Board of Education

5 Minortown Road ~ Woodbury, CT 06798
www.ctreg14.org

Mission: The mission of Connecticut Region 14 Schools is to educate all students to their highest level of academic potential and to teach them the skills and knowledge to become capable, creative, collaborative lifelong learners and responsible members of the world community.

Board of Education Goals:
Academic Performance - The district will strive to improve academic performance for all students on multiple assessment indicators and the staff will be committed to continuous improvement.
Communication - Region 14 will develop partnerships with all stakeholders in the school community to highlight the exemplary programs the district offers
Safety - Region 14 will provide safe and secure facilities equipped with technology, enabling a 21st century learning environment that supports the values of the district
Budget - Region 14 will prepare a budget that meets the needs of every student and communicates the needs and priorities of Region 14 in a clear and concise manner.

A G E N D A

Board of Education - Regular Meeting
Monday, April 7, 2025; 6:00 p.m.
Bethlehem Elementary School
Library Media Center

I. Call to Order……..…..Mr. James Crocker

II. Pledge of Allegiance…….....Mr. James Crocker

III. Introductions…….……....Mr. James Crocker

IV. Approval of Minutes (Action Anticipated)……..……..…..Mr. James Crocker
   A. Regular Meeting, Monday, March 3, 2025
   B. Regular Meeting(Budget Workshop #1), Monday, March 10, 2025
   C. Budget Presentation to the Boards of Selectmen and Boards of Finance of the towns of Bethlehem and Woodbury dated Monday, March 24, 2025
   D. Public Hearing dated Tuesday, March 25, 2025

V. Superintendent's Report
   A. Student Representative Report
   B. Student Award Presentation
   C. Woodbury-Bethlehem Community Music Foundation Presentation
   D. Nonnewaug High School NEASC Update

VI. Committee Reports

A. Finance Committee

1. Discussion of District Projects (Action Anticipated)
2. Teacher Retirement Proposal (Possible Action)

B. Curriculum Committee

On a recommendation by the Curriculum Committee to approve the following curricula: (Action Anticipated)

1. Ag Engineering Grade 10
2. Equine Science (11/12) - Comprehensive Care and Management of Equine Animals
3. Equine Science (11/12) - Equine Biology and Evolution
4. Digital Design 1
5. AP Calculus AB

C. Textbook Proposal

On a recommendation by the Curriculum Committee to approve the following textbook: (Action Anticipated)

1. AP Environmental Science Textbook

B. Policy Committee

On a recommendation by the Policy Committee to approve the following policies (First Read, No Action Anticipated)

A. Policy 4134 Tutoring

B. Policy 4111/4211 Recruitment and Selection

VII. Board Chair's Comments……Mr. James Crocker

VIII. Privilege of the floor

The Board of Education will recognize citizens of Bethlehem and Woodbury, any parent/guardian of a child enrolled in the Region 14 School District, or any current employee of the Region 14 School District who are asked to state their name and town of residence and to please limit comments to three (3) minutes. Up to 21 minutes of statements per topic are allowed. All comments should be addressed to the Board of Education Chair. Decorum will be enforced.

IX. Old Business

X. New Business

A. Discussion/possible action on Budget for 2025/2026

Move that the Region 14 Board of Education approve and adopt the Superintendent's proposed budget for the fiscal year 2025/2026 in the amount of $43,346,298 as presented to the Board.

B. Calling of Referendum (action anticipated)

Move that the Board of Education schedule and warn the Annual District Meeting for Monday, May 5, 2025 at 6:00 p.m. in the Flanders Room at Mitchell Elementary School, 14 School Street, Woodbury, CT concerning the 2025/2026 budget, with said meeting to be adjourned to a referendum on Tuesday, May 6, 2025 from 6:00 a.m. to 8:00 p.m. in the Towns of Bethlehem and Woodbury, CT.

C. Approval of Explanatory Text (action anticipated)

Move that the Secretary of the Board of Education is authorized, in such official's discretion, to prepare and cause to be printed and distributed explanatory text and other neutral printed materials regarding the 2025/2026 budget referendum scheduled for Tuesday, May 6, 2025, with such explanatory text and other neutral printed materials subject to the review and approval of the District's legal counsel and to be prepared and distributed in accordance with Section 9-369b of the Connecticut General Statutes.

D. Community Notification (action anticipated)

Move that the Chairman of the Board of Education is authorized, in such official's discretion, to request and cause the Superintendent of Schools to use the District's community notification system to provide notice of the referendum, in accordance with Section 9-369b of the Connecticut General Statutes.

E. Nonnewaug High School Graduation Date for the Class of 2025: Saturday, June 14, 2025/Rain Date, Sunday, June 15, 2025 (Action Anticipated)

XI. Other Business

XII. Adjournment

Minutes
Regular Meeting of the Region 14 Board of Education
Monday, March 3, 2025; 6:00 p.m.
Mitchell Elementary School
Flanders Room

Present:
Jim Crocker, Chairman
Chris Matta
Carol Ann Brown
Alice Jones
Caren Lipinski
Chris Griffin

Absent:
Tikva Rose
Michael Carbonneau

Also Present:
Brian Murphy, Superintendent
Tina Tanguay, Director of Finance and Operations

I. Call to Order
Chairman Crocker called the meeting to order at 6:00 p.m.

II. Pledge of Allegiance/Introductions
The Pledge of Allegiance was recited and members of the Board of Education and Central Office staff introduced themselves.

III. Approval of Minutes
A. Regular Meeting, Monday, February 3, 2025
A motion was made by Chris Matta and seconded by Caren Lipinski to accept/approve the minutes as presented, Chris Griffin abstained, motion carried.

IV. Superintendent's Report
A. Board of Education Student Representative Report
There was no report

B. Request for Leave of Absence
Superintendent Murphy received a request for a leave of absence from Lee Skalkos, Art teacher at Woodbury Middle School, for family obligation purposes. She will return to work on January 5, 2026. Superintendent Murphy recommended that the Board grant her request.

A motion was made by Jim Crocker and seconded by Chris Griffin to accept/approve the leave of absence as presented, all in favor, none opposed, motion carried

unanimously.

C. Superintendent's 2025/2026 Budget Presentation
- Superintendent presented 2025-2026 budget of $43,346,298, a 4.99% increase from previous year
- District ranked in top 27% of Connecticut school districts for academic performance
- Two schools received achievement distinction awards:
  - Mitchell Elementary School
  - Bethlehem Elementary School
- District accountability index of 78.5 exceeded state average
- 73% of budget allocated to salaries and benefits
- Salary increases account for $1.523M (75%) of total budget increase
- Federal Funding Reduced

VI. **Committee Reports**

A. Curriculum Committee

Ms. Jones, Chair of the Curriculum Committee, recapped the course proposals brought before the Board for approval on a recommendation by the Curriculum subcommittee.

1. Music Appreciation

   Motion

   A motion was made by Alice Jones and seconded by Jim Crocker to accept/approve Music Appreciation as presented, all in favor, none opposed, motion carried unanimously.

2. Music Fundamentals and Ear Training

   Motion

   A motion was made by Alice Jones and seconded by Jim Crocker to accept/approve Music Fundamentals and Ear Training as presented, all in favor, none opposed, motion carried unanimously.

3. The Writer's Studio/ENGL 3082

   Motion

   A motion was made by Alice Jones and seconded by Jim Crocker to accept/approve The Writer's Studio/ENGL 3082 as presented, all in favor, none opposed, motion carried unanimously.

B. Policy Committee

Chris Matta, Chair of the Policy Committee, recapped the policies brought before the Board for approval on a recommendation by the Policy subcommittee, second read, action anticipated

1. Policy 3323 Soliciting Prices

   Motion

   A motion was made by Chris Matta and seconded by Caren Lipinski to

accept/approve Policy 3323 as presented, all in favor, none opposed, motion carried unanimously.

2. Policy 6172 Alternative Education Programs
   Motion
   A motion was made by Chris Matta and seconded by Caren Lipinski to accept/approve Policy 6172 as presented, all in favor, none opposed, motion carried unanimously.

VII. Board Chair Comments

Chairman Crocker stated that the district is finally in a place of focus and high performance. He thanked the educational team for contributing to a stabilized environment.

VIII. Privilege of the Floor

There was none

IX. Old Business

There was none

X. New Business

A. Health Food Certification

Required motion language for participation in healthy food option of Healthy Food Certification.

Motion One

Jim Crocker moved that Pursuant to C.G.S. Section 10-215f, the **Regional School District 14 Board of Education** certifies that all food items offered for sale to students in the schools under its jurisdiction, and not exempted from the Connecticut Nutrition Standards published by the Connecticut State Department of Education, will comply with the Connecticut Nutrition Standards during the period of July 1, 2025, through June 30, 2026. This certification shall include all food offered for sale to students separately from reimbursable meals at all times and from all sources, including but not limited to school stores, vending machines, school cafeterias, culinary programs, and any fundraising activities on school premises sponsored by the school or non-school organizations and groups, seconded by Alice Jones, all in favor, none opposed, motion carried unanimously.

