Career and Technical Education TEKS Review Draft Recommendations

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

Plant Science Work Group

Courses: Greenhouse Operation and Production, Floral Design, Horticultural Science, Advanced Floral Design, Advanced Plant and Soil Science, and Viticulture

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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 groups for: **Greenhouse Operation and Production, Floral Design, Horticultural Science, Advanced Floral Design, Advanced Plant and Soil Science, and Viticulture.**

Proposed additions 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
SCI	refers to science standards in the CCRS
SS	refers to social studies standards in the CCRS
Gap Analysis	refers to gap analysis report on essential knowledge and skills aligned to in-demand high-wage occupations
KS	refers to knowledge and skills statement
SE	refers to student expectation
VA	information moved or deleted to increase vertical alignment between courses

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§127.XXX~~130.24~~ Greenhouse Operation and Production (One Credit), Adopted 2024~~2015~~.		
TEKS with edits		Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded one credit for successful completion of this course.	Recommendation: To develop a new course in the future - Controlled Environment Agriculture that addresses vertical farming, aquaponics, mushroom cultivation, lab grown protein, hydroponics, space agriculture, and other emerging technologies.
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	Greenhouse Operation and Production is designed to develop an understanding of greenhouse production techniques and practices. To prepare for careers in horticultural and controlled environment agricultural systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticultural systems and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(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.	
(c)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career development, education, and entrepreneurship opportunities in the field of greenhouse operation~~s~~ and production;	• Consistency
(B)	identify and demonstrate ~~apply competencies related to resources, information,~~ interpersonal ~~skills~~, problem solving, and critical thinking skills used in greenhouse operation~~s~~ and production;	• Consistency • CCRS: ELA.IV.A.4

(C)	describe and demonstrate appropriate personal and *occupational safety and health practices* for the workplace ~~examine licensing, certification, and legal requirements to maintain compliance with industry requirements~~;	• Consistency • CCRS: ELA.IV.A.4; SCI.2.b • Moved from 1.D
(D)	identify *employers' expectations*, including *appropriate work habits*, ethical conduct, and legal responsibilities; ~~demonstrate knowledge of personal and *occupational health and safety practices* in the industry~~;	• CCRS: ELA.IV.A.4 • Moved from 1.E • Moved to 1.C
(E)	describe and *demonstrate characteristics of good citizenship such as stewardship, advocacy, and community leadership* ~~identify *employers' expectations* and *appropriate work habits*~~; and	• Consistency • CCRS: ELA.IV.A.4 • Moved from 1.F • Moved to 1.D
(F)	identify training, education, and certification requirements for occupational choices ~~*demonstrate characteristics of good citizenship such as advocacy, stewardship, and community leadership*~~.	• Consistency
(2)	The student develops a supervised agricultur~~e~~al experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultur~~e~~al experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	use appropriate ~~apply proper~~ record-keeping skills in a ~~as they relate to the~~ supervised agricultural~~e~~ experience program;	• Consistency • CCRS: MATH.IV.B.1
(C)	participate in youth agricultural leadership opportunities ~~to create a well-rounded experience program~~; ~~and~~	• Consistency
(D)	review ~~produce~~ and participate in a local program of activities; and ~~using a strategic planning process.~~	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency
(7) ~~(3)~~	The student identifies and classifies plants used in greenhouse production. The student is expected to:	
(A)	classify ~~greenhouse~~ plants commonly used in greenhouses based on ~~according to~~ taxonomic ~~y~~ systems;	• SE clarification to make it clearer
(B)	identify and compare ~~develop knowledge of~~ plant anatomical structures and functions for plant identification; and	• SE clarification of the verb to address it to make it more measurable.
(C)	analyze ~~develop~~ plant classifications based on cropping schedules and market demand for greenhouse crops.	• SE clarification of the verb to address the Standard better.

(3)	The student understands the history and progression of the greenhouse industry. The student is expected to:	
(A)	trace the relevant historical advancements in the greenhouse industry such as developments in construction materials and use of technology and the impact of these advancements on current industry practices;	• SS I. A3 • SCI IV. A1
(B)	research and identify emerging technology in the greenhouse industry; and	• ELA V. A1, A2 • SCI III. D1 • SCI IV. A1 • CDS II. E1, E2, E3, E4
(C)	identify current trends affecting the greenhouse industry.	
(4)	The student identifies and investigates different greenhouse structures, interior layout, and construction factors. The student is expected to:	
(A)	compare and select greenhouse coverings;	
(B)	compare greenhouse styles and construction materials;	
(C)	analyze the costs associated with greenhouse construction;	• MATH I. B1 • MATH IV. C1, C3 • MATH VI. B2, C3 • MATH VIII C1, C2 • MATH X. A2
(D)	evaluate greenhouse site orientation and construction concerns such as access to electricity, roads, drainage, water, and plumbing;	• MATH VIII C1, C2 • MATH X. A2
(E)	identify additional ~~integrate other~~ growing structures such as cold frames~~,~~ and hotbeds~~, lath houses, and potting sheds~~; and	• SCI X. E3 • clarification to address the standard
(F)	identify and design a layout of essential areas of the greenhouse such as receiving, storage, seedling propagation, crop production, harvest, sanitation, packaging, labelling and distribution areas;	
(G)	describe the adaptation of greenhouse concepts to plant production in controlled environments such as indoor vertical farms and freight containers;	• SCI X. E3
(H)	differentiate between passive and controlled greenhouses; and	
(I) ~~(F)~~	analyze ~~investigate local, state, and national~~ regulations affecting greenhouse operations such as Texas Department of Agriculture, United States Department of Agriculture, and local regulations.	• SS I. A2 • SCI X. D1, D2 • SE clarification on guidance on the sources of regulations

(5)	The student identifies and assesses environmental conditions within the greenhouse. The student is expected to:	
(A)	describe various ~~investigate~~ environmental factors controlled in the greenhouse;	• SCI VI. B3
(B)	determine and calculate factors used in heating and cooling a greenhouse;	• MATH I. B1 • MATH VI. B2, C3 • MATH VIII C1, C2 • MATH X. A2 • SCI V. B2
(C)	describe ~~investigate~~ the effects of greenhouse climate conditions such as ventilation, carbon dioxide generation, and humidity on plant growth in the greenhouse;	• SCI V. B2 • SCI VII. H1 • SCI X. E4
(D)	explore the importance of light characteristics ~~quality, quantity, and duration~~ on the production of greenhouse crops; and	• SCI VI. B3
(E)	compare open and closed environmental systems in the greenhouse such as irrigation, lighting, climate control, carbon dioxide injection and fertilization ~~misting beds or hydroponics~~.	• SCI V. B2 • SCI VI. B3 • SCI VII. H1 • SCI X. E4 • SCI VIII. I4, I8
(6)	The student identifies, operates, and maintains greenhouse environmental and mechanical controls. The student is expected to:	
(A)	explain how to operate and maintain heating, cooling, and ventilation systems in a greenhouse;	• SCI V. B2 • SCI VII. H1 • SCI X. B1
(B)	explain how to operate and maintain electrical systems in a greenhouse; ~~and~~	• SCI VIII. I4, I8 • SCI X. B1
(C)	explain how to operate and maintain various water systems in a greenhouse;~~.~~	• SCI X. E4
(D)	explain how to operate lighting systems in a greenhouse; and	• SCI VIII. I4, I8
(E)	illustrate and describe the integration of automated control systems such as lighting, cooling, irrigation, fertigation, and carbon dioxide injection.	• SCI VI. B3 • SCI VIII. I4, I8

