(C) demonstrate the effects of forces on the motion of objects		x					
5	Science concepts. The student knows that changes occur within a physical system and recognizes that energy and momentum are conserved.							
	(A) interpret evidence for the work-energy theorem;		x					

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PHYSICS								
	(B) observe and describe examples of kinetic and potential energy and their transformations;		x					
6	Science concepts. The student knows forces in nature.							
	(E) design and analyze electric circuits; and		x	x	x		x	
8	Science concepts. The student knows the characteristics and behavior of waves.							
	(A) examine and describe a variety of waves propagated in various types of media and describe wave characteristics such as velocity, frequency, amplitude, and behaviors such as reflection, refraction, and interference;			x				
9	Science concepts. The student knows simple examples of quantum physics.							
	(A) describe the photoelectric effect; and			x	x			
ASTRONOMY								
8	Science concepts. The student knows the role of the Sun in our solar system.							
	(B) identify the source of energy within the Sun and explain that the Sun is the major source of energy for the Earth; and	x	x	x	x		x	x
	(C) describe the Sun's effects on the Earth.	x	x	x	x		x	x
MATHEMATICAL MODELS WITH APPLICATIONS								
1	The student uses a variety of strategies and approaches to solve both routine and non-routine problems.							
	(A) compare and analyze various methods for solving a real-life problem;	x	x	x	x	x	x	x
	(B) use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines; and	x	x	x	x	x	x	x
	(C) select a method to solve a problem, defend the method, and justify the reasonableness of the results.	x	x	x	x	x	x	x
2	The student uses graphical and numerical techniques to study patterns and analyze data.							
	(A) interpret information from various graphs, including line graphs, bar graphs, circle graphs, histograms, and scatterplots to draw conclusions from the data;	x	x	x	x	x	x	x
	(B) analyze numerical data using measures of central tendency, variability, and correlation in order to make inferences;	x	x	x	x	x	x	x
	(C) analyze graphs from journals, newspapers, and other sources to determine the validity of stated arguments; and	x	x	x	x	x	x	x
8	The student uses algebraic and geometric models to describe situations and solve problems.							
	(B) use trigonometric ratios and functions available through technology to calculate distances and model periodic motion; and	x						

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
U.S. HISTORY SINCE RECONSTRUCTION								
22	Science, technology, and society. The student understands the impact of science and technology on the economic development of the United States.							
	(A) explain the effects of scientific discoveries and technological innovations such as electric power, the telegraph and telephone, petroleum-based products, medical vaccinations, and computers on the development of the United States;	x	x	x	x	x	x	x
	(B) explain how scientific discoveries and technological innovations such as those in agriculture, the military, and medicine resulted from specific needs; and						x	
23	Science, technology, and society. The student understands the influence of scientific discoveries and technological innovations on daily life in the United States.							
	(A) analyze how scientific discoveries and technological innovations, including those in transportation and communication, have changed the standard of living in the United States; and	x	x	x	x	x	x	x
	(B) explain how technological innovations in areas such as space exploration have led to other innovations that affect daily life and the standard of living.			x	x			
WORLD GEOGRAPHY STUDIES								
3	Geography. Such as student understands how physical processes shape patterns in the physical environment (lithosphere, atmosphere, hydrosphere, and biosphere), including how Earth-Sun relationships affect physical processes and patterns on Earth’s surface							
	(A) attribute occurrences of weather phenomena and climate to annual changes in Earth-Sun relationships; and	x	x	x	x	x	x	x
	(B) describe physical environment of regions and the physical processes that affect these regions such as weather, tectonic forces, wave action, freezing and thawing, gravity, and soil-building processes.	x	x	x	x	x	x	x
5	Geography. The student understands the patterns and characteristics of major landforms, climates, and ecosystems of Earth and the interrelated processes that produce them.							
	(A) explain the distribution of different types of climate in terms of patterns of temperature, wind, and precipitation and the factors that influence climate regions such as elevation, latitude, location near warm and cold ocean currents, position on a conti		x					x
8	Geography. The student understands how people, places, and environments are connected and interdependent.							
	(A) explain the interrelationships among physical and human processes that shape the geographic characteristics of places such as connections among economic development, urbanization, population growth, and environmental change;	x	x	x	x	x	x	x
	(B) compare ways that humans depend on, adapt to, and modify the physical environment using local, state, national, and international human activities in a variety of cultural and technological contexts;	x	x	x	x	x	x	x

