Career and Technical Education TEKS Review Draft Recommendations

Texas Essential Knowledge and Skills (TEKS) for Career and Technical Education Draft Recommendations

Environmental Sustainability Work Group

Courses: Environmental Sustainability

The document reflects the draft recommendations to the career and technical education (CTE) Texas Essential Knowledge and Skills (TEKS) that have been recommended by the State Board of Education's TEKS review work group for: **Environmental Sustainability.**

Proposed additions and new courses are shown in green font with underline (additions). Proposed deletions are shown in red font with strikethroughs (~~deletions~~). Text proposed to be moved from its current student expectation is shown in purple italicized font with strikethrough (*~~moved text~~*) and is shown in the proposed new location in purple italicized font with underlines (*new text location*). Numbering for the knowledge and skills statements in the document will be finalized when the proposal is prepared to file with the *Texas Register*.

Comments in the right-hand column provide explanations for the proposed changes. The following notations may be used as part of the explanations.

Abbreviation	Description
CCRS	refers to the College and Career Readiness Standards
CDS	refers to cross disciplinary standards in the CCRS
ELA	refers to English language arts standards in the CCRS
M	refers to mathematics standards in the CCRS
SCI	refers to science standards in the CCRS
SS	refers to social studies standards in the CCRS
KS	refers to knowledge and skills statement
SE	refers to student expectation

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§127.XX Environmental Sustainability (One Credit), Adopted 2025.		
	TEKS with edits	Work Group Comments/Rationale
(a)	Implementation. The provisions of this section shall be implemented by school districts beginning with the 2025-2026 school year.	
(b)	General requirements. Environmental Sustainability is recommended for students in Grades 9-12. Recommended Prerequisites: At least one credit in a Level 2 or higher course in engineering or renewable energy. Students successfully completing this course shall be awarded one credit.	
(c)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.	
(2)	The Engineering Career Cluster focuses on planning, designing, testing, building, and maintaining of machines, structures, materials, systems, and processes using empirical evidence and science, technology, and math principles. This career cluster includes occupations ranging from mechanical engineer and drafter to electrical engineer and to mapping technician.	
(3)	In Environmental Sustainability, students research, develop, and design solutions related to water, land management, energy, and food supply with consideration to ethics and policy. The student uses technology and the engineering design approach to devise solutions focused on current and future sustainability challenges.	
(4)	Students are encouraged to participate in extended learning experiences, such as career and technical student organizations, leadership or extracurricular organizations, and work-based experiences.	
(5)	Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.	
(d)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	demonstrate dressing appropriately, speaking politely, and conducting oneself in a manner appropriate for the profession and work site;	

(B)	analyze how teams can produce better outcomes through cooperation, contribution, and collaboration from members of the team;	
(C)	present written and oral technical communication in a clear, concise, and effective manner for a variety of purposes and audiences, including explaining and justifying decisions in the design process;	
(D)	use time-management skills in prioritizing tasks, following schedules, and tending to goal-relevant activities in a way that optimizes efficiency and results independently and in groups;	
(E)	describe the importance of and demonstrate punctuality, dependability, reliability, and responsibility in reporting for duty and performing assigned tasks as directed;	
(F)	explain how engineering ethics as defined by professional organizations such as the National Society of Professional Engineers applies to engineering practice;	
(G)	demonstrate respect for diversity in the workplace;	
(H)	identify consequences relating to discrimination, harassment, and inequality;	
(I)	analyze elements of professional codes of conduct or creeds in engineering such as the National Society of Professional Engineers Code of Ethics for Engineers and how they apply to the knowledge and skills of the course and the engineering profession;	
(J)	identify the components of a safety plan and why it is critical for employees and employers to maintain a safe work environment; and	
(K)	compare skills and characteristics of managers and leaders in the workplace.	
(2)	The student understands how to implement an engineering design process to develop a product or solution. The student is expected to:	
(A)	describe and implement the stages of an engineering design process to construct a model;	
(B)	explain how factors, including complexity, scope, resources, ethics, regulations, manufacturability, and technology, impact stages of the engineering design process;	
(C)	explain how stakeholders impact an engineering design process; and	
(D)	analyze how failure is often an essential component of the engineering design process.	