(9) ~~(7)~~	The student propagates greenhouse crops. The student is expected to:	• SCI X. E3
(A)	analyze different methods of propagating greenhouse crops using sexual and asexual propagation methods;	
(B)	propagate greenhouse crops using various methods ~~such as using seeds, seedlings, plugs, cuttings, and tissue culture~~; ~~and~~	
(C)	investigate and explain physiological conditions that affect plant propagation; and ~~such as seed dormancy and root initiation.~~	
(D)	analyze the effects of plant growth regulators on plant growth and development.	• SCI X. E3
(8)	The student identifies and investigates greenhouse crop production factors. The student is expected to:	
(A)	explain and demonstrate the chemical and physical differences in greenhouse media components;	• SCI V. D1
(B)	compare greenhouse growing mixes for factors, including ~~such as~~ drainage and nutrient-holding capacity;	• Clarity to place emphasis on all parts of the SE
(C)	compare ~~and contrast~~ different containers, benches, and ~~other~~ production equipment used in greenhouses ~~crop production~~;	• Breakout this list
(D)	evaluate different methods of watering greenhouse crops;	• SCI X. E4
(E)	analyze the effect of nutrients on greenhouse plant growth;	• SCI VI. B3
(F)	diagnose common nutrient deficiency symptoms found in greenhouse crops; and	• SCI VI. B3
(G)	develop fertilization plans that address greenhouse crop needs and environmental impacts.	• SCI VI. B3
(10) ~~(9)~~	The student investigates pest and disease identification and control methods in the greenhouse environment. The student is expected to:	• SCI X. E2, E3
(A)	identify common diseases, insects, pathogens, and weeds in the greenhouse;	• SCI X. E3
(B) ~~(A)~~	identify and assess insect, pathogen, and weed infestations and diseases in a greenhouse;	• SCI X. E2, E3

(C) ~~(B)~~	identify essential components of an integrated pest management plan ~~implement Integrated Pest Management~~ in controlling an insect, pathogen, or weed problem;	• SCI X. E2, E3 • Not LEA have access to appropriate greenhouse or equipment needed to implement the IPM's
(D) ~~(C)~~	identify ~~use~~ appropriate greenhouse pesticide application techniques and equipment; and	• SCI X. E2, E3
~~(D)~~	~~research chemicals used to regulate plant growth in the greenhouse; and~~	• Redundant to 9D
(E)	analyze ~~examine~~ pesticide labeling and safety data sheets.	• SCI X. E2, E3
(11) ~~(10)~~	The student performs greenhouse management business procedures. The student is expected to:	
(A)	identify and develop effective marketing strategies to market greenhouse crops to increase profits;	• SE clarity and measurability
(B)	identify appropriate methods for preparing greenhouse crops for various means of transport ~~greenhouse crops~~;	• SE clarity and measurability
(C)	analyze materials, labor, and administrative costs related to greenhouse production;	• MATH I. B1 • MATH VI. B2, C3 • MATH VIII C1, C2 • MATH X. A2
(D)	analyze methods used to maintain crop quality during marketing and transport; and	• SCI X. E3
(E)	prepare a production schedule for a greenhouse crop from establishment to market within a specific timeline.	• SE clarity

§127.XXX~~130.20~~. Floral Design (One Credit), Adopted 2024~~2015~~.		
TEKS with edits		Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. This course satisfies the fine arts graduation requirement. Students shall be awarded one credit for successful completion of this course.	
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	Floral Design is designed to develop students' ability to identify and demonstrate the elements and principles of ~~and techniques related to~~ floral design as well as develop an understanding of the management of floral enterprises. Through the analysis of artistic floral styles and historical periods, students will develop respect for the traditions and contributions of diverse cultures. Students will respond to and analyze floral designs, thus contributing to the development of lifelong skills of making informed judgments and evaluations. To prepare for careers in floral design, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticultural systems, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(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.	
(c)	Knowledge and skills.	

(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career ~~development~~ and entrepreneurship opportunities for a chosen occupation in the field of floral design and develop a plan for obtaining the *education, training, and certifications required* ~~interior landscape development~~;	• Consistency • Increase rigor • Moved from 1.F
(B)	model professionalism by continuously exhibiting *appropriate work habits*, solving problems, taking initiative, communicating effectively, listening actively, and thinking critically ~~apply competencies related to resources, information, interpersonal skills, and systems of operation in floral design and interior landscape development~~;	• Moved from 1.D • Increase rigor • Consistency • CCRS: ELA.IV.A.4
(C)	model appropriate ~~demonstrate knowledge of~~ personal and occupational ~~health and~~ safety and health practices and explain the importance of established safety and health protocols for ~~in~~ the workplace;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4; SCI.2.b
(D)	analyze and interpret the rights and responsibilities, including ethical conduct and legal responsibilities of employers and employees; and ~~identify employer expectations and appropriate work habits;~~	• Increase rigor • CCRS: ELA.IV.A.4
(E)	analyze the importance ~~demonstrate characteristics~~ of exhibiting good citizenship and describe the effects of good citizenship on the development of home, school, workplace~~, including advocacy, stewardship~~, and community. ~~leadership; and~~	• Increase rigor • Consistency • CCRS: ELA.IV.A.4 • SS I. C3 • CDS 1. E2, E4
~~(F)~~	~~identify *training, education, and certification requirements* for occupational choices.~~	• Consistency • Moved to 1.A
(2)	The student develops a supervised agricultur~~e~~al experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultur~~e~~al experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	use appropriate ~~apply proper~~ record-keeping skills in a ~~as they relate to the~~ supervised agricultur~~e~~al experience program;	• Consistency • CCRS: M.IV.B.1
(C)	participate in youth agricultural leadership opportunities; ~~to create a well-rounded experience program; and~~	• Consistency
(D)	~~produce~~ review and participate in a local program of activities ~~using a strategic planning process.~~; and	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency

(3)	The student identifies elements and principles of design ~~principles and techniques~~ in floral art in both historical and current contexts. ~~and interiorscapes~~. The student is expected to:	• Aligning language to current national industrial standards. • Interiorscapes-moved to the next standard (4E)
(A)	identify the historic trends and characteristics ~~aesthetic benefits and the history~~ of floral art~~, particularly~~ as it relates to current industry practices;	• Aligning language to current national industrial standards. • Simplify wording • SS I. A3
~~*(B)*~~	~~*classify and identify flowers and plants used in floral design; and*~~	• Moved to 7A • To align better with business practices
(B) ~~(C)~~	identify design elements in floral art, including, *color, texture, form, line, space, pattern,* and fragrance; ~~principles.~~	• Moved from old 5B
(C)	identify design principles in floral art, including, *rhythm, balance, proportion, dominance, contrast, harmony, and unity;* and	• Moved from old 5C
(D)	compare the forms and functions of flowers and foliage, including form, mass, line, and filler.	
(4)	The student demonstrates ~~floral design~~ elements and principles through the creation of floral designs using flowers and plants. ~~and techniques~~. The student is expected to:	
~~(A)~~	~~demonstrate an understanding of and implement the design process through the medium of floral materials;~~	
(A) ~~(B)~~	create and evaluate ~~and prepare geometric~~ floral arrangements ~~designs~~ using cut flowers, including bud vase, round, symmetrical, and asymmetrical designs;	• MATH III. A1, B1 • MATH VII. D1 • MATH IX. B1, B3
(B) ~~(C)~~	*prepare* and evaluate ~~and *prepare* geometric~~ floral designs using permanent botanicals ~~silk flowers~~ such as homecoming mums;	• Placed lower-level verb first, revised to current industry terms
(C) ~~(D)~~	prepare corsages and boutonnieres; ~~and~~	
(D) ~~(E)~~	prepare floral designs for specific holidays and cultural occasions such as weddings and funerals;	• SS II. A2, B3
(E)	create interiorscapes using the elements and principles of floral design;	
(F)	apply proper wiring and taping techniques used in the industry; and	
(G)	demonstrate safe and proper tool usage in the lab.	
~~(5)~~	~~The student develops and formulates ideas from the environment. The student is expected to:~~	
~~(A)~~	~~illustrate ideas for floral designs from direct observation, experiences, and imagination;~~	