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WORLD GEOGRAPHY STUDIES								
19	Science, technology, and society. The student understands the impact of technology and human modifications on the physical environment.							
	(A) evaluate the significance of major technological innovations, including fire, steam power, diesel machinery, and electricity that have been used to modify the physical environment; and	x	x	x	x	x	x	x
20	Science, technology, and society. The student understands how technology affects definitions of, access to, and use of resources.							
	(A) describe the impact of new technologies, new markets, and revised perceptions of resources; and	x	x	x	x	x	x	x
	(B) analyze the role of technology in agriculture and other primary economic activities and identify the environmental consequences of the changes that have taken place.	x						x
21	Social studies skills. The student applies critical-thinking skills to organize and use information acquired from a variety of sources including electronic technology.							
	(A) use historical, geographic, and statistical information from a variety of sources such as databases, field interviews, media services, and questionnaires to answer geographic questions and infer geographic relationships;							x
	(B) analyze and evaluate the validity and utility of multiple sources of geographic information such as primary and secondary sources, aerial photographs, and maps;							x
	(C) construct and interpret maps to answer geographic questions, infer geographic relationships, and analyze geographic change;							x
22	Social studies skills. The student communicates in written, oral, and visual forms.							
	(A) design and draw appropriate maps and other graphics such as sketch maps, diagrams, tables, and graphs to present geographic information including geographic features, geographic distributions, and geographic relationships;							x
	(B) apply appropriate vocabulary, geographic models, generalizations, theories, and skills to present geographic information;							x
	(C) use geographic terminology correctly; and							x
23	Social studies skills. The student uses problem-solving and decision-making skills, working independently and with others, in a variety of settings.							
	(A) plan, organize, and complete a group research project that involves asking geographic questions; acquiring, organizing, and analyzing geographic information; answering geographic questions; and communicating results;							x
	(B) use case studies and geographic information systems to identify contemporary geographic problems and issues and to apply geographic knowledge and skills to answer real-world questions;							x

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WORLD GEOGRAPHY STUDIES								
	(C) use a problem-solving process to identify a problem, gather information, list and consider options, consider advantages and disadvantages, choose and implement a solution, and evaluate the effectiveness of the solution; and							x
	(D) use a decision-making process to identify a situation that requires a decision, gather information, identify options, predict consequences, and take action to implement a decision.							x
US GOVERNMENT								
19	Science, technology, and society. The student understands the role the government plays in developing policies and establishing conditions that influence scientific discoveries and technological innovations.							
	(A) identify examples of government-assisted research that, when shared with the private sector, have resulted in improved consumer products such as computer and communication technologies; and							x
	(B) analyze how U.S. government policies fostering competition and entrepreneurship have resulted in scientific discoveries and technological innovations.							x
-20	Science, technology, and society. The student understands the impact of advances in science and technology on government and society.							
	(A) analyze the potential impact on society of recent scientific discoveries and technological innovations; and							x
	(B) analyze the reaction of government to scientific discoveries and technological innovations.							x
ENGLISH I								
4	Writing/inquiry/research. The student uses writing as a tool for learning.							
	(A) use writing to formulate questions, refine topics, and clarify ideas;	x	x	x	x	x	x	x
	(B) use writing to discover, organize, and support what is known and what needs to be learned about a topic;	x	x	x	x	x	x	x
	(C) compile information from primary and secondary sources in systematic ways using available technology;	x	x	x	x	x	x	x
	(D) represent information in a variety of ways such as graphics, conceptual maps, and learning logs;	x	x	x	x	x	x	x
	(E) use writing as a study tool to clarify and remember information;	x	x	x	x	x	x	x
6	Reading/word identification/vocabulary development. The student uses a variety of strategies to read unfamiliar words and to build vocabulary.							
	(A) expand vocabulary through wide reading, listening, and discussing;	x	x	x	x	x	x	x
	(B) rely on context to determine meanings of words and phrases such as figurative language, idioms, multiple meaning words, and technical vocabulary;	x	x	x	x	x	x	x
	(C) apply meanings of prefixes, roots, and suffixes in order to comprehend;	x	x	x	x	x	x	x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH I								
	(E) use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meanings and usage; and	x	x	x	x	x	x	x
7	Reading/comprehension. The student comprehends selections using a variety of strategies.							
	(A) establish a purpose for reading such as to discover, interpret, and enjoy;	x	x	x	x	x	x	x
	(B) draw upon his/her own background to provide connection to texts;	x	x	x	x	x	x	x
	(C) monitor reading strategies and modify them when understanding breaks down such as rereading, using resources, and questioning;	x	x	x	x	x	x	x
	(F) identify main ideas and their supporting details;	x	x	x	x	x	x	x
	(H) draw inferences such as conclusions, generalizations, and predictions and support them from text;	x	x	x	x	x	x	x
	(J) read silently with comprehension for a sustained period of time.	x	x	x	x	x	x	x
13	Reading/inquiry/research. The student reads in order to research self-selected and assigned topics.							
	(A) generate relevant, interesting, and researchable questions;	x	x	x	x	x	x	x
	(B) locate appropriate print and non-print information using texts and technical resources, periodicals and book indices, including databases and the Internet;	x	x	x	x	x	x	x
	(C) organize and convert information into different forms such as charts, graphs, and drawings;	x	x	x	x	x	x	x
	(E) draw conclusions from information gathered.	x	x	x	x	x	x	x
14	Listening/speaking/critical listening. The student listens attentively for a variety of purposes.							
	(A) focus attention on the speaker’s message;							x
	(B) use knowledge of language and develop vocabulary to interpret accurately the speaker’s message;							x
	(C) monitor speaker’s message for clarity and understanding such as asking relevant questions to clarify understanding; and							x
	(D) formulate and provide effective verbal and nonverbal feedback.							x
15	Listening/speaking/evaluation. The student listens to analyze, appreciate, and evaluate oral performances and presentations.							
	(A) listen and respond appropriately to presentations and performances of peers or published works such as original essays or narratives, interpretations of poetry, or individual or group performances of scripts;							x
	(C) evaluate informative and persuasive presentations of peers, public figures, and media presentations;							x
	(E) use audience feedback to evaluate his/her own effectiveness and set goals for future presentations.							x
16	Listening/speaking/purposes. The student speaks clearly and effectively for a variety of purposes and audiences.							