(3)	The student explores the methods and aspects of project management in relation to projects. The student is expected to:	
(A)	research and explain the process and phases of project management, including initiating and planning; executing; and closing;	
(B)	explain the roles and responsibilities of team members, including project managers and leads;	
(C)	research and evaluate methods and tools available for managing a project;	
(D)	discuss the importance of developing and implementing a system for the organization of project documentation such as file naming conventions, document release control, and version control;	
(E)	describe how project requirements, constraints, and deliverables impact the project schedule and influence and are influenced by an engineering design;	
(F)	explain how a project budget is developed and maintained, including materials, equipment, and labor; and	
(G)	describe the importance of management of change (MOC) and how it applies to project planning.	
(4)	Sustainability Ethics. The student applies ethical consideration to analyze sustainable and resilient engineered systems. The student is expected to:	
(A)	compare the Texas Engineering Practices Act to the code of ethics of other engineering societies such as the American Society of Civil Engineers and the National Society of Professional Engineers to explain how engineers demonstrate the responsibility they have to serve the public interest, his or her clients, and the profession with a high degree of honesty, integrity, and accountability;	
(B)	research the New London school explosion and explain how this event led to the development of the Texas Engineering Practice Act and other regulations such as odorization of natural gas;	
(C)	assess an engineering ethical dilemma between environmental limitations and the needs and wants of our society;	
(D)	explain how engineering solutions can have significantly different impacts, including environmental, economic, social, political, health, and welfare, on an individual, society, and the natural world; and	
(E)	identify an ethical dilemma that has positive and negative outcomes resulting from an environmental engineering decision or series of decisions.	

(5)	The student builds a model(s) using the appropriate tools, materials, and techniques. The student is expected to:	
(A)	identify and describe the steps needed to produce a model;	
(B)	identify advantages and limitations of models such as size, scale, properties, and materials;	
(C)	identify and use appropriate tools, equipment, and materials to produce a model;	
(D)	describe the use of a model to accurately represent the key aspects of a physical system, including the identification of constraints such as cost, time, or expertise that may influence the selection of a model;	
(E)	present a model using a variety of media; and	
(F)	evaluate the successes and failures of a model(s) in the context of an iterative design process.	
(6)	Critical and Creative Problem-Solving. The student examines environmental challenges and gathers assumptions to synthesize a meaningful, well-defined problem and ideates multiple solutions. The student is expected to:	
(A)	collect, analyze, and interpret information relevant to a problem;	Iterations, SE to gather and analyze assumptions
(B)	document a design process according to best practices in an engineering notebook;	
(C)	identify and define visual, functional, and design requirements with realistic constraints against which solution alternatives can be evaluated;	
(D)	list potential appropriate criteria for a defined problem that may impact the success of a design solution, such as economic, environmental, social, political, ethical, health and safety, manufacturability, technical feasibility, and sustainability;	
(E)	represent concepts using a variety of visual tools such as sketches, graphs, and charts to communicate the details of an idea;	
(F)	develop, design, and test alternatives to generate valid quantitative data to inform decision making and demonstrate solutions; and	
(G)	explain why there are often multiple viable solutions and no obvious best solution.	

(7)	Critical and Creative Problem-Solving. The student selects the optimal design solution for real-world environmental problems based on engineering judgement. The student is expected to:	
(A)	develop and carry out a justifiable scheme to compare and evaluate competing solutions paths using a decision matrix to compare and evaluate competing solutions based on design criteria;	Risk matrix is important
(B)	formulate a risk analysis matrix using a spreadsheet to evaluate threats and opportunities, including cost, time, environmental and social impacts;	Threat or opportunity
(C)	identify the data needed to address an environmental research question and the appropriate tools necessary to collect, record, analyze, and evaluate the data; and	
(D)	evaluate evidence and arguments to identify deficiencies, limitations, and biases for appropriate next steps in the pursuit of a better solution.	
(8)	Engineering Tools and Technology (ETT). The student uses a variety of techniques to measure and report quantities appropriate for an environmental analysis. The student is expected to:	Larger scale surface area calculations (acres, square miles, hectares, etc.) delineation of areas, working at scale is most difficult. Estimate mining or watersheds – calculations, terminology, measuring methodologies, geospatial skills-several free resources available
(A)	research and determine appropriate units of measure, including acres, miles, and hectares, for environmental analysis;	
(B)	measure and estimate a large-scale area such as a wetland, streamline, or floodplain using maps or digital resources;	
(C)	perform dimensional analysis and unit conversions to transform data to units appropriate for a particular purpose or model; and	
(D)	select and effectively use the appropriate tool for accurately measuring specific volumes.	Bathymetric volume, Gas volumes, water volume in a lake. In chemistry, it is tied in to 9C - (C) perform stoichiometric calculations, including determination of mass relationships, gas volume relationships, and percent yield. Learn to identify and select an appropriate unit of measure for area and volumetric calculations based on the scale of an environmental problem.