~~(B)~~	~~compare and contrast the use of art elements such as *color, texture, form, line, and space*; and~~	• Moved up to 3B
~~(C)~~	~~compare and contrast *art principles such as continuity, pattern, rhythm, balance, proportion, and unity in personal designs.*~~	• Moved up to 3C
(5) ~~(6)~~	The student makes informed judgments about personal designs and the designs of others. The student is expected to:	
(A)	interpret, evaluate, and justify artistic decisions in personal arrangements; and	
~~(B)~~	~~select and analyze original designs, portfolios, and floral exhibitions by peers and others to form precise conclusions about formal qualities and historical and cultural contexts, intents, and meanings.~~	• Replaced by 5B
(B)	construct a physical or electronic portfolio of personal floral artwork to provide evidence of learning.	• Added to bring in fine arts components and prepare students for the industry.
(6) ~~(7)~~	The student demonstrates contemporary designs~~, *business practices*~~, and creativity in the floral industry by developing floral design skills. The student is expected to:	• Moved down to 8
(A)	*identify and* classify ~~*and identify*~~ specialty floral items for a variety of occasions;	• Change order of verbs
(B)	evaluate and appraise floral designs; and	
~~*(C)*~~	~~*prepare cost-effective designs;*~~	• Moved down to 8
~~(D)~~ (C)	create specialty designs to expand artistic expression.~~;~~	
~~*(E)*~~	~~*demonstrate pricing and order-processing skills; and*~~	• Moved down to 8
~~(F)~~	~~list service delivery options related to effectiveness.~~	• Deleted for redundancy with 7I
(7) ~~(8)~~	The student recognizes ~~knows~~ the current industry management ~~factors~~ and *business practices* of floral enterprises. The student is expected to:	• Moved from above, from 7
(A)	*identify and classify flowers,* foliage, *and plants used in floral design;*	• Moved from 3B, change order of verbs • SCI V. D1
(B) ~~(A)~~	use temperature, preservatives, and cutting techniques to extend the vase life ~~increase keeping quality~~ of floral materials;	• Edited for clarity and industry vocabulary
(C) ~~(B)~~	identify tools, chemicals, and equipment used in floral design;	
(D) ~~(C)~~	determine the needs of indoor plants such as fertilizing~~e~~, lighting, pruning~~e~~, and watering based on the condition of the plant ~~tropical plants~~;	• Revised for clarity
(E) ~~(D)~~	identify and manage common pests and diseases that affect the floral industry; ~~and~~	• Revised for clarity
~~(E)~~	~~demonstrate technical skills for increasing the preservation of cut flowers and foliage.~~	• Repetitive and is like 8B

(F)	*prepare cost-effective designs;*	• Moved from above 7C
(G)	apply ~~*demonstrate*~~ *pricing and order-processing skills;* and	• Moved from above 7E
(H)	identify packaging, distribution, and setup logistics in the floral industry.	
(8)	The student understands botany and physiology and how they relate to floral design and interiorscapes.	• Students basic understanding of the biological concepts are needed to be a better floral designer. • SCI I. E2 • SCI VI. B3 • SCI VI. E1
(A)	analyze the structure and functions of indoor plants used in the floral industry; and	• SCI I. E2 • SCI VI. B3 • SCI VI. E1
(B)	identify the structure and functions of flowers used in the floral industry.	• SCI I. E2

§127.XXX~~130.23~~. Horticultural Science (One Credit), Adopted 2024~~2015~~.		
TEKS with edits		Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded one credit for successful completion of this course.	
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	Horticultural Science is designed to develop an understanding of common horticultural management practices as they relate to food and ornamental plant production. To prepare for careers in horticultural industry systems, students must attain academic skills and knowledge, acquire technical knowledge and skills related to horticulture and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer knowledge and skills in a variety of settings.	
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(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.	
(c)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career ~~development~~ and entrepreneurship opportunities in the field of ~~horticulture~~ plant science and develop a plan for obtaining the education, training, and certifications required;	• Increase rigor

(B)	model ~~apply competencies related to resources, information, interpersonal skills~~, solving problems, taking initiative, communicating effectively, listening actively, and thinking critically~~and systems of operation in horticulture~~;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4
(C)	model appropriate ~~demonstrate knowledge of~~ personal and occupational safety and health practices and explain the importance of established safety and health protocols for ~~in~~the workplace;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4; SCI.2.b
(D)	analyze and interpret the rights and responsibilities, including ethical conduct and legal responsibilities of ~~identify~~ employers and employees ~~expectations and appropriate work habits~~; and	• Increase rigor • CCRS: ELA.IV.A.4
(E)	analyze the importance ~~demonstrate characteristics~~ of exhibiting good citizenship and describe the effects of good citizenship on the development of home, school, workplace~~, including advocacy, stewardship,~~ and community ~~leadership~~.	• Increase rigor • Consistency • CCRS: ELA.IV.A.4
(2)	The student develops a supervised agricultural~~e~~ experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultural~~e~~ experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	use appropriate ~~apply proper~~ record-keeping skills in a ~~as they relate to the~~ supervised agricultural~~e~~ experience program;	• Consistency • CCRS: MATH.IV.B.1
(C)	participate in youth agricultural leadership opportunities ~~to create a well-rounded experience program~~; ~~and~~	• Consistency
(D)	review ~~produce~~ and participate in a local program of activities; and ~~using a strategic planning process.~~	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency
(3)	The student understands the history and progression of the horticulture industry. The student is expected to:	
(A)	trace relevant historical advancements in the horticultural industry as they relate to current industry practices;	• SS I. A3 • SCI IV. A1
(B)	identify the different disciplines of horticulture such as arboriculture, floriculture, olericulture, pomology, viticulture, turf management, and ornamental horticulture;	

(C)	research and identify emerging technology in the horticultural industry;	• ELA V. A1, A2 • SCI III. D1, D2 • SCI IV. A1 • CDS II. E1, E4
(D)	identify current trends affecting the horticultural industry; and	
(E)	compare types of horticultural industries in the different regions of Texas.	• SCI X. E1
(5) ~~(3)~~	The student develops technical knowledge and skills associated with the ~~management and~~ production of horticultural plants. The student is expected to:	
(A)	classify horticultural plants based on taxonomy ~~physiology for taxonomic and other classifications~~;	• SCI I. E2 • SCI V. D1 • SCI VI. E1
(B)	identify classifications of plants based on growing cycles, including annuals, perennials, biennials, and evergreens;	• SCI I. E2 • SCI V. D1 • SCI VI. E1
(C)	identify horticultural plants based on their physical characteristics;	• SCI I. E2 • SCI V. D1 • SCI VI. E1
(D)	compare flowering and non-flowering horticultural plants as it pertains to reproduction;	• SCI I. E2 • SCI V. D1 • SCI VI. E1
~~(B)~~	~~manage the horticultural production environment;~~	
(E)	*select appropriate tools and equipment* for production of horticultural plants;	• Moved from old 6B
(F)	*demonstrate safe* and appropriate *use of tools and equipment;* and	• Moved from old 6C
(G)	*identify* maintenance practices of *hand* tools, ~~and~~ *power tools*, *and equipment*.	• Moved from old 6A
~~(C)~~	~~*propagate and grow horticultural plants;*~~	• Moved to new 6B
~~(D)~~	~~create a *design using* plants that demonstrates an application of *design elements and principles;*~~	• Moved to new 8C
~~(E)~~	~~design and establish landscapes;~~	• Redundant
~~(F)~~	~~describe the processes of fruit, nut, and vegetable production; and~~	