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH I								
	(A) use the conventions of oral language effectively;							
	(B) use informal, standard, and technical language effectively to meet the needs of purpose, audience, occasion, and task;							x
	(C) prepare, organize, and present a variety of informative messages effectively;							x
	(D) use effective verbal and nonverbal strategies in presenting oral messages;							x
	(E) ask clear questions for a variety of purposes and respond appropriately to the questions of others; and							x
	(F) make relevant contributions in conversations and discussions.							x
17	Listening/speaking/presentations. The student prepares, organizes, and presents informative and persuasive oral messages.							
	(A) present and advance a clear thesis and support the major thesis with logical points or arguments;							x
	(B) choose valid evidence, proofs, or examples to support claims;							x
	(C) use appropriate and effective appeals to support points or claims; and							x
	(D) use effective verbal and nonverbal strategies such as pitch and tone of voice, posture, and eye contact.							x
ENGLISH II								
4	Writing/inquiry/research. The student uses writing as a tool for learning.							
	(A) use writing to formulate questions, refine topics, and clarify ideas;							
	(B) use writing to discover, organize, and support what is known and what needs to be learned about a topic;							
	(C) compile information from primary and secondary sources in systematic ways using available technology;							
	(D) represent information in a variety of ways such as graphics, conceptual maps, and learning logs;							
	(E) use writing as a study tool to clarify and remember information;							
6	Reading/word identification/vocabulary development. The student acquires an extensive vocabulary through reading and systematic word study.							
	(A) expand vocabulary through wide reading, listening, and discussing;	x	x	x	x	x	x	x
	(B) rely on context to determine meanings of words and phrases such as figurative language, idioms, multiple meaning words, and technical vocabulary;	x	x	x	x	x	x	x
	(C) apply meanings of prefixes, roots, and suffixes in order to comprehend;	x	x	x	x	x	x	x
	(E) use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meanings and usage;	x	x	x	x	x	x	x
7	Reading/comprehension. The student comprehends selections using a variety of strategies.							
	(A) establish a purpose for reading such as to discover, interpret, and enjoy;	x	x	x	x	x	x	x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH II								
	(B) draw upon his/her own background to provide connection with texts;	x	x	x	x	x	x	x
	(C) monitor his/her own reading strategies and make modifications when understanding breaks down such as by rereading, using resources, and questioning;	x	x	x	x	x	x	x
	(G) draw inferences such as conclusions, generalizations, and predictions and support them with text evidence and experience;	x	x	x	x	x	x	x
	(I) read silently with comprehension for a sustained period of time.	x	x	x	x	x	x	x
14	Listening/speaking/critical listening. The student listens attentively for a variety of purposes.							
	(A) focus attention, interpret, respond, and evaluate speaker’s message; and							x
	(B) engage in critical, empathic, appreciative, and reflective listening.							x
15	Listening/speaking/evaluation. The student listens to analyze, appreciate, and evaluate oral performance and presentations.							
	(A) listen and respond appropriately to presentations and performances of peers or published works such as original essays or narratives, interpretations of poetry, and individual or group performances of scripts;							x
	(C) evaluate informative and persuasive presentations of peers, public figures, and media presentations;							x
	(E) use feedback to evaluate his/her own effectiveness and set goals for future presentations.							x
16	Listening/speaking/purposes. The student speaks clearly and effectively for a variety of purposes and audiences.							
	(A) use the conventions of oral language effectively;							x
	(B) use informal, standard, and technical language effectively to meet the needs of purpose, audience, occasion, and task;							x
	(C) prepare, organize, and present a variety of informative and persuasive messages effectively with an emphasis on persuasion;							x
	(D) use effective verbal and nonverbal strategies in presenting oral messages;							x
	(E) ask clear questions for a variety of purposes and respond appropriately to the questions of others; and							x
	(F) make relevant contributions in conversations and discussions.							x
17	Listening/speaking/presentations. The student prepares and presents informative and persuasive messages.							
	(A) present and advance a clear thesis and logical points, claims, or arguments to support messages;							x
	(B) choose valid proofs from reliable sources to support claims;							x
	(C) use appropriate appeals to support claims and arguments;							x
	(D) use language and rhetorical strategies skillfully in informative and persuasive messages;							x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH II								
	(E) use effective nonverbal strategies such as pitch and tone of voice, posture, and eye contact; and							x
	(F) make informed, accurate, truthful, and ethical presentations.							x
ENGLISH III								
4	Writing/inquiry/research. The student uses writing as a tool for learning.							
	(A) use writing to formulate questions, refine topics, and clarify ideas;	x	x	x	x	x	x	x
	(B) use writing to discover, organize, and support what is known and what needs to be learned about a topic;	x	x	x	x	x	x	x
	(D) represent information in a variety of ways such as graphics, conceptual maps, and learning logs;	x	x	x	x	x	x	x
	(E) use writing as a study tool to clarify and remember information;	x	x	x	x	x	x	x
6	Reading/word identification/vocabulary development. The student acquires an extensive vocabulary through reading and systematic word study.							
	(A) expand vocabulary through wide reading, listening, and discussing;	x	x	x	x	x	x	x
	(B) rely on context to determine meanings of words and phrases such as figurative language, connotation and denotation of words, analogies, idioms, and technical vocabulary;	x	x	x	x	x	x	x