Required motion language for combined food and beverage exemptions

Motion Two

Jim Crocker moved that the **Regional School District 14 Board of Education** will allow the sale to students of food items that do not meet the Connecticut Nutrition Standards and beverages not listed in Section 10-221q of the Connecticut General Statutes provided that the following conditions are met: 1) the sale is in connection with an event occurring after the end of the regular school day or on the weekend; 2) the sale is at the location of the event; and 3) the food and beverage items are not sold from a vending machine or school store. An "event" is an occurrence that involves more than just a regularly scheduled practice, meeting, or extracurricular activity. For example, soccer games, school plays, and interscholastic debates are events but soccer practices, play rehearsals, and debate team meetings are not. The "regular school day" is the period from midnight before to 30 minutes after the end of the official school day. "Location" means where the event is being held and must be the same place as the food and beverage sales, seconded by Carol Ann Brown, all in favor, none opposed, motion carried unanimously.

XI. Other Business

There was none

XII. Adjournment

A motion was made by Jim Crocker and seconded by Chris Griffin to adjourn the meeting at 6:50 p.m., all in favor, none opposed, motion carried unanimously.

Respectfully Submitted,

Patricia Paige
Board Clerk
Recorded and filed subject to Board of Education approval by: Patricia Paige, Board Clerk

Minutes created with assistance of Circleback AI"

Minutes
Regular Meeting/Budget Workshop #1
Region 14 Board of Education
Monday, March 10, 2025; 6:00 p.m.
Mitchell Elementary School
Flanders Room

Present:
Jim Crocker, Chairman
Chris Matta
Carol Ann Brown
Alice Jones
Caren Lipinski

Absent:
Tikva Rose
Michael Carbonneau
Chris Griffin

Also Present:
Brian Murphy, Superintendent
Tina Tanguay, Director of Finance and Operations
Mark Sommaruga, Attorney for the Board

I. Call to Order
Chairman Crocker called the meeting to order at 6:00 p.m.

II. Pledge of Allegiance/Introductions
The Pledge of Allegiance was recited and members of the Board of Education and Central Office staff introduced themselves.

III. Board of Education Workshop #1

A. Discussion of the Superintendent's Proposed 2025/2026 Budget
At their previous meeting, Board members were asked to review the proposed 25/26 budget and to reach out to Tina Tanguay with questions. A brief discussion was had regarding the capital reserve fund and the status of the already approved projects.

The meeting scheduled for Monday, March 17, 2025 has been cancelled

IV. Discussion with Board Attorney on referendum advocacy issues
- Legal counsel explained the fundamental law prohibits spending public money to influence voter decisions in referendums
- Law only takes effect when referendum becomes legally pending on (**April 7, 2025)**
- State Election Commission enforces these regulations
- Legal counsel clarified that public funds cannot be used to influence referendum votes after (**April 7, 2025)** when referendum becomes legally pending

- Board members retain full rights to personal advocacy using private resources (after **April 7, 2025)**
- Neutral communications about referendum facts, dates, and locations are permitted using district resources

V. Adjournment

A motion was made by Jim Crocker and seconded by Chris Matta to adjourn the meeting at 7:11 p.m., all in favor, none opposed, motion carried unanimously.

Respectfully Submitted,

Patricia Paige
Board Clerk
Recorded and filed subject to Board of Education approval by: Patricia Paige, Board Clerk

Minutes created with assistance of Circleback AI"

Minutes
Region 14 Board of Education
Budget Presentation to the Boards of Selectmen and Boards of Finance
of the Towns of Bethlehem and Woodbury
Monday, March 24, 2025; 6:00 p.m.
Woodbury Middle School
Cafeteria

Present:
Jim Crocker, Chairman
Chris Matta
Carol Ann Brown
Alice Jones
Caren Lipinski

Absent:
Chris Griffin
Tikva Rose
Michael Carbonneau

Also Present:
Brian Murphy, Superintendent
Tina Tanguay, Director of Finance and Operations

I. Call to Order

Jim Crocker called the meeting to order at 6:00p.m.

II. Pledge of Allegiance/Introductions

The Pledge of Allegiance was recited and acquaintances were made

III. Presentation of the Superintendent's proposed 2025-2026 budget to the Boards of Selectmen and Finance of the towns of Bethlehem and Woodbury

The Superintendent's proposed budget:

- Supports the district's goals and meets the needs of all students and staff
- Notes an increase of $2,060,835 over last year or 4.99%
- Contractual salaries and benefits (health insurance) are the driving force at 73% of the total budget or 94% of the 4.99% increase
- Includes the addition of one new staff member, a 1.0 F.T.E. Elementary Spanish teacher
- Student Services indicated a decrease of $709,075, specifically in the areas of outplacement and transportation costs
- No major capital projects in the budget for 2025/2026
- Significant decreases in federal funding Title I, IDEA, and School Mental Health

V. **Discussion of Superintendent's Proposed 2025-2026 Budget**

Principal discussions included:

- State reimbursement for Special Education costs and its impact on the district
- IEPs versus 504 costs per student
- Teacher Salary Increases
- Out-of-district Vo-Ag Tuition and Enrollment Numbers
- Capital Projects (Technology)
- Decrease in Federal Grant Funding/Impact on Region 14
- Covid Monies/Staff

XI. Adjournment

A motion was made by Jim Crocker and seconded by Carol Ann Brown to adjourn the meeting at 7:32 p.m., all in favor, none opposed, motion carried unanimously.

Respectfully Submitted,

Patricia Paige
Board Clerk

Recorded and filed subject to Board of Education approval by: Patricia Paige, Board Clerk

PUBLIC HEARING
Minutes
Tuesday, March 25, 2025; 6:00 p.m.
Auditorium, Nonnewaug High School
5 Minortown Road, Woodbury, CT

Present:	**Absent:**
Jim Crocker, Chairman	Tikva Rose
Chris Matta	Chris Griffin
Carol Ann Brown	Caren Lipinski
Alice Jones	Michael Carbonneau

Also Present:
Brian Murphy, Superintendent
Tina Tanguay, Director of Finance and Operations
Dina Ericson, Director of Student Services
Taryn Fernandez, Director of Teaching and Learning
Attorney John McDonald, Moderator

Patricia Paige, Board Recording Clerk

I. Call to Order
Mr. Crocker called the Public Hearing to order at 6:00 p.m.

II. Pledge of Allegiance/Introductions
The Pledge of Allegiance was recited and acquaintances were made

III. Appointment of Moderator
Mr. Crocker appointed Attorney John McDonald as moderator of the meeting.

IV. Appointment of Meeting Clerk by the Moderator
Attorney McDonald appointed Patricia Paige as meeting clerk.

V. Call of the Meeting
Attorney McDonald read the Call of the Meeting:
To present and receive questions about the Regional School District 14 Superintendent's proposed budget for 2025-2026. Attorney McDonald deferred

to Superintendent Brian Murphy to present the proposed budget.

VI. Presentation of the Superintendent's proposed Region 14 Budget for the 2025/2026 School Year

The Superintendent's proposed budget:

- Supports the district's goals and meets the needs of all students and staff
- Notes an increase of $2,060,835 over last year or 4.99%
- Contractual salaries and benefits (health insurance) are the driving force at 73% of the total budget or 94% of the 4.99% increase
- Includes the addition of one new staff member, a 1.0 F.T.E. Elementary Spanish teacher
- Student Services indicated a decrease of $709,075, specifically in the areas of outplacement and transportation costs
- No major capital projects in the budget for 2025/2026
- Significant decreases in federal funding Title I, IDEA, and School Mental Health

VII. Budget Comments and Questions by the Public

Karen Reddington-Hughes, Woodbury
Staffing positions during Covid and how many still exist
Why the decrease in Special Education
Vo-Ag tuition reimbursement formula

Gary Suslavich, Woodbury
Agriscience program enrollment and tuition
Woodbury Middle School teacher salaries
Classes/Class Sizes
Paraprofessional Salary Line
Pre-school tuition and how it compares to private schools
Increase in equipment line/what is the district purchasing
Number of students in PreK
Shift in reserve funds

Steve Sordi, Bethlehem
Agriscience students/special education costs
Huge disparity in costs between in-district and out-of-district students
Is there a waitlist for district students for the Ag Program

Diane Macleod, Woodbury
Local Ag students vs sending districts' students' tuition and fees
Region 14 is getting short-changed

Ray Butkus, Bethlehem
Not only is expense increasing, so is the rate of acceleration. It a rate of change issue
Respectfully requested that the Board of Education examine the budget with a view towards the taxpayers and the voters in their communities
Quoted Bethlehem Taxpayer, "When is enough, enough?"