~~(G)~~	~~demonstrate proper pruning techniques.~~	• Redundant
(4)	The student identifies plant structures and their functions and needs ~~and physiological processes used in plant production~~. The student is expected to:	• SCI I. E2 • SCI VI. B3 • SCI VI. E1
(A)	identify horticultural plants by their common and scientific names;	• SCI I. E2 • SCI VI. E1
(B) ~~(A)~~	~~examine unique plant properties to~~ identify ~~and describe~~ functional differences in plant structures, including roots, stems, flowers, leaves, and fruit;	• SCI I. E2 • SCI V. D1 • SCI VI. B3, E1
(C)	identify pollination factors affecting plants and trees such as access to pollinators, wind, and hand pollination;	
(D) ~~(B)~~	compare ~~differentiate between~~ monocots and dicots ~~and male and female plants~~;	• Redundant to 4A (flower parts) • SCI I. E2 • SCI V. D1 • SCI VI. E1
(E)	analyze environmental needs of plants, including light, water, and nutrients; and	• SCI VI. B3 • SCI X. A6
(F)	identify the components of a fertilizer label.	• MATH VII. B1 • MATH VII. D1 • MATH IX. B1, B3 • SCI VII. A2
~~(C)~~	~~germinate seeds and transplant seedlings; and~~	• Replaced by 6C
~~(D)~~	~~demonstrate asexual propagation techniques.~~	• Replaced by 6B
(7) ~~(5)~~	The student manages and controls common pests, diseases, and deficiencies of horticultural plants. The student is expected to:	
(A)	identify and manage common horticultural pests, diseases, and deficiencies ~~pathogens~~;	• SCI X. E3
(B)	identify and manage common weeds that impact horticultural production;	
(C)	develop a plan for disease control using integrated pest management;	• SCI X. E2, E3
(D)	apply proper sanitation methods to prevent the spread of pests;	• SCI X. E3

(E) ~~(B)~~	demonstrate safe and proper practices in selecting, applying, storing, and disposing of chemicals; and	• MATH VII. B1 • MATH VII. D1 • MATH IX. B1, B3
(F) ~~(C)~~	explain the parts of a pesticide label.	• MATH VII. B1 • MATH VII. D1 • MATH IX. B1, B3 • SCI X. E2
(9) ~~(6)~~	The student demonstrates business ~~marketing and management~~ skills used in the ~~operation of~~ horticultural industry ~~businesses~~. The student is expected to:	
~~(A)~~	~~*identify* and maintain *hand* and *power tools and equipment;*~~	• Moved to new 5G
~~(B)~~	~~*select appropriate tools and equipment;*~~	• Moved to new 5E
~~(C)~~	~~*demonstrate safe use of tools and equipment;*~~	• Moved to new 5F
(B)	identify practices to maintain business relationships;	
(C)	demonstrate correct procedures for handling customer sales transactions;	
(D)	calculate pricing to maximize profit for wholesale and retail settings;	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(E)	develop a plan to market horticultural products and services; and	
(F)	formulate a budget for a horticultural enterprise.	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(A) ~~(D)~~	identify ~~options and~~ opportunities for entrepreneurship in the horticulture industry; ~~business ownership; and~~	
~~(E)~~	~~analyze the role of small business in free enterprise.~~	
(6)	The student understands plant propagation techniques and growing methods. The student is expected to:	• SCI X. E3
(A)	identify asexual propagation methods for horticultural plants, including cuttings, grafting, budding, layering, and tissue culture;	

(B)	*propagate* ~~*and grow*~~ *horticultural plants* using asexual methods such as cuttings, grafting, budding, layering, and tissue culture;	• Moved from old 3C
(C)	manipulate the germination of seeds using various methods such as mechanical scarification, chemical scarification, and heat and cold treatments;	• SCI V. B2
(D)	compare various soil-based growing media, and	• SCI V. D1
(E)	identify soilless growing methods used in the horticulture industry.	
(8)	The student understands the concepts of ornamental plants and landscape design. The student is expected to:	• SCI X. E1
(A)	compare landscaping methods that account for environmental variables such as water availability, soil type, light availability, and climate;	• SCI V. B2 • SCI X. A6, E4
(B)	identify and select plants to be used in landscapes, including bedding plants, shrubs, trees, and turf grasses based on United States Department of Agriculture (USDA) hardiness zones;	• SCI V. D1 • SCI X. E5
(C)	*design* a landscape *using design elements and principles;* and	• Moved from old 3D • MATH III. D1 • MATH IX. B1, C3 • SCI V. E3
(D)	apply sustainability practices such as planting native plants, water conservation, and irrigation technology to a landscape.	• CDS II. E1, E2, E3, E4

§127.XXX Advanced Floral Design (One Credit), Adopted 2024.		
TEKS with edits		Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 11-12. Prerequisite: Floral Design. Recommended prerequisite: Principles of Agriculture, Food, and Natural Resources. Students shall be awarded one credit for successful completion of this course.	Recommend: Allow combining with the Agricultural Laboratory and Field Experience
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	In Advanced Floral Design, students gain advanced knowledge and skills specifically needed to enter the workforce as floral designers or as freelance floral event designers, with an emphasis on specialty designs and occasion-specific designs and planning. Students are also prepared to enter postsecondary certification or degree programs in floral design or special events design. Students build on the knowledge base from Floral Design and are introduced to more advanced floral design concepts. In addition, students gain knowledge of the design elements and planning techniques used to produce unique specialty floral designs that support the goals and objectives of an occasion or event.	• Updated to reflect the correct course name
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(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.	
(c)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career and entrepreneurship opportunities for a chosen occupation in the field of floral design and develop a plan for obtaining the education, training, and certifications required;	• Consistency • Increase rigor
(B)	model professionalism by continuously exhibiting appropriate work habits, solving problems, taking initiative, communicating effectively, listening actively, and thinking critically;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4

(C)	model appropriate personal and occupational safety and health practices and explain the importance of established safety and health protocols for the workplace;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4; SCI.2.b
(D)	analyze and interpret the rights and responsibilities, including ethical conduct and legal responsibilities of employers and employees; and	• Increase rigor • CCRS: ELA.IV.A.4
(E)	analyze the importance of exhibiting good citizenship and describe the effects of good citizenship on the development of home, school, workplace, and community.	• Increase rigor • Consistency • CCRS: ELA.IV.A.4 • SS I. C3 • CDS 1. E2, E4
(2)	The student develops a supervised agricultural experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultural experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	Use appropriate record-keeping skills in a supervised agricultural experience program;	• Consistency • CCRS: M.IV.B.1
(C)	participate in youth agricultural leadership opportunities;	• Consistency
(D)	review and participate in a local program of activities; and	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency
(3)	The student understands advanced floral design elements and principles. The student is expected to:	
(A)	use advanced botanical terminology to describe floral materials;	• SCI I. E2
(B)	identify the symbolic meaning of flowers and plants used in floral design such as love, friendship, courage, and innocence;	• Updated for clarity
(C)	compare the characteristics of contemporary floral design styles such as abstract, assemblage, asymmetrical, Biedermeier, cascade/waterfall, hedgerow, parallel, synergistic, submerged, topiary, and vegetative;	
(D)	illustrate ideas for arrangements using contemporary floral design styles from direct observation, experience, and imagination;	
(E)	evaluate the advanced use of floral design elements and principles;	
(F)	identify various basing design techniques such as layering, terracing, pavé, clustering, and pillowing; and	