	(C) apply meanings of prefixes, roots, and suffixes in order to comprehend;	x	x	x	x	x	x	x
	(E) use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meaning and usage;	x	x	x	x	x	x	x
7	Reading/comprehension. The student comprehends selections using a variety of strategies.							
	(A) establish and adjust purpose for reading such as to find out, to understand, to interpret, to enjoy, and to solve problems;	x	x	x	x	x	x	x
	(B) draw upon his/her own background to provide connection to texts;	x	x	x	x	x	x	x
	(C) monitor his/her own reading strategies and make modifications when understanding breaks down such as by rereading, using resources, and questioning;	x	x	x	x	x	x	x
	(G) draw inferences such as conclusions, generalizations, and predictions and support them with text evidence and experience;	x	x	x	x	x	x	x
	(I) read silently with comprehension for a sustained period of time.	x	x	x	x	x	x	x
13	Reading/inquiry/research. The student reads in order to research self-selected and assigned topics.							
	(E) draw conclusions from information gathered.	x	x	x	x	x	x	x
14	Listening/speaking/critical listening. The student listens attentively for a variety of purposes.							
	(A) demonstrate proficiency in each aspect of the listening process such as focusing attention, interpreting, and responding;							x
	(C) demonstrate proficiency in critical, empathic, appreciative, and reflective listening;							x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH III								
15	Listening/speaking/purposes. The student speaks clearly and effectively for a variety of purposes.							
	(A) use the conventions of oral language effectively;							x
	(B) use informal, standard, and technical language effectively to meet the needs of purpose, audience, occasion, and task;							x
	(C) communicate effectively in conversations and group discussions while problem solving, and planning;							x
	(D) use effective verbal and nonverbal strategies in presenting oral messages;							x
16	Listening/speaking/evaluation. The student evaluates and critiques oral presentations and performances.							
	(A) apply valid criteria to analyze, evaluate, and critique informative and persuasive messages;							x
	(B) apply valid criteria to analyze, evaluate, and critique literary performances;							x
	(C) use praise and suggestions of others to improve his/her own communication; and							x
17	Listening/speaking/presentations. The student prepares, organizes, and presents informative and persuasive messages.							
	(A) present and advance a clear thesis and logical points, claims, or arguments to support messages;							x
	(B) choose valid proofs from reliable sources to support claims;							x
	(E) make effective nonverbal strategies such as pitch and tone of voice, posture, and eye contact; and							x
	(F) make informed, accurate, truthful, and ethical presentations.							x
ENGLISH IV								
4	Writing/inquiry/research. The student uses writing as a tool for learning and research.							
	(A) use writing to formulate questions, refine topics, and clarify ideas;	x	x	x	x	x	x	x
	(B) use writing to discover, record, review, and learn;	x	x	x	x	x	x	x
	(C) use writing to organize and support what is known and what needs to be learned about a topic;	x	x	x	x	x	x	x
	(D) compile information from primary and secondary sources using available technology;							x
	(E) organize notes from multiple sources in useful and informing ways such as graphics, conceptual maps, and learning logs;							x
	(F) link related information and ideas from a variety of sources;							x
	(G) compile written ideas and representations into reports, summaries, or other formats and draw conclusions; and							x
	(H) use writing as a tool for reflection, exploration, learning, problem solving, and personal growth.							x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH IV								
7	Reading/word identification/vocabulary development. The student acquires an extensive vocabulary through reading and systematic word study.							
	(A) expand vocabulary through wide reading, listening, and discussing;	x	x	x	x	x	x	x
	(B) rely on context to determine meanings of words and phrases such as figurative language, idioms, multiple meaning words, and technical vocabulary;	x	x	x	x	x	x	x
	(C) apply meanings of prefixes, roots, and suffixes in order to comprehend;	x	x	x	x	x	x	x
	(E) use reference material such as glossary, dictionary, thesaurus, and available technology to determine precise meanings and usage;	x	x	x	x	x	x	x
8	Reading/comprehension. The student comprehends selections using a variety of strategies.							
	(A) establish and adjust purpose for reading such as to find out, to understand, to interpret, to enjoy, and to solve problems;	x	x	x	x	x	x	x
	(B) draw upon his/her own background to provide connection to texts;	x	x	x	x	x	x	x
	(C) monitor his/her own reading strategies and modify when necessary;	x	x	x	x	x	x	x
	(G) draw inferences and support them with textual evidence and experience;	x	x	x	x	x	x	x
	(I) read silently with comprehension for a sustained period of time.	x	x	x	x	x	x	x
14	Reading/inquiry/research. The student uses reading and research skills to develop self-selected topics.	x	x	x	x	x	x	x
	(A) generate relevant, interesting, and researchable questions;	x	x	x	x	x	x	x
	(B) locate appropriate print and non-print information using text and technical resources, including databases and the Internet;	x	x	x	x	x	x	x
	(C) use text organizers such as overviews, headings, and graphic features to locate and categorize information;	x	x	x	x	x	x	x
	(D) evaluate the credibility of information sources and their appropriateness for varied needs;	x	x	x	x	x	x	x
	(E) organize and record new information in systematic ways such as notes, charts, and graphic organizers;	x	x	x	x	x	x	x
	(F) produce research projects and reports in varying forms for audiences; and	x	x	x	x	x	x	x
	(G) draw relevant questions for further study from the research findings or conclusions.	x	x	x	x	x	x	x
15	Listening/speaking/critical listening. The student listens attentively for a variety of purposes.							
	(A) demonstrate proficiency in each aspect of the listening process such as focusing attention, interpreting, and responding;							x
	(C) demonstrate proficiency in critical, empathic, appreciative, and reflective listening;							x