Phil Dunphy, Bethlehem
Appalled, need to look internally
Is the district contractually obligated to have inbound students
Could not find transparency in the budget
Who develops the budget and when does the process begin

Dr. Karen Miller, Bethlehem
Has the district thought about co-teaching
When was the last time excess money was returned to the towns
Seniors have fixed budget
Need more transparency

George Rehkamp
Are the special education costs for out-of-district students covered by sending towns/do they supply the resources

VIII. <u>Adjournment</u>
Hearing no further comments, Attorney McDonald adjourned the Public Hearing at 7:36 p.m.

Respectfully Submitted,

Patricia Paige
Board Clerk

Recorded and filed subject to Board of Education approval by: Patricia Paige, Board Clerk

SOPHOMORE AGRICULTURAL ENGINEERING CURRICULUM

	
Grade Level(s): 10	**Curriculum Author(s):** Andrew Zielinski
Course Description: *Students enrolled in the Sophomore Ag Engineering Curriculum will be exposed to a wide variety of topics including precision measurement, outdoor construction, machinery maintenance and operation, small engines, introduction to welding, and agricultural electrical utilities.*	

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner Attribute and Indicator**
Precision Measurement	How does precision measurement relate to engine mechanics?	Students will understand that precision measurement allows exact computation of clearances, size, bolt threads, and distances that are essential to engine efficiency.	CCE3(9-12); DE4(9-12); TI3(9-12); AA2(9-12)
Outdoor Construction	How can mathematical principles be applied to construction?	Students will understand that properly squaring and leveling a building stakeout allows for an accurate and stable base to construct a structure	TCC4, CCE3, DE4, TI1, TI3, P1
Machinery Maintenance and Operation	Why is preventative maintenance important?	Students will understand that preventative maintenance ensures equipment longevity, decreased cost over time, and protection of equipment during seasonal changes	TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3
Small Engines	Why is four stroke theory important to understanding preventative maintenance?	Students will understand how an engine operates and identify commons sources of failure in an engine	TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3
Introduction to Welding	How does understanding of individual welding processes increase welding technique?	Understanding how welding works increases technique by decreasing porosity, creating optimal penetration, correctly balancing heat transfer an increasing overall weld quality	TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3

Ag Electrical Utilities	Why is it important to read and understand electrical diagrams?	Measuring and rating electricity helps with application of proper electrical devices and limits safety risks	TCC4, CCE3, DE4, TI1, TI3, P1, AA2, AA3

Unit 1 - Shop Safety & Precision Measurement

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
Performance Indicator: PST.01.0 - Apply physical science laws and principles to identify, classify, and use lubricants.
Performance Indicator: Identify and use hand and power tools and equipment for service, construction, and fabrication
PST.01.02.01.c. Select, use and dispose of lubricants according to local, state, and federal regulations
PST.01.02.01.b. Maintain and repair tools used in agricultural mechanics

Vision of A Learner Attributes: Students will be able to independently use their learning to...

- CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.
- DE4(9-12): I can work respectfully with all members of my community and support the needs of others.
- TI3(9-12): I can formulate and investigate probing questions to further my learning.
- AA2(9-12): I can assess my past successes and mistakes to change my approach.

Understandings:	**Essential Questions:**
• A well-organized, and well-maintained shop ensures effective use of time and increased longevity of equipment. • Precision measurement allows exact computation of clearances, size, bolt threads, and distances that are essential to engine efficiency.	• Why is shop maintenance and organization important? • How does precision measurement relate to engine mechanics?
Students will know...	**Students will be able to...**
• How to select, use, and dispose of lubricants according to local,	• Demonstrate knowledge of local, state, and federal regulations

state, and federal regulations. ● How to maintain and repair tools used in agricultural mechanics ● How to properly maintain and organize and clean the shop equipment and facility ● How to read a vernier caliper to the hundredths of an inch ● How to tap and die a threaded hole for a particular bolt	and properly dispose of lubricants in the shop (oils, cleaners, etc…) ● Maintain and repair tools used in agricultural mechanics ● Organize and maintain a clean and organized shop ● Read the measurement of a bolt using a vernier caliper to the hundredths of an inch ● Utilize the tap drill chart, caliper, and proper shop tools to tap and die a threaded hole for a particular bolt
Key Vocabulary: caliper, vernier scale, micrometer, tap, die, bolt length, thread length, body length, fine thread, coarse thread, root, crest, thread count, torque	
Assessment Evidence	
Performance Tasks: *Summative: Bolt Tap & Die Activity (Shop)* **AA3, P1** - Students demonstrate the correct way to tap and die a threaded hole for a particular bolt in a piece of flat steel. Included precision measurement, fraction to decimal conversion, correct use of power tools and tap & die set.	**Other Evidence:** Classwork: Bolt Measurement Exercise (utilize caliper and thread pitch gauge to measure assigned bolts) **DE4** Interim: Measurement Quiz (terminology, bolt grading, using the caliper) Classwork: Tap Drill Chart Assignment (practice using the tap drill chart to determine tap drill size)
Learning Plan	
● Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3** ● Learn precision measurement terminology and identify precision measurement tools **TI3** ● Use a caliper, thread pitch gauge, and tap drill chart to drill and tap a threaded hole. **AA2**	
Teacher Resources: *Steps to Reading a Caliper notes; Bolt Handout (With Tap Drill Chart) - notes for students; Fundamental of Service - John Deere - FOS60 - Fasteners*	

Unit 2 - Outdoor Construction

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
Performance Indicator: PST.05.04. Follow architectural and mechanical plans to construct agricultural buildings and facilities.
Performance Indicator: CT-PST.05.02. Apply structural plans, specifications, and building codes

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY –
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.
CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.
DE: DEMONSTRATE EMPATHY –
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.
TI: TAKE INITIATIVE –
TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3(9-12): I can formulate and investigate probing questions to further my learning.
P: PERSEVERE –
P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

Understandings:

- Mathematical principles are integral to construction as they enable precise measurements, efficient use of resources, and adherence to design specifications, ensuring the functionality, safety, and cost-effectiveness of agricultural and structural projects. By applying concepts such as geometry, ratios, and algebra, students can create accurate plans, estimate costs,

Essential Questions:

- How can mathematical principles be applied to construction?
- Why is leveling and squaring important to building layout?

and optimize materials for sustainable and effective construction. ● Properly squaring and leveling a building stakeout allows for an accurate and stable base to construct a structure	
Students will know... ● How to operate basic land surveying equipment ● How to complete a building stake-out based on Pythagorean Theorem and by using a transit ● How to utilize agricultural plans/drawings and measure accurately	**Students will be able to...** ● Identify and operate basic land surveying equipment ● Complete a building stake-out using both pythagorean theorem and provided surveying equipment ● Interpret agricultural plans and measure accurately
Key Vocabulary: transit, survey staff, batter-board, plumb bob, acre, leveling, squaring, benchmark	
Assessment Evidence	
Performance Tasks: *Summative: Batter Boards* - Students will properly square and level a building stake-out along with installing batter boards and leveling strings. This process reflects industry required techniques and real-world applications.	**Other Evidence:** Classwork: Understanding Reading a Rod (becoming more familiar with reading the survey staff) Interim: Surveying Quiz (terminology, tools, uses for survey) Classwork: Survey Staff Practice (becoming more familiar with reading the survey staff) Classwork: Area Worksheet (determining area)
Learning Plan	
● Demonstrate proper use of surveying equipment to do differential leveling, calculate areas, and batter boards. **DE4, CCE 3** ● Learn precision land measurement and identify surveying tools **TI3**	
Teacher Resources: Cooper, Elmer. Agricultural Mechanics: Fundamentals and Applications. 2nd Edition. Delmar Publishers Inc. 1992	

Unit 3 - Machinery Maintenance & Operation

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
PST.01.01.01.a. Classify lubricants by source, sustainability, and equipment capability
PST.01.01.01.b. Classify lubricants by SAE viscosity and API service classifications
PST.02.01.01.a. Identify and schedule power unit and equipment lubrication
PST.02.02.01.a. Operate and maintain agricultural machinery and power systems
PST.02.02.01.b. Use operator/service/technical manuals utilized in agriculture mechanics

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY –
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

DE: DEMONSTRATE EMPATHY –
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

TI: TAKE INITIATIVE –
TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3(9-12): I can formulate and investigate probing questions to further my learning.