(G)	identify advanced focal-emphasis design techniques such as grouping, banding, binding, shadowing, sequencing, framing, zoning, and parallelism.	
(4)	The student demonstrates advanced design techniques using fresh and permanent floral designs. The student is expected to:	
(A)	plan and design fresh flower and permanent botanical arrangements using various contemporary design styles such as abstract, assemblage, asymmetrical, Biedermeier, cascade/waterfall, hedgerow, parallel, synergistic, submerged, topiary, and vegetative;	• Edited to be more measurable
(B)	prepare and evaluate floral designs that exhibit various basing design techniques such as layering, terracing, pave, clustering, and pillowing; and	• Edited for clarity in breakouts
(C)	prepare and evaluate floral designs using advanced focal-emphasis design techniques such as grouping, banding, binding, shadowing, sequencing, framing, zoning, and parallelism.	
(5)	The student describes effective design planning and the processes used to create floral designs for specific occasions and events. The student is expected to:	
(A)	develop proper planning techniques in floral design;	
(B)	identify and execute the steps of effective planning used to design floral arrangements for specific occasions such as weddings and funerals;	
(C)	analyze and discuss contingency factors when planning large-volume floral designs; and	
(D)	identify effective consultation practices to determine customer's expectations for design, including budget.	• TEKS Clarity • Industry terminology • ELA III. A1 • CDS I. A2
(6)	The student applies key floral design elements and principles to enhance the experience of specific occasions and events. The student is expected to:	
(A)	identify floral design terminology used for specific occasions, including weddings and funerals;	
(B)	apply elements and principles of floral design to wedding and funeral arrangements such as bouquets, boutonnieres, corsages, sprays, and pedestal arrangements;	
(C)	describe current floral design trends;	
(D)	use and maintain floral design tools; and	
(E)	create examples of appropriate occasion-specific floral designs from direct observation, experience, and imagination.	

(7)	The student demonstrates effective planning of occasion-specific floral designs from the conceptual stage through completion. The student is expected to:	
(A)	conduct a floral design consultation to gather details such as occasion, budget, formality, and theme;	• ELA III. A1
(B)	evaluate and select floral arrangements that achieve the objectives and budget expectations of an occasion;	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(C)	present a proposal that showcases floral arrangements appropriate for the selected occasion;	
(D)	assess the design, creation, installation, and disassembly of floral arrangements when developing a production schedule;	
(E)	develop a procurement plan to ensure necessary resources are obtained within a specified budget and timeframe; and	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(F)	implement and evaluate a floral design plan through completion.	• Edited for clarity
(8)	The student demonstrates business management and merchandising skills necessary for floral design and freelance floral event design professionals. The student is expected to:	
(A)	calculate mark-up of floral products and design services;	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(B)	evaluate pricing policies related to cost-effectiveness and profitability;	• Clarity
(C)	develop and negotiate contracts for floral services;	• ELA IV. A4 • MATH VII. C1 • MATH VII. D1 • MATH IX. B1, B3
(D)	formulate a floral budget, including per item total costs;	• MATH I. A2 • MATH VII. D1 • MATH IX. B1, B3
(E)	demonstrate proper customer service skills for a floral business;	• ELA IV. A2

(F)	identify business relationships with a variety of vendors such as wedding venues, funeral homes, wholesale florists, and wire services; and	
(G)	analyze basic marketing principles and procedures used in the floral industry.	
(9)	The student explains the significance of professional organizations to the floral design industry. The student is expected to:	
(A)	identify industry-related professional organizations; and	
(B)	describe the benefits of participating in professional floral organizations and earning industry-based certifications.	• SS I. C3

§127.XXX~~130.25~~. Advanced Plant and Soil Science (One Credit), Adopted 2024~~2015~~.		
	TEKS with edits	Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 11 and 12. Prerequisites: ~~*Recommended prerequisites*~~ Biology; either *Chemistry* or *Integrated Physics and Chemistry* (IPC); Algebra I; Geometry; and either Horticultural Science, Greenhouse Operation and Production, or Floral Design. *Recommended prerequisite*: Principles of Agriculture, Food, and Natural Resources. ~~prerequisites *Integrated Physics and Chemistry*, *Chemistry*, or Physics and a minimum of one credit from the courses in the Agriculture, Food, and Natural Resources Career Cluster.~~ Students must meet the 40% laboratory and fieldwork requirement. This course satisfies a high school science graduation requirement. Students shall be awarded one credit for successful completion of this course.	• Edited to better align with other science courses in the AFNR career cluster.
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	Advanced Plant and Soil Science provides a way of learning about the natural world. Students should know how plant and soil science has influenced a vast body of knowledge, that there are still applications to be discovered, and that plant and soil science is the basis for many other fields of science. To prepare for careers in plant and soil science, students must attain academic skills and knowledge, acquire technical knowledge and skills related to plant and soil science and the workplace, and develop knowledge and skills regarding career opportunities, entry requirements, and industry expectations. To prepare for success, students need opportunities to learn, reinforce, apply, and transfer their knowledge and skills and technologies in a variety of settings.	
(4)	Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.	

(5)	Scientific hypotheses and theories. Students are expected to know that:	
(A)	hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories; and	
(B)	scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed.	
(6)	Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world using scientific and engineering practices. Scientific methods of investigation are descriptive, comparative, or experimental. The method chosen should be appropriate to the question being asked. Student learning for different types of investigations include descriptive investigations, which involve collecting data and recording observations without making comparisons; comparative investigations, which involve collecting data with variables that are manipulated to compare results; and experimental investigations, which involve processes similar to comparative investigations but in which a control is identified.	
(A)	Scientific practices. Students should be able to ask questions, plan and conduct investigations to answer questions, and explain phenomena using appropriate tools and models.	
(B)	Engineering practices. Students should be able to identify problems and design solutions using appropriate tools and models.	
(7)	Science and social ethics. Scientific decision making is a way of answering questions about the natural world involving its own set of ethical standards about how the process of science should be carried out. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).	
(8)	Science consists of recurring themes and making connections between overarching concepts. Recurring themes include systems, models, and patterns. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested, while models allow for boundary specification and provide tools for understanding the ideas presented. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.	
~~(4)~~	~~Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by~~	

	~~physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.~~	
~~(5)~~	~~Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.~~	
~~(6)~~	~~Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).~~	
~~(7)~~	~~A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.~~	
(8)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(9)	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.	
(c)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career ~~development~~ and entrepreneurship opportunities for a chosen occupation in the field of plant science ~~systems~~ and develop a plan for obtaining the education, training, and certifications required;	• Consistency • Increase rigor
(B)	model professionalism by continuously exhibiting *appropriate work habits*, solving problems, taking initiative, communicating effectively, listening actively, and thinking critically ~~apply competencies related to resources, information, interpersonal skills, and systems of operation in plant systems~~;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4 • Moved from 1.D
(C)	model appropriate ~~demonstrate knowledge of~~ personal and occupational safety practices and explain the importance of established safety and health protocols for ~~in~~ the workplace;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4; SCI.2.b

(D)	analyze and interpret the rights and responsibilities, including ethical conduct and legal responsibilities of ~~identify~~ employers ~~expectations~~ and employees~~*appropriate work habits*~~; and	• Increase rigor • CCRS: ELA.IV.A.4 • Moved to 1B
(E)	analyze the importance ~~demonstrate characteristics~~ of exhibiting good citizenship~~, including~~ and describe the effects of good citizenship on the development of home, school, workplace ~~advocacy, stewardship~~, and community ~~leadership~~.	• Increase rigor • Consistency • CCRS: ELA.IV.A.4 • SS I. C3 • CDS 1. E2, E4
(2)	Scientific and engineering practices. The student, for at least 40% of instructional time, asks questions, identifies problems, and plans and safely conducts classroom, laboratory, and field investigations to answer questions, explain phenomena, or design solutions using appropriate tools and models. The student is expected to:	
(A)	ask questions and define problems based on observations or information from text, phenomena, models, or investigations;	
(B)	apply scientific practices to plan and conduct descriptive, comparative, and experimental investigations and use engineering practices to design solutions to problems;	
(C)	use appropriate safety equipment and practices during laboratory, classroom, and field investigations as outlined in Texas Education Agency-approved safety standards;	
(D)	use appropriate tools such as microscopes, measuring equipment, sensors, plant propagation tools, soil testing kits, and calculators;	• SCI I. D3 • SCI IX. A4
(E)	collect quantitative data using the International System of Units (SI) and qualitative data as evidence;	
(F)	organize quantitative and qualitative data using graphs and charts;	• SCI II. A7 • SCI III. C1 • MATH VI. C2, C3
(G)	develop and use models to represent phenomena, systems, processes, or solutions to engineering problems; and	
(H)	distinguish among scientific hypotheses, theories, and laws.	
(3)	Scientific and engineering practices. The student analyzes and interprets data to derive meaning, identify features and patterns, and discover relationships or correlations to develop evidence-based arguments or evaluate designs. The student is expected to:	