TEKS – HIGH SCHOOL

TEKS	Description	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
ENGLISH IV								
	(D) use effective strategies to evaluate his/her own listening such as asking questions for clarification, comparing and contrasting interpretations with those of others, and researching points of interest or contention; and							x
	(E) use effective listening to provide appropriate feedback in a variety of situations such as conversations and discussions and informative, persuasive, or artistic presentations.							x
16	Listening/speaking/purposes. The student speaks clearly and effectively for a variety of purposes.							
	(A) use conventions of oral language effectively, including word choice, grammar, and diction;							x
	(B) use informal, standard, and technical English to meet demands of occasion, audience, and task;							x
	(C) respond appropriately to the opinions and views of others;							x
	(D) adopt verbal and nonverbal strategies to accommodate needs of the listener and occasion;							x
	(E) ask clear questions for a variety of purposes and respond appropriately to the questions of others;							x
	(F) make relevant contributions in conversations and discussions;							x
	(G) express and defend a point of view using precise language and appropriate detail; and							x
	(H) speak responsibly to present accurate, truthful, and ethical messages.							x
17	Listening/speaking/presentations. The student prepares, organizes, and presents oral messages.							
	(A) present clear thesis statements and claims;							x
	(B) support major thesis with logical points or arguments;							x
	(C) choose valid evidence or proofs to support claims;							x
	(D) use effective appeals to support points, claims, or arguments;							x
	(E) use language and rhetorical strategies skillfully in informative and persuasive messages;							x
	(F) analyze purpose, audience, and occasion to choose effective verbal and nonverbal strategies for presenting messages and performances;							x
	(H) use feedback to judge effectiveness in communicating and setting goals for future presentations.							x
18	Listening/speaking/evaluation. The student evaluates and critiques oral presentations and performances.							
	(A) apply valid criteria to analyze, evaluate, and critique informative and persuasive messages;							x
	(B) apply valid criteria to analyze, evaluate, and critique literary performances;							x
	(C) use praise and suggestions of others to improve his/her own communication; and							x