P: PERSEVERE –
P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

AA: ADAPT AND ADJUST –
AA2(9-12): I can assess my past successes and mistakes to change my approach.
AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

Understandings:	**Essential Questions:**
• Preventative maintenance ensures equipment longevity, decreased cost over time, and protection of equipment during seasonal changes	• Why is preventative maintenance important?
Students will know...	**Students will be able to...**
• How to identify proper lubricants and fluid capacities using the operators/service/technical manual • How to operate and maintain agricultural machinery and power systems • How to identify and verify the presence of safety systems and hardware on tools and equipment • How to verify fluids are at the appropriate levels on a piece of equipment	• Perform a 100hr increment service on an assigned piece of equipment • Operate a school-owned piece of equipment safely • Verify a piece of equipment is safe to operate by completing a pre-operation check and ensuring safety systems are present

Key Vocabulary: radiator, coolant, hydraulic oil, engine oil, drain plug, load tester, SMV (slow moving vehicle), Zerk, coolant tester, acid tester, terminal, hydraulic filter

Assessment Evidence	
Performance Tasks:	**Other Evidence:**
Interim: Maintenance Documentation (Students complete summary of work completed to be put into maintenance binders and kept according to industry standards)	Classwork: Operators Manual Lookup (researching technical data, is also how students keep track of maintenance data in the shop) Classwork: Equipment Maintenance Background Wksht (bellringer/lead-in to equipment maintenance)

Learning Plan
• Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3** • Identify and schedule power unit and equipment lubrication. **DE4** • Operate and maintain agricultural machinery and power systems **TI3, TCC4**
Teacher Resources: Equipment Manuals for school tractors/equipment (print & digital copies) Filter Numbers Binder

Unit 4 - Small Engines

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
CT-PST.03.01 Troubleshoot a repair internal combustion engines
PST.01.02.02.a. Identify and explain the appropriate use of tools used in agricultural mechanics
PST.01.02.01.b. Maintain and repair tools used in agriculture mechanics
PST.02.02.01.a. Operate and maintain agricultural machinery and power systems
PST.02.02.01.b. Use operator/service/technical manuals utilized in agricultural mechanics
PST.02.02.02.b. Explain the safe operation of agricultural tractors and related agricultural equipment
PST.03.01.01.a. Identify components and systems of internal combustion engines
PST.03.01.01.b. Utilize technical manuals and computer-based diagnostics in engine analysis and repair

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY –
TCC4: Transfer new learning and skills to other contexts and settings beyond the classroom.
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –
CCE3: Lead group progress through active listening, questioning, and giving advice.
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

DE: DEMONSTRATE EMPATHY –
DE4: Are inclusive and help others in need.
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

TI: TAKE INITIATIVE –

TI1: Organize time to set goals and devise plans.
TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3: Ask questions to direct learning and self-advocate.
TI3(9-12): I can formulate and investigate probing questions to further my learning.

P: PERSEVERE –
P1: Identify and utilize personal strengths to overcome obstacles.
P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

AA: ADAPT AND ADJUST –
AA2: Reflect on prior experiences to recall successful pathways and strategies.
AA2(9-12): I can assess my past successes and mistakes to change my approach.
AA3: Cope with unanticipated changes and maintain a productive attitude.
AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

Understandings:	**Essential Questions:**
• Understanding the four-stroke theory is essential for recognizing how internal combustion engines operate, which aids in diagnosing potential problems and implementing effective preventative maintenance strategies to enhance engine performance and longevity. • Proficiency in selecting and using appropriate tools and understanding engine components is critical for the accurate disassembly and reassembly of engines, ensuring operational safety, reliability, and adherence to technical standards.	• Why is four stroke theory important to understanding preventative maintenance? • What tools and parts are needed to properly disassemble and reassemble an engine?
Students will know...	**Students will be able to...**
• Students will know how to utilize technical manuals to look up specifications to assist in engine disassembly/reassembly • Students will know the components and systems of internal combustion engines • Students will know the tools used used in engine disassembly/reassembly	• Lookup engine specifications to assist in engine disassembly/reassembly • Identify the components and systems of internal combustion engines • Identify small engine tools • Disassemble/reassemble an engine according to factory

• Students will know how to disassemble/reassemble an engine according to factory specification	specifications

Key Vocabulary: carburetor, fuel tank, governor, compression, air filter, valves, piston, rings, crankshaft, connecting rod, muffler, ignition, coil/armature, spark plug, camshaft, shut-off switch(es), crankcase, oil, oil filter, flywheel, cooling fins, torque, lapping

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Students will successfully disassemble and reassemble a Briggs & Stratton OHV small engine. Graded with a Checklist Summative: Small Engines Test (written)	Classwork: Four Stroke Theory Worksheet while watching Briggs & Stratton Four Stroke Theory video Classwork: Parts ID & Functions worksheet Interim: Four Stroke Theory Classwork: Small Engines Systems worksheet - organize parts into the appropriate systems based on the parts function Classwork: Small Engines Review Sheet

Learning Plan

- Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3**
- Explain four stroke theory and the parts that make up a small engine **P1**
- Successfully disassemble and reassemble a Briggs & Stratton small engine to factory specifications **CCE3**

Teacher Resources:

Briggs & Stratton - Single Cylinder OHV Repair Manual

Briggs & Stratton Power Portal (Online Resource) https://www.thepowerportal.com/

Unit 5 - Introduction to Welding

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
PST.01.02.01.b. Maintain and repair tools used in agricultural mechanics
PST.01.02.01.c. Assess the performance of self and/or peers in use of hand and power tools to safely and efficiently service, construct, and fabricate quality products
PST.02.02.01.a. Operate and maintain agricultural machinery and power systems
PST.05.01.01.a. Identify kinds and characteristics of metal materials
PST.05.05.02.a. Identify personal protective equipment (PPE) used in welding
PST.05.05.02.b. Demonstrate how to safely setup, use, and turn off oxy-acetylene welding equipment
PST.05.05.03.a Demonstrate how to safely set up, use, and turn off shielded metal arc welding (SMAW) equipment
PST.05.05.04.a. Demonstrate how to safely set up, use, and turn off a gas metal arc welding (GMAW) system

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY –
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

DE: DEMONSTRATE EMPATHY –
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

TI: TAKE INITIATIVE –
TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3: Ask questions to direct learning and self-advocate.

TI3(9-12): I can formulate and investigate probing questions to further my learning.

P: PERSEVERE –
P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

AA: ADAPT AND ADJUST –
AA2(9-12): I can assess my past successes and mistakes to change my approach.
AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

Understandings:	**Essential Questions:**
• A safe environment prevents injuries, protects equipment and the environment, and increases productivity • Understanding how welding works increases technique by decreasing porosity, creating optimal penetration, correctly balancing heat transfer an increasing overall weld quality	• How is understanding safe protocol important when using welding equipment? • How does understanding of individual welding processes increase welding technique?
Students will know...	**Students will be able to...**
• How a welding shop needs to be set up in order to complete all welding processes safely • What personal protective equipment (PPE) is needed in order to weld safely • How to set up, use, and turn off oxygen/acetylene equipment • How to set up, use, and turn off SMAW equipment • How to set up, use, and turn off GMAW/FCAW equipment	• Identify potential hazards in the shop and correct them when setting up a safe welding shop • Identify and wear appropriate clothing and PPE for welding • Perform basic welding strategies with oxygen/acetylene torches • Perform basic arc (stick or SMAW) welding methods with a variety of welding electrodes • Perform basic FCAW & GMAW (wire-feed) welding

Key Vocabulary: melting point, molten puddle, fusion, gas shield, inner cone, oxidizing flame, reducing flame, flagging flame, neutral flame, Gas Metal Arc Welding (GMAW), Flux Core Arc Welding (FCAW), acetylene, arc length, electrode, flux, alternating current (AC), direct current (DC), lap joint, tee joint, butt joint, corner joint, edge joint

Assessment Evidence	
Performance Tasks: Students will complete three welding joints (butt, lap, and tee-joint) for each welding method. Student grades will be with checklist	**Other Evidence:** Classwork: Introduction to Welding Classwork: Oxy-Fuel cutting & welding notes Interim: Shop Performance tasks (complete a weld using oxygen/acetylene, stick welding, and MIG welding processes) Classwork: Stick welding notes Classwork: MIG welding notes

Learning Plan

- Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3**
- Recognize what a safe welding shop looks like and take steps to ensure shop safety **P1**
- Successfully perform the following welding processes: oxygen/acetylene, stick welding, and MIG (wire-feed) welding **AA2, AA3, P1, TI1**

Teacher Resources:

Lincoln Welding & Miller Welding websites

Teacher created

Unit 6 - Ag Electrical Utilities

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Pathway Content Standard: The student will demonstrate competence in the application of principles and techniques for the development and management of power, structural, and technical systems.
Performance Element: PST.01 - Use physical science principles and engineering applications with power, structural and technical systems to solve problems and improve performance.
PST.04.03.01.a. Define and measure amps, volts, and watts
PST.04.03.02.a. Identify the kinds and applications of electricity, including direct and alternating current
PST.04.03.03.a. Identify electrical measurements and make measurements calculations
PST.04.03.06.a. Describe the process of installing the following electrical circuits: duplex receptacle, single pole switch with light, and three-way switch with light
PST.04.03.07.a. Identify hazards and safety practices in planning, installing, and using electricity
PST.o4.03.03.b. Distinguish electrical circuits and components of each

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY –
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY –
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

DE: DEMONSTRATE EMPATHY –
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

TI: TAKE INITIATIVE –
TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3(9-12): I can formulate and investigate probing questions to further my learning.