(A)	identify advantages and limitations of models such as their size, scale, properties, and materials;	
(B)	analyze data by identifying significant statistical features, patterns, sources of error, and limitations;	
(C)	use mathematical calculations to assess quantitative relationships in data; and	
(D)	evaluate experimental and engineering designs.	
(4)	Scientific and engineering practices. The student develops evidence-based explanations and communicates findings, conclusions, and proposed solutions. The student is expected to:	
(A)	develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;	
(B)	communicate explanations and solutions individually and collaboratively in a variety of settings and formats; and	
(C)	engage respectfully in scientific argumentation using applied scientific explanations and empirical evidence.	
(5)	Scientific and engineering practices. The student knows the contributions of scientists and recognizes the importance of scientific research and innovation on society. The student is expected to:	
(A)	analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student;	
(B)	relate the impact of past and current research on scientific thought and society, including research methodology, cost-benefit analysis, and contributions of diverse scientists as related to the content; and	
(C)	research and explore resources such as museums, libraries, professional organizations, private companies, online platforms, and mentors employed in a science, technology, engineering, and mathematics (STEM) field in order to investigate STEM careers.	
~~(2)~~	~~The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:~~	
~~(A)~~	~~demonstrate safe practices during field and laboratory investigations; and~~	
~~(B)~~	~~demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.~~	

~~(3)~~	~~The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:~~	
~~(A)~~	~~know the definition of science and understand that it has limitations, as specified in subsection (b)(4) of this section;~~	
~~(B)~~	~~know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power that have been tested over a wide variety of conditions are incorporated into theories;~~	
~~(C)~~	~~know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;~~	
~~(D)~~	~~distinguish between scientific hypotheses and scientific theories;~~	
~~(E)~~	~~plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;~~	
~~(F)~~	~~collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, analysis kits, sieve sets, sieve shakers, soil augers, soil moisture meters, hand lenses, Celsius thermometers, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;~~	
~~(G)~~	~~analyze, evaluate, make inferences, and predict trends from data; and~~	
~~(H)~~	~~communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.~~	
~~(4)~~	~~The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:~~	
~~(A)~~	~~in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;~~	
~~(B)~~	~~communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;~~	

~~(C)~~	~~draw inferences based on data related to promotional materials for products and services;~~	
~~(D)~~	~~evaluate the impact of scientific research on society and the environment;~~	
~~(E)~~	~~evaluate models according to their limitations in representing biological objects or events; and~~	
~~(F)~~	~~research and describe the history of biology and contributions of scientists.~~	
(6) ~~(5)~~	The student develops a supervised agricultural~~e~~ experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultural~~e~~ experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	use appropriate ~~apply proper~~ record-keeping skills in a ~~as they relate to the~~ supervised agricultural~~e~~ experience program;	• Consistency • CCRS: M.IV.B.1
(C)	participate in youth agricultural leadership opportunities ~~to create a well-rounded experience program~~; ~~and~~	• Consistency
(D)	review ~~produce~~ and participate in a local program of activities; and ~~using a strategic planning process.~~	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency
(17)~~(6)~~	The student analyzes plant and soil science as it relates to plant and soil relationships affecting the production of food, fiber, and other economic crops. The student is expected to:	• SCI X. B2 • SCI X. E3
(A)	explain the importance and interrelationship of soil and plants; and	• SCI VI. G3
(B)	evaluate ~~practice~~ soil and plants in ~~evaluation as it applies to~~ agricultural and urban settings.	
~~(7)~~	~~The student develops scenarios for advances in plant and soil science. The student is expected to:~~	• Repeated based on the new SEP's
~~(A)~~	~~design, conduct, and complete research in a laboratory or field investigation to solve problems in plant and soil science;~~	
~~(B)~~	~~use charts, tables, and graphs to prepare written summaries of results and data obtained in a laboratory or field investigation;~~	
~~(C)~~	~~organize, analyze, evaluate, make inferences, and predict trends from data obtained in a laboratory or field investigation; and~~	
~~(D)~~	~~communicate valid outcomes and solutions.~~	

(13)~~(8)~~	The student explains the relationship of biotic and abiotic factors within habitats and ecosystems and their effects on plant ecology. The student is expected to:	• SCI IX. F1
(A)	identify and define plant populations, ecosystems, communities, and biomes;	• SCI III. B3 • SCI V. D1 • SCI VI. C2, G1 • SCI IX. F1 • SCI X. A5
(B)~~(A)~~	identify native and introduced plants~~, *assess their role*~~ in an ecosystem,~~ and compare them to plants in other ecosystems~~;	• SCI V. D1
(C)	*assess* native and introduced plants' *role in an ecosystem*;	• SCI X. E5
(D)~~(B)~~	make observations and compile data about fluctuations in abiotic cycles ~~and *evaluate their effects on local ecosystems*~~;	• SCI II. A7 • SCI III. C1 • MATH VI. C2, C3
(E)	*evaluate* the *effects* of fluctuations in abiotic cycles *on local ecosystems*; and	
(F)~~(C)~~	evaluate the impact of human activity such as pest control, hydroponics, monoculture planting, and sustainable agriculture on ecosystems.~~;~~ ~~and~~	• SCI X. E2
~~(D)~~	~~predict how the introduction, removal, or re-introduction of an organism may affect the food chain and existing populations.~~	• Similar to 8.C
(11)~~(9)~~	The student analyzes soil science as it relates to plant and human activity ~~food and fiber production~~. The student is expected to:	• SCI X. B2 • SCI X. E3
(A)	explain soil formation;	• SCI IX. E4
(B)	evaluate the properties ~~and nature~~ of soils, including texture, horizons, structure, color, parent materials, and fertility;	• SCI III. B3 • SCI IX. E4
(C)	identify and classify soil orders;	• SCI III. B3 • SCI V. D1 • SCI IX. E4
(D)~~(C)~~	explain methods ~~recognize the importance~~ of *soil* conservation ~~of *soil* and agencies involved in conservation~~;	• SCI X. D2
(E)~~(D)~~	describe ~~recognize~~ the application of soil mechanics to buildings, landscapes, and crop production ~~to engineering and excavation operations~~;	• SCI X. E3

(F)~~(E)~~	research and explain ~~perform~~ soil management practices such as tillage trials and sustainable soil management practices; ~~and~~	• ELA V. A1, A2 • SCI III. D1, D2 • CDS II. E1, E4
(G)~~(F)~~	practice and explain soil evaluations related to experiential activities such as land judging;~~.~~	• SCI X. E1
(H)	evaluate soil health through soil testing; and	
(I)	analyze concepts of soil ecology.	
(15)~~(10)~~	The student describes the relationship between resources within environmental systems. The student is expected to:	• SCI IX, F2 • SCI X. D2
(A)	summarize and evaluate methods of land use and management;	• SCI X. E1
(B)	identify sources, ~~use,~~ quality, and conservation of water in plant production;	• SCI X. D2
(C)	explore and describe ~~the use and~~ conservation practices ~~of renewable and non-renewable resources~~ such as rainwater collection, water-conserving irrigation systems and use of biofuels;	• SCI X. D2 • Renewable and nonrenewable have been removed and added methods of conservation instead
(D)	analyze and evaluate the economic significance and interdependence of components of the environment;	
(E)	evaluate the impact of human activity and technology on soil health ~~fertility~~ and plant productivity;	• CDS II. E1, E2, E3, E4 • SCI VI. B3 • SE clarity
(F)	evaluate the impact of natural disasters on soil health and plant productivity ~~analyze and describe the effects on environments of events such as fire, hurricanes, deforestation, mining, population growth, and urban development on plants and soil~~; and	• SCI VI. C2 • SE clarity
(G)	explain how regional changes in the environment may have a global effect.	• SCI V. B2 • SS I. A2
~~(11)~~	~~The student describes the origin and use of water in a watershed. The student is expected to:~~	• Redundant to aquatic, less applicable to plant and soil science
~~(A)~~	~~identify sources and calculate the amount of water in a watershed, including ground and surface water;~~	
~~(B)~~	~~research and identify the type of water used in a watershed;~~	
~~(C)~~	~~analyze water quality in a watershed; and~~	
~~(D)~~	~~identify and use methods to evaluate water quantity available in a watershed.~~	