5.0 RESOURCES

5.1 Recommended Reading

Art of Natural Building: Design, Construction, Resources, Joseph F. Kennedy et al, New Society, 2002

Energy for Keeps: Electricity from Renewable Energy, written and published by Educators for the Environment, 2003

Exploring Energy: Energy from the Sun, Jan Burgess, Schoolhouse Press, 1988

Exploring Energy: Wind and Water Power, Philip Sauvain, Schoolhouse Press, 1988

From Space to Earth: The Story of Solar Electricity, John Perlin, Aatec Publications

Green by Design: Creating a Home for Sustainable Living, Angela Dean, Gibbs Smith, 2003

Heaven's Flame: A Guide to Solar Cookers, Joseph Radabaugh, Home Power Publishing, 1998

Real Goods Solar Living Source Book 12th Edition, John Schaeffer, Executive Editor, Real Goods, 2004

Solar Water Heating Systems, Active and Passive, US Department of Energy (available by calling 900-523-2929)

The Fuel Savers: A Kit of Solar Ideas for Your Home, Bruce Anderson, Real Goods, 2002

The New Natural House Book, David Pearson, Simon & Schuster, 1998

The Return of the Solar Cat Book, Jim Augustyn and Hildy Paige Burns, Patty Paw Press, 2003

The Solar Electric House : Energy for the Environmentally Responsive, Energy-Independent Home, Steven J. Strong and William G Scheller, Sustainability Press, 1994

The Solar House: Passive Heating and Cooling, Daniel D. Chiras, Ph.D., Chelsea Green, 2002

The Wind at Work : An Activity Guide to Windmills, Gretchen Woelfle, Chicago Review Press, 1997

Wind Energy Basics, Paul Gipe, Chelsea Green Publishing, 1999

INTERNET RESOURCES

5.2 Internet Resources

TABLE 3. Suggested Websites

Organization	Website	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
SECO Infinite Power of TX	http://www.InfinitePower.org	x	x	x	x	x	x	x
TX Solar Energy Society	http://www.txses.org	x	x	x	x	x	x	x
U.S. DOE - Energy Efficiency and Renewable Energy (EERE) for Educators	http://www.eere.energy.gov/education/	x	x	x	x	x	x	x
TERI - The Energy Resource Institute - Edugreen Program*	http://www.edugreen.teri.res.in/explore/n_renew/energy.htm	x	x	x	x	x	x	x
Union of Concerned Scientists	http://www.ucsusa.org/clean_energy/renewable_energy/	x	x	x	x	x	x	x
Florida Solar Energy Center	www.fsec.ucf.edu	x		x	x			
U.S. DOE - Energy Efficiency and Renewable Energy - Solar Water Heaters	http://www.eere.energy.gov/RE/solar_hotwater.html	x						
Alliance to Save Energy - Educators Page	http://www.ase.org/section/_audience/educators/	x						
National Renewable Energy Labs - Passive Solar for Educators	http://www.nrel.gov/clean_energy/teach_passive.html	x						
How Stuff Works - Seasons	http://science.howstuffworks.com/question165.htm	x						
El Paso Solar Energy Society - Thermal Mass (Passive Solar)	http://www.epsea.org/mass.html	x						
American Institute for Learning - Green Construction	http://www.ail.org/cvb/greenConstruction/frontPage.htm	x						
Rocky Mountain Institute - Home Resource Efficiency	http://www.rmi.org/sitepages/pid167.php	x						
US DOE EERE - State Energy Information	http://www.eere.energy.gov/state_energy/mystate.cfm?state=tx		x	x		x		
US Agency for International Development - Battery Evaluation	http://www.usaid.gov/our_work/economic_growth_and_trade/energy/rural_energy/projects.html		x	x			x	
Alternative Energy Institute - Windenergy.org	http://www.windenergy.org/		x					
American Wind Energy Association - TX Projects Page	http://www.awea.org/projects/texas.html		x					
American Wind Energy Association	http://www.awea.org		x					
National Renewable Energy Labs - Wind Energy	http://www.nrel.gov/clean_energy/wind.html		x					
US DOE EERE - Wind Energy	http://www.eere.energy.gov/RE/wind.html		x					
Massachusetts Technology Collaborative	http://www.mtpc.org/renewableenergy/owec.htm		x					