P: PERSEVERE –

P1(9-12): I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

AA: ADAPT AND ADJUST –
AA2(9-12): I can assess my past successes and mistakes to change my approach.
AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

Understandings:	**Essential Questions:**
• A safe environment prevents injuries, protects equipment and the environment, and increases productivity • Understanding an electrical diagram allows safe installation of electrical devices • Measuring and rating electricity helps with application of proper electrical devices and limits safety risks	• Why is safety during electrical work important? • Why is it important to read and understand electrical diagrams? • Why should you be able to quantify electricity?
Students will know...	**Students will be able to...**
• How to define and measure electricity, including amperage, volts, ohms, and watts • How to identify different electrical systems and diagrams • Types of wire and various electrical components • Basic function of a DMM (Digital Multi-Meter)	• Explain amperage, volts, ohms, and watts • Differentiate between AC (Alternating Current) and DC (Direct Current) circuits • Select the right type of wire based on the application in which it is being used for • Utilize a DMM (Digital Multi-Meter) to take basic measurements of an electrical circuit

Key Vocabulary: voltage, amperage, electrical potential, watt, ohm, AC (Alternating Current), DC (Direct Current), NM (Non-metallic romex), UF (Underground Feed), MC (Metallic cable - armored cable), load, DMM (Digital Multi-Meter)

Assessment Evidence	
Performance Tasks:	**Other Evidence:**
Electrical Shop Activity - students will construct various circuits to current electrical code and test for functionality. Checklist used to grade.	Interim: electrical terminology, wire types, wire color coding

Learning Plan
• Demonstrate safe shop practices including, but not limited to, chemical disposal, appropriate shop attire, and maintaining a safe shop. **DE4, CCE3** • Explain terminology associated with electrical circuits, identify different types of wire and explain color coding, and take basic electrical measurements using a DMM (Digital Multi-Meter) **TCC4, CCE3** • Construct and test various circuits to the current electrical code as a group **P1, DE4**
Teacher Resources: *Electrical Wiring Exercises - ITCS Instructional Materials. University of Illinois: Vocational Agriculture* *Teacher Created*

COMPREHENSIVE CARE AND MANAGEMENT OF EQUINE ANIMALS CURRICULUM

Grade Level(s): 11-12	**Curriculum Author(s):** Marisa Bedron

Course Description:
This course offers a thorough exploration into the multifaceted world of equine care, management, and facility design. Designed for students interested in equine sciences, veterinary studies, or careers in the equine industry, this comprehensive program covers critical aspects of horse health and stable management including: biosecurity, facility design and management, anatomy and physiology, nutrition, health management. Throughout the course, students will engage in both theoretical and practical activities, including case studies, facility visits, hands-on workshops, and interactive simulations. This approach ensures that students not only learn the science behind equine management but also acquire the practical skills needed to apply this knowledge effectively. Upon completion of this course, students will be well-prepared to pursue further education in equine studies or embark on a career in the equine industry, equipped with a holistic understanding of the demands to manage and care for horses responsibly and professionally. Students enrolled in this course and its pair (Equine Biology and Evolution) are eligible for University of Connecticut Early College Experience (ECE) credit. Every student must maintain and document an approved supervised agriculture experience (SAE) project and actively participate in the Woodbury FFA Chapter to develop premier leadership, personal growth, and career success through attending FFA meetings and participating in chapter events and planning.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Principles and Practices of Equine Biosecurity	What strategies and practices are critical in preventing, managing, and controlling the spread of diseases and pests among animal populations to ensure their health and welfare?	Animal biosecurity is a critical concept in preventing and managing the spread of diseases among horses, and it has broader implications for public health, agriculture, and the environment.	TCC2, TCC3, TI1, DE1, DE4, P4
Equine Facility Design and Management	How can the design and management of a horse facility optimize animal welfare, ensure efficient operations, and meet regulatory and ethical standards?	Effective design and management of a horse facility are fundamental to ensuring optimal animal welfare, operational efficiency, and compliance with ethical and regulatory standards.	TCC4, AA1, DE2, P4
Equine Anatomy and Physiology: Foundations for Equine Health and Performance	How do specific anatomical and physiological traits impact the overall performance, health, and suitability of an animal for its intended purpose or breed standard?	The form and function of an animal's anatomy and physiology are crucial in determining their overall performance, health, and alignment with breed standards or specific roles.	TCC3, TCC4, TI2, TI3, AA1, AA3, DE2, DE3, P1

Equine Nutrition: Principles and Practices for Optimal Health	How do the nutritional needs of horses vary with their life stage, activity level, and health status, and how can these needs be met through balanced feeding practices?	Meeting the specific nutritional needs of horses through balanced and tailored feeding practices is crucial for their health, performance, and overall well-being.	TCC2, TCC3, TCC4, TI1, TI3, AA1, CCE2, CCE3
Equine Health and Management: Essentials for Optimal Care	How can effective management practices and preventative health measures be integrated to optimize the overall health, performance, and longevity of horses?	Comprehensive health and management practices, including preventative care, effective daily management, and proactive health monitoring, are crucial for ensuring the overall well-being, performance, and longevity of horses.	TCC1, TCC3, TCC4, TI1, TI2, AA1, AA3, CCE1, DE1, DE4

UNIT 1 | PRINCIPLES AND PRACTICES OF EQUINE BIOSECURITY

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Agriculture, Food and Natural Resources Framework

AS.01.01.01.b Examine characteristics of animals that developed in response to environmental and production related influences.
AS.01.01.02.b Analyze the development of a variety of animal industries, technological advancements, research, and engineering practices and how they influenced products, services, and careers.
AS.01.02.03.b Execute effective record keeping and documentation practice for animal enterprises.
AS.01.03.01.b Analyze the roles of state and federal agencies and how they govern animal industries, international trade, and animal production policies.
AS.02.01.01.c Design quality-assurance programs and procedures for animal production.
AS.02.01.02.c Design safety procedures and plans for working with different species of animals based on animal behaviors and economical impact.
AS.02.02.01.b Utilize technology and equipment to perform animal husbandry and welfare procedures and techniques.
AS.02.02.03.b Analyze the impact of animal traceback and capabilities on producers and consumers.
AS.05.01.01.b Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe, sustainable, and efficient use of the facility.
AS.05.02.01.b Analyze animal facilities to determine if industry standards have been met.
AS.05.02.02.c Evaluate the impact of laws pertaining to animal systems.
AS.07.01.01.b Demonstrate the proper use and function of specific tools, techniques, and technology related to animal health management.
AS.07.01.04.b Analyze data to evaluate preventive measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
AS.07.02.01.b Analyze procedures at the local, state, and national levels to ensure biosecurity of the animal industry.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to the limitations on measurement when reporting quantities.

MATH.CONTENT.HSS.IC.B.6 Evaluate reports based on data.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC2 I can evaluate evidence from multiple perspectives,and recognize their limitations and implications, in order to justify new conclusions.

TCC3 I can integrate relevant information to produce multiple valid solutions.

TI: TAKE INITIATIVE

TI1 I can implement a realistic plan and adapt when necessary to achieve my goals.

DE: DEMONSTRATE EMPATHY

DE1 I can acknowledge, process, and respond appropriately to others comments and perspectives.

DE4 I can work respectfully with all members of my community and support the needs of others.

P: PERSEVERE

P4 I can take on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging.

Understandings: Students will understand that…

- Effective biosecurity practices help to prevent the introduction and transmission of infectious diseases among animals, which can have significant impacts on their health and productivity.
- My animal diseases can be transmitted to humans (zoonoses).
- Strong biosecurity measures reduce the risk of zoonotic and transmittable diseases jumping from animal to animal, or animal to human.
- Preventing disease outbreaks through biosecurity not only protects animal health but also maintains the economic stability of farming and agriculture industries by avoiding costly disease management and loss of equine animals.
- Biosecurity requires a combination of practices, including sanitation, vaccination, quarantine, and monitoring, all of which need to be tailored to specific animal species and environments.

Essential Questions:

- What are the key components of an effective equine biosecurity plan?
- How can biosecurity measures prevent the spread of infectious disease in equine facilities?
- What roles do isolation and quarantine play in managing disease outbreaks among horses?
- How can routine practices and facility design contribute to enhanced biosecurity?
- What are the consequences of inadequate biosecurity measures on the health and performance of horses?