(12)	The student maps the process of soil formation influenced by weathering, including erosion processes due to water, wind, and mechanical factors influenced by climate. The student is expected to:	• SCI V. B2
(A)	illustrate or model the role of weathering in soil formations;	• SCI III. B3
(B)	distinguish chemical weathering from mechanical weathering; ~~and~~	• SCI III. B3
(C)	identify geological formations that result from differing weathering processes; and~~.~~	• SCI III. B3
(D)	identify the role of biotic factors in soil formation.	
(16)~~(13)~~	The student describes the dynamics of soil on ~~a~~ watersheds and its effects on plant growth and production. The student is expected to:	• Clarity of the standard
(A)	identify and record the characteristics of a local watershed such as average annual rainfall, runoff patterns, aquifers, location of water basins, and surface reservoirs; and	• SCI III. B3 • SCI V. C1
(B)	analyze the impact of floods, drought, irrigation, urbanization, and industrialization in a watershed.	
~~(14)~~	~~The student explains how petroleum energy resources affect agriculture. The student is expected to:~~	• Out of scope of plant and soil science, added biofuels to the course
~~(A)~~	~~research and describe the origin of fossil fuels such as coal, oil, and natural gas;~~	
~~(B)~~	~~analyze issues regarding the use of fossil fuels and other non-renewable energy sources or alternative energy sources; and~~	
~~(C)~~	~~analyze the significance and economic impact of the use of fossil fuels and alternative energy sources.~~	
(14)~~(15)~~	The student evaluates components of plant science as they relate to crop production and advancements. The student is expected to:	• SCI X. E3
(A)	analyze ~~plant~~ ~~*physiology,*~~ genetics and evolution ~~reproduction~~ of various crops;	• Moved to new KS 10 • SCI III. B3 • SCI VI. D1, F2 • SCI X. E3
(B)	identify and classify plants according to taxonomy;	• SCI I. E2 • SCI V. D1 • SCI VI. E1

(C) ~~(B)~~	identify ~~recognize~~ characteristics related to seed quality such as mechanical damage, viability, and grade;	• Measurability
(D) ~~(C)~~	identify plant pests and diseases using laboratory equipment such as microscopes, test kits, and technology ~~and their causes, prevention, and treatment~~;	• SCI X. E2 • Causes, prevention, and treatment redundant to horticulture and greenhouse operations
(E) ~~(D)~~	perform and evaluate plant management practices such as germination tests, plant spacing trials, and fertilizer tests; ~~and~~	SCI VI. B3
(F) ~~(E)~~	measure trends in crop species and varieties grown locally in Texas and the United States and how trends ~~they~~ affect producers ~~agriculture~~ and consumers~~.~~; and	• SCI X. E3
(G)	identify recent advancements in plant and soil science.	• Adding recent advancements in food production
(8) ~~(16)~~	The student identifies how plants grow and how specialized cells, tissues, and organs develop. The student is expected to:	• SCI VI. A1
(A)	identify the unique structure and function of organelles in plant cells;	• SCI III. B3 • SCI VI. A1, A3, A6
(B)	explain the growth and division of plant cells;	• SCI VI. A4
(C) ~~(A)~~	compare cells from different parts of the plant, including roots, stems, flowers, and leaves, to show specialization of structures and functions; and	• SCI V. D1
(D) ~~(B)~~	illustrate ~~sequence~~ the levels of cellular organization in plants ~~multicellular organisms that relate the parts to each other and the whole~~.	• Revised for clarity • SCI III. B3
~~(17)~~	~~The student diagrams the structure and function of nucleic acids in the mechanism of genetics. The student is expected to:~~	• Redundant to biology
~~(A)~~	~~describe components of deoxyribonucleic acid (DNA) and illustrate how information for specifying the traits of an organism is carried in DNA;~~	
~~(B)~~	~~identify and illustrate how changes in DNA cause phenotypic or genotypic changes;~~	
~~(C)~~	~~compare and contrast genetic variations observed in plants and animals; and~~	
~~(D)~~	~~compare the processes of mitosis and meiosis and their significance.~~	
(18)	The student demonstrates skills related to the human, scientific, and technological dimensions of crop production and the resources necessary for producing domesticated plants. The student is expected to:	• SCI X. E3
(A)	describe the growth and development of major agricultural crops in Texas such as cotton, corn, sorghum, sugarcane, wheat, and rice;	• SCI X. E3

(B)	apply principles of genetics and plant breeding to plant production;	• SCI III. B3 • SCI VI. D1
(C)	illustrate ~~examine~~ the development of crop varieties through the origin of agriculture; ~~and~~	• SCI X. E3 • SS I. A2, A3, A4, A6 • SS III. A2
(D)	design and conduct investigations to test ~~support~~ known principles of genetics~~.~~; and	• SCI VI. D1
(E)	identify and test alternative growing methods such as hydroponics, and aquaponics, used in plant production.	• Addressing advancements in plant production
~~(19)~~	~~The student explains the chemistry involved in plants at the cellular level. The student is expected to:~~	• Redundant to biology
~~(A)~~	~~compare the structures and functions of different types of organic molecules such as carbohydrates, lipids, proteins, and nucleic acids;~~	
~~(B)~~	~~compare the energy flow in photosynthesis to the energy flow in cellular respiration; and~~	
~~(C)~~	~~investigate and identify the effect of enzymes on plant cells.~~	
~~(20)~~	~~The student identifies the sources and flow of energy through environmental systems. The student is expected to:~~	• Redundant to biology
~~(A)~~	~~summarize forms and sources of energy;~~	
~~(B)~~	~~explain the flow of energy in an environment;~~	
~~(C)~~	~~investigate and explain the effects of energy transformations in an ecosystem; and~~	
~~(D)~~	~~investigate and identify energy interaction in an ecosystem.~~	
(7)	The student understands interrelationships between plants, soil, and people in historical and current contexts. The student is expected to:	• SCI IV. C1
(A)	identify major historical milestones of plants and soil in human civilization;	• SS I. A2, A3, A4, A6 • SS III. A2
(B)	explain how humans have influenced plant selection and how plant selection has influenced civilization's development;	• SS I. A2, A3, A4, A5, A6
(C)	analyze the effect of soil properties on settlement of civilizations and migration; and	• SS I. A2, A3, A4, A6 • SS III. A2
(D)	investigate and explain how plants have shaped major world economies.	• SS I. A2, A3 • SS I. D • SS III. A2