(9)	Water Resources. The student analyzes environmental factors related to safe drinking water. The student is expected to:	
(A)	analyze the relationship between population growth and water resources;	
(B)	describe how human health is affected by the quality of drinking water sources;	
(C)	explain the characteristics of clean water;	
(D)	explain why clean water is necessary for survival;	
(E)	describe common sources of drinking water contamination, including stormwater runoff;	
(F)	explain contaminant cycling through an ecosystem;	
(G)	describe the types of water found on Earth and the relative amounts of each type;	
(H)	describe and compare the most common sources of drinking water such as desalination, aquifers, surface water, glacial water, reclaimed water in developed and developing countries;	
(I)	describe the infrastructure components of private wells and public drinking water systems; and	
(J)	research and describe the Texas State Water Plan, including the sources of water, floodplain management, and recycling.	Texas Water Plan produced by the Texas Water Development Board Describe the development of water security within Texas (why do we recycle, conserve, aquifer depletion) Scarcity of water in certain regions, reclaimed water from fracking, treat and reuse at other wells.
(10)	Water Quality. The student evaluates water quality and uses a variety of chemical and biological assays to describe water quality. The student is expected to:	
(A)	research and describe Environmental Protection Agency (EPA) and Texas Commission on Environmental Quality (TCEQ) surface water quality standards for rivers, lakes, and estuaries;	microplastics
(B)	research and describe annual water quality compliance reports and compare water quality between the different reports;	

(C)	explain how water quality is quantitatively measured using chemical and biologically based testing processes;	
(D)	perform and analyze a culture assay to detect coliform in water;	
(E)	collect a water sample and determine water turbidity and pH;	
(F)	outline the stages of treatment that a typical modern sewage treatment plant uses to treat sewage water;	
(G)	explain the role of bacteria in wastewater treatment;	
(H)	research and describe emerging contaminants such as microplastics and pharmaceuticals in water;	
(I)	describe the interacting roles of bacteria, protozoa, and rotifers in a wastewater treatment ecosystem;	
(J)	describe and provide examples of how physical, chemical and biological processes work in the process of purifying contaminated water;	
(K)	explain how plants remove nitrates from contaminated water;	
(L)	use the engineering design process to design, build, and test a water filtration system;	
(M)	design and perform an experiment to use phytoremediation to remove contaminants from water; and	
(N)	design and conduct a scientific experiment to test a variable affecting the bacteria's ability to decompose oil.	
(11)	Food Security. The student explains the meaning and value of food security and analyzes environmentally and socially sustainable and unsustainable food production methods. The student is expected to:	Research and describe food deserts
(A)	analyze the advantages and disadvantages of genetically modified crops;	
(B)	research and explain the use of genetically modified crops as animal feed such as cottonseed for livestock;	
(C)	list and explain potential ways that crop plants might be improved through genetic modification;	
(D)	explain how transgenic plants could lead to positive and negative consequences to the environment and local ecosystem;	
(E)	describe the economic and socio-political issues associated with genetically modified food crops;	

(F)	investigate and summarize the ethical ramifications of genetic engineering and recombinant DNA technologies;	
(G)	analyze socially sustainable and unsustainable food production methods;	
(H)	describe food deserts and how food security exists with all people; and	
(I)	research and explain the impact to food security when food sources are used as energy sources.	
(12)	Energy. The student demonstrates a working knowledge of various sources of energy and their environmental and economic impact. The student is expected to:	Energy, calculations, sources,
(A)	explain the differences between renewable and non-renewable sources of energy and provide examples of each;	
(B)	identify and measure the amount and types of energy that students use in their daily lives;	Calculate carbon footprint
(C)	calculate the carbon footprint of a household;	
(D)	compare the carbon intensity of fossil fuels and alternative fuel sources terms of the short and long-term effects on the atmospheric carbon cycle;	Geothermal, nuclear, hydro-electrical power generation
(E)	explain the similarities and differences between fossil fuels and alternative sources;	
(F)	explain the differences between renewable and non-renewable sources of energy and provide examples of each;	
(G)	analyze the results of software simulations and models that vary the amounts and types of energy used to predict future energy needs;	
(H)	perform a full life cycle assessment (LCA) of material and energy sources; and	
(I)	identify the variables and the methods for completing an LCA.	