INTERNET RESOURCES

Organization	Website	Unit of Study No. 16	Unit of Study No. 17	Unit of Study No. 18	Unit of Study No. 19	Unit of Study No. 20	Unit of Study No. 21	Unit of Study No. 22
American Solar Energy Society - general information	http://www.ases.org			x				
US DOE EERE - Photovoltaics	http://www.eere.energy.gov/RE/solar_photovoltaics.html			x	x			
National Renewable Energy Labs - Photovoltaics	http://www.nrel.gov/clean_energy/photovoltaic.html			x	x			
Engineers Without Borders	http://www.ewb-usa.org/index.htm			x			x	
Rural Renewable Energy Alliance	http://www.rreal.org/				x		x	
National Rural Electric Cooperatives Association	http://www.nreca.org/				x			
Texas Electric Cooperatives	http://www.texas-ec.org/				x			
National Renewable Energy Labs - Biomass Energy	http://www.nrel.gov/clean_energy/bioenergy.html					x		
US DOE EERE - Bioenergy	http://www.eere.energy.gov/RE/bioenergy.html					x		
US DOE EERE - Int'l Bioenergy Links	http://www.eere.energy.gov/RE/bioenergy-intl.html					x		
Natural Resources Defense Council - Biomass	http://www.nrdc.org/air/energy/fbiom.asp					x		
How Stuff Works - Landfills	http://people.howstuffworks.com/landfill.htm					x		
National Renewable Energy Labs - Rural Sustainable Village Power	http://www.rsvp.nrel.gov/						x	
Sandia National Laboratories -	http://www.sandia.gov/pv/docs/BattIntro.htm						x	
Solar Cookers International	http://solarcookers.org/						x	
US DOE EERE - Geothermal	http://www.eere.energy.gov/geothermal/							x
National Renewable Energy Labs - Utility Sector Projects	http://www.nrel.gov/documents/profiles.html							x
Public Utility Commission - Texas Electric Choice	http://www.powertochoose.org/							x
NC Solar Center - Database of State Incentives for Renewable Energy	http://www.dsireusa.org/							x

5.3 Additional Resources

There are many resources for additional information and materials on renewable energy and energy-efficiency from organizations, public agencies and supply companies some of which are free and some of which can be purchased. Below are a few suggestions:

- Pitsco (educational tools and kits for renewable energy and energy education including solar cells, model wind turbines, etc.) www.pitsco.com (items to be purchased)
- Edmunds Scientific www.scientificsonline.com

- Texas State Energy Conservation Office, www.seco.cpa.state.tx.us
- U.S. Environmental Protection Agency, www.epa.gov/teachers
- U.S. Department of Education, www.eere.energy.gov/education
- Watt Watchers, a free, state sponsored program designed to help school districts save energy dollars by enlisting students to look for energy waste in their schools by patrolling the hallways looking for empty classrooms with the lights on. <http://wattwatchers.org>

RUBRICS

6.0 RUBRICS

In order for the teacher and students to have the same understanding of how students' performance will be assessed or how grades will be assigned in each Unit, the class can develop rubrics. Specific expectations can be identified for each Unit. Table 4 provides a generic template that can be modified as a class for

the entire Unit. The teacher will need to add additional points if the alternative activities suggested in this Guide are followed, such as the alternative vocabulary work or any written steps taken to enhance the scientific inquiry. Table 5 can optionally be used as a peer assessment tool for group work, such as the Lab Activity, and then be incorporated into the Unit rubric as suggested in Table 4.

TABLE 4. Template Rubric

Activity	Exceptional (Advanced) – 4 points	Satisfactory (Acceptable and Developing) 3 points	Unsatisfactory (Beginning) 1 point
<p>1. Vocabulary:</p> <p>Point assignment : 1 point per word</p> <p>0 – student did not provide a definition for the word</p> <p>1 – student provided the correct definition for the word</p>	<p>Student received 85 - 100% of total points possible</p>	<p>Student received 70 - 84% of total points possible</p>	<p>Student received less than 69% of total points possible</p>
<p>2. Reading Passage and Questions:</p> <p>a. Qualitative: Did the student accurately complete the assignment?</p> <p>b. Quantitative: Point assignment: (2 points per question)</p> <p>0 – student did not provide any answer for question;</p> <p>1 – student attempted to answer question, but either not thoroughly or accurately;</p> <p>2 – student answered the question thoroughly and correctly</p>	<p>a. Yes, student completed the assignment: reading the required passage and answering questions. Answers accurately addressed all of the major points including more.</p> <p>b. Student received 85 - 100% of total points possible</p>	<p>a. Yes, student completed the assignment: reading the required passage and answering questions. Most of the answers accurately addressed most of the major points.</p> <p>b. Student received 70 - 84% of total points possible</p>	<p>a. No, student did not complete the assignment. Student either did not read the required passage or did not answer all of the required questions. Answers did not accurately address the required points.</p> <p>b. Student received less than 69% of total points possible</p>
<p>3. Lab Activity:</p> <p>a. Cooperative Learning Grade (See rubric Table 5)</p> <p>b. Qualitative – did the student understand and complete the assignment?</p> <p>c. Quantitative Data Summary Questions: 3 points each</p>	<p>a. Score of 27-23 (from Table 5)</p> <p>b. Student participated enthusiastically in the activity and following instructions; data/information gathered was appropriate; the data was accurately recorded and organized with tables, graphs, or drawings (if required); the results were summarized correctly in sentence form.</p> <p>c. Student received 85 - 100% of total points possible</p>	<p>a. Score of 22-18 (from Table 5)</p> <p>b. Student had minimal participation in the activity and followed most instructions correctly; data/information was gathered but with some errors; the data was recorded and organized with tables, graphs, or drawings (if required) but with some errors; the results were summarized.</p> <p>c. Student received 70 - 84% of total points possible</p>	<p>a. Score of 17 or less (from Table 5)</p> <p>b. Student had little or no participation in the activity or did not follow the instructions correctly; data/information was not gathered; little or no data was recorded and organized with tables, graphs, or drawings (if required); the results were not summarized.</p> <p>c. Student received less than 69% of total points possible</p>