Students will know…

- The fundamental principles of biosecurity, including the reasons for its implementation and the risks of non-compliance.
- Knowledge of common infectious diseases in horses, their modes of transmission, symptoms, and impact on health.
- Awareness of preventative measures such as vaccination, deworming, and regular veterinary checks.
- Familiarity with the protocols for isolating new or sick horses to

Students will be able to…

- Identify potential biosecurity risks in an equine facility and evaluate the effectiveness of existing measures.
- Create a comprehensive biosecurity plan tailored to a specific equine facility, considering its unique challenges and requirements.
- Properly implement quarantine measures for new or ill horses to prevent disease transmission.

prevent the spread of disease within a population. ● Understanding of effective sanitation practices, including the proper cleaning and disinfection of stalls, equipment, and transport vehicles. ● Knowledge of procedures to follow in the event of a disease outbreak, including reporting protocols and steps to mitigate spread. ● Insight into the legal requirements and ethical considerations in managing horse health and biosecurity.	● Execute effective sanitation and disinfection protocols to maintain a clean and disease-free environment. ● Respond appropriately to disease outbreaks, including implementing emergency protocols, communicating with veterinary professionals, and informing relevant authorities. ● Teach peers, staff and facility visitors about biosecurity practices to ensure widespread compliance and understanding. ● Critically assess and suggest improvements for facility design to enhance biosecurity measures and disease prevention.
Key Vocabulary: biocontainment, biosecurity, carrier, decontamination, disease transmission, disinfections, fomite, health certificate, infectious agent, isolation, outbreak, pathogen, personal protective equipment (PPE), quarantine, risk assessment, sanitation, surveillance, traffic control, vaccination, vector control	
Assessment Evidence	
Performance Tasks: *Classwork:* Complete a biosecurity scavenger hunt of the Nonnewaug High School Education Farm facilities. **P4** *Classwork:* Conduct a fictional or industry equine facility risk assessment identifying potential biosecurity threats such as disease transmission and human activity to assess the potential for biosecurity breaches. **TCC2, TI1** *Interim:* Analyze a real-world case study highlighting a biosecurity breach to identify factors that led to the breach, evaluate the response, and propose alternative strategies of prevention. **DE1, DE4, TCC3**	**Other Evidence:** *Summative:* Written summative (test) assessment.
Learning Plan	
● Students will assess methods to protect equine animals from disease and transmission. **P4** ● Students will apply biosecurity protocols to protect equine animals from disease and transmission. **TCC2, TI1** ● Students will evaluate the impact of current disease outbreaks in their local equine industry. **DE1, DE4**	
Teacher Resources: Teacher Created Resources	

UNIT 2 | EQUINE FACILITY DESIGN AND MANAGEMENT

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resources Framework

AS.05.01.01.a Describe the types of facilities needed to house and produce animal species in a safe, efficient, and human manner.
AS.05.01.01.b Critique designs for an animal facility and prescribe alternative layouts and adjustments for the safe, sustainable, and efficient use of the facility.
AS.05.01.01.c Design an animal facility focusing on animal requirements, economic efficiency, sustainability, safety, and ease of handling.
AS.05.01.02.a Identify equipment, technology, and handling facility procedures used in modern animal production (e.g., climate control devices, sensors, automation, etc.).
AS.05.01.02.b Analyze the use of modern equipment, technology, and handling facility procedures to determine if they enhance the safe, economic, and sustainable production of animals.
AS.05.01.02.c Recommend enhancements to equipment, technology, and handling procedures to improve sustainability and production efficiency.
AS.05.02.01.a Summarize the general standards that must be met in facilities for animal production (e.g., environmental, local zoning considerations, construction, etc.)
AS.05.02.01.b Analyze animal facilities to determine if industry standards have been met.
AS.05.02.02.a Categorize laws and regulations pertaining to animal systems (e.g., environmental, consumer protection, entertainment, etc.).
AS.05.02.02.b Analyze laws pertaining to animal systems.
AS.05.02.02.c Evaluate the impact of laws pertaining to animal systems.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC4 I can integrate my learning to adapt to experiences in the classroom, career life.

AA: ADAPT AND ADJUST

AA1 I can evaluate different approaches and justify the best pathway to success.

DE: DEMONSTRATE EMPATHY

DE2 I can honor my own feelings and show empathy toward others through my actions.

P: PERSEVERE

P4 I can take on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging.

Understandings: Students will understand that…

- Effective equine facility design enhances the health, safety, and welfare of horses by accommodating their physical and behavioral needs.
- Sustainable management practices within equine facilities are essential for long-term operational success and environmental stewardship.
- Safety and efficiency in equine facility design not only protects horses and handlers but also ensures smooth daily operations and reduces costs.
- Facilities must be adaptable to changes in management practices, technology, and the evolving needs of horses and their handlers.

Essential Questions:

- How do the principles of equine behavior and welfare influence facility design?
- What features of equine facility design are critical for optimizing the health and safety of horses and handlers?
- How can equine facilities be managed to minimize environmental impacts while maximizing operational efficiency?
- In what ways can equine facility designs be future-proofed to adapt to new technologies and changes in horse care practices?

Students will know…

- Understand the essential elements of equine facility design, including stabling, exercise areas, and storage needs.
- Recognize how facility design affects horse behavior, health, and performance.
- Be aware of environmental impacts related to equine facility management, such as waste disposal and water conservation.
- Know the regulatory and safety standards applicable to equine facility construction and management.
- Be informed about current and emerging technologies that can enhance facility management and horse care.

Students will be able to…

- Develop a simple layout that incorporates essential features such as stabling, feeding areas, waste management, and traffic flow.
- Implement management strategies that ensure cleanliness, safety, and environmental sustainability.
- Critically assess existing equine facility designs for efficiency, safety and horse welfare.
- Develop a comprehensive maintenance schedule that addresses both routine upkeep and long-term sustainability.
- Use knowledge of equine welfare and behavior to make informed decisions about facility features that enhance horse well-being.

Key Vocabulary:

aisleway, anti-slip flooring, arena, automated feeders, biosecurity protocols, composting system, cross-tie area, drafting, emergency evacuation plan, emergency evacuation plan, environmental enrichment, equine monitoring systems, feed room, fire suppression system, fire suppression system, green roofing, grooming bay, gutter drainage system, hay loft, heat stress management, hydronic heating, isolation stall, iso-thermal zone, lameness examination area, louvered ventilation, manure management, nutritional supplementation, paddock, perimeter fencing, perimeter fencing, preventative maintenance, rainwater harvesting, remote irrigation system, safety mats, safety mats, sawdust bedding, solar panels, stable, stall card, temperature sensors

Assessment Evidence	
Performance Tasks: *Classwork:* Assess form, function and quality of different equine facilities to meet animal welfare, biosecurity and efficient management practices. **TCC4** *Classwork:* Create a maintenance timeline for the Nonnewaug High School Education Farm equine facilities. **AA1, P4** *Summative:* Design an equine facility to meet a hypothetical client's needs to meet animal welfare, biosecurity and efficient management practices considering stall design and placement, feeding areas, water sources and equine amenities. **AA1**	**Other Evidence:** *Interim:* Written interim (quiz) assessment.

Learning Plan

- Students will design an equine facility using best management practices. **AA1, P4**
- Students will explore a multitude of equine facility designs to assess how they meet animal welfare, biosecurity and efficient management needs. **DE2, CCE2**

Teacher Resources:
Teacher Created Resources

UNIT 3 | EQUINE ANATOMY AND PHYSIOLOGY: FOUNDATIONS FOR EQUINE HEALTH AND PERFORMANCE

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resource Framework

AS.01.01.01.b Examine characteristics of animals that developed in response to environmental and production related influences.
AS.06.01.01.b Classify animals using a taxonomic classification system.
AS.06.01.03.c Communicate knowledge of animal systems with proper classification terms to others in an effective and accurate manner.
AS.06.02.03.a Identify the properties, locations, functions and types of animal cells, tissues, organs and body systems.
AS.06.02.03.b Compare and contrast animal cells, tissues, organs, body systems types, and functions among animal species.
AS.06.02.03.c Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions.
AS.06.03.01.a Identify optimal anatomical and physiological characteristics according to established breed standards.

AS.06.03.01.b Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.
AS.06.03.01.c Select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
ELA-LITERACY.RH.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC3 I can integrate relevant information to produce multiple valid solutions.
TCC4 I can integrate my learning to adapt to experiences in the classroom, career and life.

TI: TAKE INITIATIVE

TI2 I can evaluate my objectives and variety of credible resources to find the best solutions for any challenge.
TI3 I can formulate and investigate probing questions to further my learning.

AA: ADAPT AND ADJUST

AA1 I can evaluate different approaches and justify the best pathway to success.
AA3 I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

DE: DEMONSTRATE EMPATHY

DE2 I can honor my own feelings and show empathy toward others through my actions.
DE3 I can recognize my triggers, use appropriate coping strategies, and access relevant resources to help regulate my emotional response.

P: PERSEVERE

P1 I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.

Understandings: Students will understand that…

- The interconnectedness of equine body systems is essential for recognizing how they collectively support the health, movement, function of horses.
- A deep understanding of equine anatomy and physiology is critical for effective equine care, treatment, and management.