(13)	Climate. The student understands the impacts of human activities on climate. The student is expected to:	Alignment with grade 7 and 8 science standards. Climate, land, policy/Regs
(A)	research and explain net embodied carbon;	8.11.B use scientific evidence to describe how human activities, including the release of greenhouse gases, deforestation, and urbanization, can influence climate;
(B)	research and explain greenhouse gas emissions;	Env.10.E distinguish between the causes and effects of global warming and ozone depletion, including the causes, the chemicals involved, the atmospheric layer, the environmental effects, the human health effects, and the relevant wavelengths on the electromagnetic spectrum (IR and UV).
(C)	identify common sources of air pollution and describe the impacts of air pollution to human health;	Earth.12.B analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms;
(D)	describe mitigation techniques for air pollutants;	
(E)	analyze the impact on humans of naturally occurring extreme weather events such as flooding, hurricanes, tornadoes, and thunderstorms;	Mitigate? How are we resilient regarding severe weather
(F)	research and explain how engineering design can be more resilient to climate change to limit additional impacts to the natural environment;	Design infrastructure to withstand severe weather events/shelters, increase capacities, to mitigate (not having to rebuild structures, therefore, using less resources) impact our built impact. Respect to natural environment resiliency.
(G)	describe and analyze the impacts of climate to renewable energy resources; and	Resilience, infrastructure
(H)	research and explain elements of natural environmental resilience.	

(14)	Land management. The student understands the practice of using land resources to meet needs while also protecting the environment and ensuring the land's long-term productivity. The student is expected to:	
(A)	explain the value of a healthy ecosystem and the impact of biodiversity on the environment;	
(B)	research and explain ecological value of the land and explain how to conserve the ecology of the land;	Environmental studies – what is important about the land? What should be preserved? Coastal, prairie restoration
(C)	develop land conservation and preservation restorative measures using United States Department of Agriculture (USDA) National Resources Conservation Services (NRCS) Conservation Practice Standards;	Develop land conservation and preservation restorative measures using USDA NRCS Conservation Practice Standards.
(D)	research changes in land use and land cover over time using geospatial tools;	
(E)	analyze and report environmental impacts due to changes in land use such as urbanization over time; and	Land use (human impacts), land cover (natural changes)
(F)	explain the role of protected areas and lands to safeguard natural ecosystems.	Area could include areas of water.
(15)	Waste management. The student understands the role and importance of waste management. The student is expected to:	
(A)	analyze the impacts of reduction, reuse, and recycling for environmental sustainability;	
(B)	explain the impact of individual practices of waste reduction on resource management;	
(C)	analyze the waste breakdown cycle of various waste products that enter landfills; and	
(D)	research and describe hazardous waste products and impacts on the environment, including long-term storage needs and pollution.	
(16)	Policy. The student understands the role of global, national, and local policies and regulations in environmental sustainability. The student is expected to:	
(A)	research and analyze the United Nations (UN) sustainability development goals (SDG);	

(B)	research and describe the origins and functions of the EPA;	Purpose of rules and regulations
(C)	describe the relationship between the National Environmental Policy Act (NEPA), the EPA, and TCEQ; and	NEPA (law) 1970, EPA developed to carry out the laws of NEPA. Historical/Cultural resources
(D)	describe how policy can develop, incentivize, and maintain environmentally sustainable practices.	
(17)	Future sustainability challenges. The student discusses and analyzes some of the persistent global engineering challenges to sustain growing populations, the natural environment, and improve quality of life. The student is expected to:	
(A)	explain why some environmental engineering challenges are persistent such as providing access to clean water, providing a sustainable food supply, energy, sanitation, and health care to growing populations;	
(B)	identify and describe the environmental sustainability elements within the "Grand Challenges" defined by the National Academy of Engineering;	
(C)	analyze the environmental sustainability elements within the "Grand Challenges" to determine the potential implications for society;	
(D)	create a sustainable solution to a current challenge to meet the needs of society without compromising the ability of future society;	
(E)	identify principles that help guide development of sustainable solutions with considerations for sustainable development to include people, planet, and profit; and	
(F)	describe the life cycle of a product or service and identify energy consumption, wastes, and emissions that are produced in the process.	