(10)	The student develops an understanding of plant *physiology* and nutrition. The student is expected to:	• Moved from old 15.A
(A)	explain the metabolic process of photosynthesis and cellular respiration;	• SCI III. B3 • SCI VI. B3, B4, B6, F2, G3 • SCI X. A6
(B)	identify the role of mineral nutrition in the soil for plant development;	• SCI VI. G2
(C)	identify the essential nutrients in soil; and	• SCI VI. G2
(D)	describe the role of macronutrients and micronutrients in plants.	• SCI VI. G2
(9)	The student develops a knowledge of plant anatomy and functions. The student is expected to:	
(A)	describe the structure and function of plant parts, including roots, stems, leaves, flowers, fruits, and seeds;	• SCI VI. F2
(B)	differentiate the anatomy of monocots and dicots;	• SCI V. D1
(C)	compare the various propagation methods for plants; and	• SCI V. D1 • SCI VI. F2
(D)	identify the functions of modified plant structures such as tubers, rhizomes, pseudo stems and pitchers.	• SCI VI. F2

§127.XXX. Viticulture (One Credit), Adopted 2024.		
TEKS with edits		Work Group Comments/Rationale
(a)	General requirements. This course is recommended for students in Grades 10-12. Recommended prerequisite: Principles of Agriculture, Food and Natural Resources. Students shall be awarded one credit for successful completion of this course.	Recommend: Allow combining with the Agricultural Laboratory and Field Experience
(b)	Introduction.	
(1)	Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.	
(2)	The Agriculture, Food, and Natural Resources Career Cluster focuses on the production, processing, marketing, distribution, financing, and development of agricultural commodities and resources, including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.	
(3)	Viticulture is a course designed to provide students with the academic and technical knowledge and skills that are required to pursue a career related to vineyard operations, grape cultivation, and related industries that contribute to the Texas economy. Students in Viticulture develop an understanding of grape production techniques and practices, while emphasizing environmental science related to production decisions. To prepare for success, students need opportunities to learn, reinforce, experience, apply, and transfer their knowledge and skills in a variety of settings.	• Removed as numbers may change over time
(4)	Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.	
(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.	
(c)	Knowledge and skills.	
(1)	The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:	
(A)	identify career and entrepreneurship opportunities for a chosen occupation in the field of viticulture and develop a plan for obtaining the education, training, and certifications required;	• Consistency • Increase rigor
(B)	model professionalism by continuously exhibiting appropriate work habits, solving problems, taking initiative, communicating effectively, listening actively, and thinking critically;	• Moved from 1.D • Increase rigor • Consistency • CCRS: ELA.IV.A.4

(C)	model appropriate personal and occupational safety and health practices and explain the importance of established safety and health protocols for the workplace;	• Increase rigor • Consistency • CCRS: ELA.IV.A.4; S.I.C.2.b
(D)	analyze and interpret the rights and responsibilities, including ethical conduct and legal responsibilities of employers and employees; and	• Moved to 1.B • Increase rigor • CCRS: ELA.IV.A.4
(E)	analyze the importance of exhibiting good citizenship and describe the effects of good citizenship on the development of home, school, workplace, and community.	• Increase rigor • Consistency • CCRS: ELA.IV.A.4 • SS I. C3 • CDS 1. E2, E4
(2)	The student develops a supervised agricultural experience program. The student is expected to:	• Consistency
(A)	plan, propose, conduct, document, and evaluate a supervised agricultural experience program as an experiential learning activity;	• Consistency • CCRS: ELA.V
(B)	use appropriate record-keeping skills in a supervised agricultural experience program;	• Consistency • CCRS: M.IV.B.1
(C)	participate in youth agricultural leadership opportunities;	• Consistency
(D)	review and participate in a local program of activities; and	• Consistency
(E)	create or update documentation of relevant agricultural experience such as community service, professional or classroom experiences.	• Consistency
(3)	The student understands the history and progression of the viticulture industry. The student is expected to:	• Added to provide background knowledge and industry history
(A)	trace relevant historical advancements in viticulture as they relate to current industry practices;	• SS I. A3 • SCI IV. A1
(B)	research and identify emerging technology in the viticulture industry; and	• ELA V. A1, A2 • SCI III. D1 • SCI IV. A1 • CDS II. E1, E4
(C)	identify current trends affecting the viticulture industry.	
(4)	The student explains the production cycle and basic physiology of grapevines. The student is expected to:	• SCI X. E3
(A)	apply asexual propagation techniques used in the production of domesticated grapes;	
(B)	identify the major vegetative and reproductive structures of grapevines;	• SCI I. E2

(C)	describe the annual vegetative growth and reproductive cycle of grapevines;	• SCI I. E2 • SCI VI. E1
(D)	explain how environmental conditions influence grapevine vegetative and reproductive growth; and	
(E)	describe the use of training systems in vineyard production.	
(5)	The student analyzes vineyard design and development. The student is expected to:	• SCI X. E3
(A)	identify the site characteristics required for successful vineyard production;	• SCI X. E1, E4
(B)	evaluate the soil and climatic characteristics of a potential vineyard site to determine if it is suitable for vineyard production;	• SCI X. E1, E4
(C)	identify and research successful vineyards in other parts of the world with soil and climate characteristics similar to local conditions; and	• ELA V. A1, A2 • SS I. A1 • SCI III. D1 • SCI X. E1, E4
(D)	develop a vineyard design and installation plan.	• SCI X. E1, E4
(6)	The student evaluates technology and practices utilized for vineyard frost protection. The student is expected to:	• SCI X. E3 • CDS II. E1, E4
(A)	describe the environmental conditions that lead to plant cold injury;	
(B)	identify frost damage in grapevines and effective frost damage mitigation techniques;	
(C)	differentiate advection and radiation frost events;	
(D)	evaluate passive frost protection techniques employed in vineyards;	
(E)	evaluate active frost protection techniques employed in vineyards; and	
(F)	analyze the cost effectiveness of frost protection systems.	
(7)	The student demonstrates vineyard management techniques. The student is expected to:	• SCI X. E3
(A)	identify and demonstrate safe and appropriate usage of vineyard tools;	• More measurable
(B)	describe dormant pruning of grapevines as an effective method for minimizing crop loss due to frost;	• Clarity
(C)	identify grapevine-training techniques such as spur and cane pruning; and	
(D)	explain the use of technology in modern vineyard production systems.	• CDS II. E1, E4

(8)	The student develops an integrated pest management plan for vineyards. The student is expected to:	• SCI X. E3
(A)	identify the common insect pests and diseases found in vineyards;	
(B)	identify common animal pests problematic in vineyards;	
(C)	evaluate the components of integrated pest management related to vineyards;	• SCI X. E2
(D)	explain cultural practices for vineyard pest control; and	• SCI X. E2
(E)	describe the safe and effective usage of pesticides in vineyards.	• SCI X. E2
(9)	The student examines soil properties and soil fertility as it relates to vineyards production systems. The student is expected to:	• SCI X. E3
(A)	explain the concepts of soil type, soil texture, and basic soil chemistry;	• SCI X. E5
(B)	identify the essential nutrients required by grapevines;	
(C)	describe the relationship between soil properties and fertility;	• SCI X. E4
(D)	calculate the fertilizer needs of grapevines;	• MATH I. A2, C2 • MATH VII. B1, D1 • MATH IX. B1, B3 • SCI VII. I2
(E)	develop and present a vineyard fertilization plan; and	• SCI X. E4
(F)	identify the practices of organic vineyards.	• SCI X. E3, E4
(10)	The student evaluates water requirements vineyards and associated climatic factors. The student is expected to:	• SCI X. E3
(A)	explain the water requirements of grapevines;	• SCI X. E4
(B)	compare grape varieties that thrive in local soil and weather conditions;	• More measurable • SCI V. D1 • SCI VI. E1 • SCI VI. E1
(C)	analyze the influence of soil properties and climate on vineyard water usage;	• SCI X. E1, E4, E5
(D)	describe irrigation strategies used in vineyards;	• SCI X. E4
(E)	identify the water resources required for vineyards;	• SCI X. E4
(F)	describe methods of determining soil moisture; and	

(G)	calculate the irrigation needs of vineyards based on soil and climate.	• MATH I. A2, C2 • MATH VII. D1 • MATH IX. B1, B3