RUBRICS

Activity	Exceptional (Advanced) – 4 points	Satisfactory (Acceptable and Developing) 3 points	Unsatisfactory (Beginning) 1 point
<p>4. Assessment:</p> <p>a. Short Answer Point assignment (3 points possible per question): 0 – student did not provide any answer for question; 1 – student attempted to answer question, but not correctly; 2 – student answered the question correctly but briefly showing little depth of knowledge 3 – student answered the question correctly and displaying a depth of understanding</p> <p>b. Multiple Choice Point assignment (1 point per question): 0 – student did not answer question correctly; 1 – student answered question correctly</p>	<p>a. Student received 85 - 100% of total points possible</p> <p>b. Student received 85 - 100% of total points possible</p>	<p>a. Student received 70 - 84% of total points possible</p> <p>b. Student received 70 - 84% of total points possible</p>	<p>a. Student received less than 69% of total points possible</p> <p>b. Student received less than 69% of total points possible</p>
<p>Total Scores:</p> <p>1. Vocabulary</p> <p>2. Reading Passage and Questions a. Qualitative b. Quantitative</p> <p>3. Lab Activity a. Cooperative Learning b. Qualitative c. Quantitative</p> <p>4. Assessment a. Short Answer b. Multiple Choice</p>	<p>Points</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>		

RUBRICS

TABLE 5. Cooperative Learning Peer Assessment Rubric

	Seldom or Never Demonstrates 0	Sometimes Demonstrates 1	Frequently Demonstrates 2	Always Demonstrates 3	Score
Responsibilities					
<i>Fulfills Team Role & Duties</i>	Does not perform any duties of assigned team role	Performs some duties	Performs all duties	Performs all duties & helps others	
<i>Participates in Action Planning</i>	Does not participate in planning even after encouragement	Participates in planning after encouragement	Participates in planning without encouragement	Participates in planning & encourages others	
<i>Shares Responsibilities</i>	Does not fulfill responsibilities & relies on others to do their work	Fulfills some responsibilities	Fulfills responsibilities	Fulfills responsibilities & helps others	
Contributions					
<i>Researches & Gathers Information</i>	Collects information that does not relate to the topic	Collects very little information that relates to the topic	Collects some basic information that mostly relates to the topic	Collects a lot of information that relates to the topic	
Share Information					
<i>Upholds Team Action Plan</i>	Doesn't follow the team action plan	Follows the team action plan some of the time	Follows the team action plan	Follows the team action plan & helps others stay on track	
Interactions with Teammates					
<i>Listens to Others</i>	Always talks & does not listen to other's ideas	Usually does most of the talking & listens to some teammates' ideas	Listens to other's ideas, but sometimes talks too much	Listens to others' ideas & speaks when appropriate	
<i>Cooperates with Others</i>	Does not cooperate & argues with teammates	Cooperates sometimes & argues with some teammates	Cooperates with teammates & sometimes argues	Cooperates well with others & never argues	
<i>Respects Others' Opinions or Decisions</i>	Usually does not respect opinions or decisions of others & wants things his/her way	Usually sides with someone who has a similar opinion or decision as his/her own	Usually respects opinions of teammates & supports their decisions	Respects opinions of teammates & supports their decisions	
<i>Asks & Discusses Questions with Team Members</i>	Does not ask or discuss questions with teammates	Asks questions to some teammates	Asks & discusses questions with some teammates	Asks & discusses questions with all teammates	



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State Energy Conservation Office
111 East 17th Street, Room 1114
Austin, Texas 78774
Ph. 800.531.5441 ext 31796
www.InfinitePower.org

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