Essential Questions:

- How do the various systems of a horse interact to affect its overall health and capabilities?
- What anatomical and physiological characteristics are unique to horses and how do these traits enhance their performance?
- How can knowledge of equine anatomy and physiology inform

• Knowledge of how equine bodies function underpins all aspects of training, performance, and rehabilitation in the equine industry. • Horses have evolved specific physiological traits that enable their remarkable performance capabilities, which must be understood to optimize their care and management.	better health care, training, and management practices? • What are the implications of equine physiology for veterinary care and preventative health practices?
Students will know... • The major bones, muscles, and organs of the equine body and their functions. • How key systems such as the skeletal, muscular, respiratory, circulatory, and digestive systems operate and interact in horses. • Common anatomical and physiological disorders in horses, including symptoms and potential treatments. • Evolutionary adaptations that enable horses to perform specific tasks or endure environmental stresses. • Principles of preventative care that arise from an understanding of equine anatomy and physiology.	**Students will be able to...** • Identify and label the major anatomical features of a horse, including bones, muscles, and organs. • Explain how different bodily systems in horses interact and the implications for health and performance. • Apply their understanding of anatomy and physiology to practical scenarios in equine care, such as diet planning, exercise regimes, and disease prevention. • Analyze case studies involving equine health issues to diagnose problems and propose treatment based on anatomical and physiological knowledge. • Effectively communicate understanding and finding to peers, instructors, or professionals in the field through presentations, reports or discussions.
Key Vocabulary: alveoli, anatomy, circulatory system, cortex, digestive system, endocrine system, enzyme, gait, homeostasis, hoof, joint, ligament, lymphatic system, metabolism, muscular system, nervous system, neuron, palpation, physiology, respiratory system, skeletal system, tendon, vaccine	
Assessment Evidence	
Performance Tasks: *Classwork:* Participate in a practical examination identifying and labeling various anatomical structures on diagrams, models and live animals. **TI2** *Interim:* Prepare a detailed presentation explaining a physiological system and how it functions in the horse. **TCC3, AA1** *Summative:* Participate in a mock showmanship presentation focusing on evaluation of a partner animal's anatomical confirmation. **DE2, DE3, P1, AA3**	**Other Evidence:** *Interim:* Written interim (quiz) assessment.

Classwork: Oral presentation of visual observations of equine confirmation and physiological performance. **TI3, TCC3, TCC4,**	

Learning Plan

- Students will work with a partner animal to present a showmanship clinic experience showcasing the animal's anatomical confirmation. **DE2, DE3, P1, AA3**
- Students will identify and label equine anatomical structures, and outline their functions in the body. **TI2**
- Students will present a set of oral reasons describing their thoughts and opinions on the confirmation of equine animals. **TI3, TCC3, TCC4**

Teacher Resources:
Teacher Created Resources

UNIT 4 | EQUINE NUTRITION: PRINCIPLES AND PRACTICES FOR OPTIMAL HEALTH

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Agriculture, Food and Natural Resources Framework

AS.03.01.01.a Analyze essential nutrients required for animal health and analyze each nutrient's role in growth and performance.
AS.03.01.01.b Differentiate needs of animals based on growth stages, anatomy, and/or production systems (e.g., maintenance, gestation, work, growth, etc.).
AS.0301.01.c Develop a nutritionally balanced ration for an animal based on its production stage.
AS.03.02.01.a Compare and contrast common types of feedstuffs and their general quality and condition.
AS.03.02.01.b Evaluate the adequacy of feed rations using data from the analysis of feedstuffs, animal requirements, and performance.
AS.03.02.01.c Select appropriate feedstuffs for animals based on a variety of factors (e.g., economics, digestive system, and nutritional needs, etc.).
AS.03.02.03.a Summarize the purpose, impact, and mode of action of feed additives and growth promotants in animal production.
AS.03.02.03.b Compare and contrast methods that utilize feed additives and growth promotants with natural production practices.
AS.03.03.01.a Identify the tools, equipment, techniques, and technology used to meet animal nutrition needs and ensure an abundant, safe, and quality food supply.
AS.03.03.02.a Summarize the meaning of various components of feed labels and feeding directions.
AS.03.03.02.b Apply information from a feed label and feeding directions to feed animals.
AS.03.03.02.c Evaluate the potential impacts, positive and negative, of compliance and/or noncompliance with a feed label and feeding directions.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Vision of A Learner Attributes: Students will be able to independently use their learning to…

TCC: THINK CRITICALLY AND CREATIVELY

TCC2 I can evaluate evidence from multiple perspectives,and recognize their limitations and implications, in order to justify new conclusions.

TCC3 I can integrate relevant information to produce multiple valid solutions.

TCC4 I can integrate my learning to adapt to experiences in the classroom, career and life.

TI: TAKE INITIATIVE

TI1 I can implement a realistic plan and adapt when necessary to achieve my goals.

TI3 I can formulate and investigate probing questions to further my learning.

AA: ADAPT AND ADJUST

AA1 I can evaluate different approaches and justify the best pathway to success.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE2 I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.

CCE3 I can show initiative in prompting group discourse and fostering collaboration among others,providing actionable feedback, and working with others to solve problems and/or design products.

Understandings: Students will understand that…

- Understanding the basic nutritional needs of horses is essential for maintaining their health, performance, and longevity.
- The diet of a horse directly impacts its physical condition, performance capabilities, and susceptibility to various health issues.
- Effective equine nutrition involves tailoring diets to meet the individual needs of horses based on their age, weight, activity level, and health status.
- Proper nutrition is a key preventative measure that can reduce the likelihood of many common equine health problems.

Essential Questions:

- What are the fundamental components of a balanced equine diet and why are they important for horse health?
- How does a horse's nutritional needs change with age, activity level, and health status?
- What are the common nutritional disorders in horses, and how can they be prevented through diet?
- How can horse owners evaluate and adjust diets to ensure optimal health and performance.
- What role do supplements play in equine nutrition, and when are they necessary?

Students will know…

- The specific dietary needs of horses, including macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins and

Students will be able to…

- Analyze and critique horse diets to ensure they meet nutritional requirements based on the horse's profile.

minerals). ● Various types of feeds and forages available for horses, their nutritional content, and appropriate use. ● Circumstances under which supplements are needed to address dietary deficiencies or support health conditions. ● Strategies for managing diets in special situations such as pregnancy, lactation, old age, or competitive training. ● How improper nutrition can lead to health problems such as colic, laminitis, and metabolic disorders.	● Develop balanced diet plans for horses in various life stages and with different activity levels. ● Implement and manage feeding regimes that accommodate individual horse needs and stable management practices. ● Identify signs of nutritional deficiencies and excesses, and know how to correct them. ● Evaluate the necessity and efficacy of dietary supplements in an equine diet. ● Communicate nutritional plans and rationales to horse owners, trainers, and caretakers effectively.

Key Vocabulary:
ad libitum, amino acids, balanced diet, by-product, carbohydrate, carbohydrate metabolism, chelated minerals, colic, complete feed, concentrate, crude protein (CP), digestible energy (DE), digestible protein (DP), endotoxin, energy density, fat, feed efficiency, feeding behavior, fiber, forage, forage analysis, forage-to-concentrate ratio, hydration, laminitic diet, laminitis, metabolic syndrome, metabolizable energy (ME), microbial protein, mineral bioavailability, minerals, net energy (NE), non-structural carbohydrates (NSC), nutrient density, nutrient density, nutrient interactions, nutrient partitioning, nutrient requirements, pellets, performance nutrition, phytate, protein, ration, structural carbohydrates, supplement, total digestible nutrients (TDN), vitamins

Assessment Evidence

Performance Tasks: *Classwork:* Conduct a nutrient analysis of several common feedstuffs used in equine diets to delineate between concentrates, forages and supplements. **TCC2, CCE2** *Interim:* Conduct a pasture assessment of the Nonnewaug Education Farm pasture facilities to determine nutritional value, poisonous plants and management needs. **TCC4** *Classwork:* Use the Pearson Square methodology to create a balanced ration for an equine animal, calculating the proportions of each feed ingredient needed to meet an animal's nutritional requirements. **TI1, CCE3**	**Other Evidence:** *Interim:* Written interim (quiz) assessment. *Summative:* Written summative (test) assessment. *Classwork:* Take instructional notes on the digestive system organs and their functions. *Classwork:* Complete a scenario activity determining appropriate feeding methods for various equine life stages. **AA1 TI1, CCE3**

Learning Plan

- Students will evaluate the types of hay. **TI3**
- Students will learn the organs present in the equine digestive system and each of the organ's functions. **TCC3**
- Students will identify types of feed concentrates. **TCC2, CCE2**

- Students will learn the methods of feeding for different stages of the equine life cycle. **AA1**

Teacher Resources:
Teacher Created Resources

UNIT 5 | EQUINE HEALTH AND MANAGEMENT: ESSENTIALS FOR OPTIMAL CARE

Established Goals:

Connecticut Agriculture, Food and Natural Resources Framework

AS.02.01.02.b Analyze animal welfare procedures used to ensure safety and minimize stress during management practices.
AS.07.01.01.b Demonstrate the proper use and function of specific tools, techniques, and technology related to animal health management.
AS.07.01.01.c Select tools, techniques, and technology to meet specific animal health management goals.
AS.07.01.02.a Explain methods of determining animal health and disorders.
AS.07.01.02.b Analyze illnesses and disorders of animals based on symptoms and problems caused by wounds, diseases, parasites, and physiological disorders.
AS.07.01.03.c Treat common diseases, parasites, and physiological disorders of animals according to directions prescribed by an animal health professional.
AS.07.01.04.a Identify characteristics of causal agents and vectors of diseases and disorders in animals.
AS.07.01.04.b Analyze data to evaluate preventative measures for controlling and limiting the spread of diseases, parasites, and disorders among animals.
AS.07.01.05.a Explain the clinical significance of common veterinary methods and treatment (e.g., aseptic techniques, antibiotic use, wound management, etc.).

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
MATH.CONTENT.HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
MATH.CONTENT.HSN.Q.A.3 Choose a level of accuracy appropriate to the limitations on measurement when reporting quantities.
MATH.CONTENT.HSS.IC.B.6 Evaluate reports based on data.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC1 I can ask purposeful, insightful questions to find a variety of innovative solutions.
TCC3 I can integrate relevant information to produce multiple valid solutions.
TCC4 I can integrate my learning to adapt to experiences in the classroom, career and life.

TI: TAKE INITIATIVE

TI1 I can implement a realistic plan and adapt when necessary to achieve my goals.
TI2 I can evaluate my objectives and variety of credible resources to find the best solutions for any challenge.

AA: ADAPT AND ADJUST

AA1 I can evaluate different approaches and justify the best pathway to success.
AA3 I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE1 I can initiate discussion with my peers and teachers about a variety of topics, respecting differing viewpoints, actively listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias.

DE: DEMONSTRATE EMPATHY

DE1 I can acknowledge, process, and respond appropriately to others' comments and perspectives.
DE4 I can work respectfully with all members of my community and support the needs of others.

Understandings: Students will understand that…

- Comprehensive equine health management encompasses not only disease prevention and treatment but also includes daily care practices, nutritional management, and mental well-being.
- Preventative health care is crucial for maintaining the long-term health and performance of horses, including regular vaccinations, deworming, dental care, and hoof care.
- Effective equine managers must develop keen observation skills to detect early signs of illness or distress in horses, facilitating timely intervention.
- Managing equine health involves integrating knowledge of veterinary medicine, nutrition, psychology, and facility management to create optimal living conditions.

Essential Questions:

- What are the key components of effective equine health management?
- How do daily care practices impact the overall health and well-being of a horse?
- What preventive measures can be taken to protect horses from common diseases and injuries?
- How can equine caretakers identify and address early signs of health issues in horses?
- What role does the environment play in the health and management of equine populations?

Students will know…

- Key indicators of health in horses, including vital signs like temperature, pulse, and respiration rates, and what these indicators can reveal about a horse's health.
- Symptoms, causes, and preventive strategies for common equine diseases and ailments such as colic, laminitis, and respiratory infections.

Students will be able to…

- Conduct routine health checks to assess the well-being of horses and recognize signs of potential health issues.
- Design and implement a comprehensive preventive health care program that includes vaccination schedules, parasite control and regular veterinary check-ups.
- Develop and manage feeding plans that meet the nutritional

• The role of nutrition in maintaining equine health and how to formulate diets that meet the specific needs of individual horses. • How to perform routine care procedures such as hoof care, dental care, grooming, and administering medications. • Steps to take in emergency situations, including how to assess the situation, provide first aid, and when to call a veterinarian.	needs of horses at different stages of life and activity levels. • Safely administer basic treatments such as vaccinations, dewormers, and first aid. • Create and execute management plans that consider the housing, health, and welfare needs of horses in various settings. • Effectively communicate health care and management plans to horse owners, trainers, and other stakeholders in the equine industry.
Key Vocabulary: anthelmintic, biomechanics, body condition scoring (BCS), colic, cribbing, deworming, endoscope, equine metabolic syndrome (EMS), farrier, fecal egg count (FEC), float, founder, hoof abscess, laminitis, navicular disease, pastern, probiotics, quarantine, strangles, tack, thrush, vaccination, withers	
Assessment Evidence	
Performance Tasks: *Interim:* Perform a fundamental health assessment of an equine animal recording temperature, pulse, respiration, comprehensive history and observations. **AA3, TI2, DE1** *Summative:* Create a health care management plan for an equine animal throughout its lifecycle including routine maintenance and vaccination schedules. **TI1, AA1, TCC3, TCC4** *Interim:* Practice first aid, and emergency procedures on equine animals. **DE4, AA3, TCC1**	**Other Evidence:** *Classwork:* Observe industry professionals perform routine dental procedures to maintain animal health and wellness. **CCE1**
Learning Plan	
• Students will collect health vital signs including temperature, pulse and respiration. **AA3, TI2, DE1** • Students will identify proper vaccine protocols for equine animals throughout their lifecycle. **TI1, AA1, TCC3, TCC4** • Students will practice first aid and emergency procedures in response to equine animal emergencies. **DE4, AA3, TCC1**	
Teacher Resources: Teacher Created Resources	

EQUINE BIOLOGY AND EVOLUTION CURRICULUM

Nonnewaug Equine Science	REGION 14 SCHOOL DISTRICT — VISION OF A LEARNER
Grade Level(s): 11/12	**Curriculum Author(s):** Marisa Bedron

Course Description:
This course provides an in-depth exploration of equine biology, tracing the evolutionary origins of horses and examining their complex biological systems. Designed for students with interests in veterinary medicine, equine science, or zoology, this course blends theoretical knowledge with practical insights into equine anatomy, physiology, and reproductive biology. The course will cover concepts such as evolutionary biology, systemic systems including the muscular, circulatory, and nervous systems, accessory systems including the respiratory, integumentary, endocrine system, and reproduction covering hormonal cycles, mating behaviors, and the gestation process. Throughout the course, students will engage with a variety of learning modalities, including lectures, laboratory dissections, industry professional guest speakers, and field trips to equine facilities. Upon completion, students will have a robust understanding of the biological foundations that underpin equine health and management. This knowledge will prepare them for advanced studies in equine sciences or careers in the equine industry, where a deep understanding of horse biology and evolution is essential. Students enrolled in this course and its pair (Comprehensive Care and Management of Equine Animals) are eligible for University of Connecticut Early College Experience (ECE) credit. Every student must maintain and document an approved supervised agriculture experience (SAE) project and actively participate in the Woodbury FFA Chapter to develop premier leadership, personal growth, and career success through attending FFA meetings and participating in chapter events and planning.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Tracing Hoofprints: The Evolutionary Journey of Equines	How have the evolutionary adaptations of horses shaped their physical characteristics, behavior, and ecological roles over time?	The evolutionary history of horses illustrates how species adapt to their environments through changes in physical traits and behaviors, demonstrating the broader principles of natural selection and adaptation in the context of ecological and environmental pressures.	TCC2, TCC3, TI3, AA1, AA4, CCE1, CCE3, DE1, P4
Equine Systemic Anatomy	How do the interconnected systems within a horse's body work together to maintain health, performance, and adaptability?	The health and performance of horses depend on the complex interplay between their systemic bodily systems, with each system contributing to the overall functionality and adaptability of the organism. Understanding these interactions is essential for optimizing care, performance, and well-being in equine management.	TCC2, TI4, CCE1, CCE2, CCE4, DE1
Equine Accessory Systems: Supporting Structures And Functions	How do the accessory systems of horses—such as the integumentary, endocrine, and sensory systems—support their overall health, behavior, and adaptation to their environment?	The accessory systems of horses, including the integumentary, endocrine, and sensory systems, play crucial roles in maintaining overall health and facilitating interactions with their environment, illustrating how specialized systems contribute to the adaptability and well-being of the organism.	TCC3, TI1, TI3, AA2, CCE1, CCE4, DE2, P1, P4

Equine Reproduction: Fundamentals And Advanced Techniques	The equine reproductive system is a complex interplay of anatomical and physiological processes that ensures species survival through successful mating, gestation, and foaling. Understanding these processes is essential for effective breeding practices and the health of both mares and stallions.	The equine reproductive system is a finely tuned network of physiological processes that work together to ensure successful reproduction. Knowledge of these processes is vital for managing breeding, optimizing fertility, and ensuring the health and well-being of both mares and stallions.	TCC1, TCC3, TI1, AA2, AA4, CCE4, DE4, P4

UNIT 1 | TRACING HOOFPRINTS: THE EVOLUTIONARY JOURNEY OF EQUINES

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resource Framework

AS.01.01.01.a Summarize the origin, significance, distribution, and domestication of different animal species.
AS.01.01.01.b Examine the characteristics of animals that developed in response to the environmental and production related influences.
AS.01.01.01.c Evaluate the implication of animal characteristics on production practices and the environment.
AS.01.01.02.a Summarize the major components of animal industrial systems (e.g., livestock, small animal, research).
AS.01.01.02.b Analyze the development of a variety of animal industries, technological advancements, research, and engineering practices and how they influenced products, services, and careers.

Common Core State Standards

ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
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Vision of A Learner Attributes: Students will be able to independently use their learning to...

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TCC2 I can evaluate evidence from multiple perspectives, and recognize their limitations and implications in order to justify new conclusions.
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TI: TAKE INITIATIVE

TI3 I can formulate and investigate probing questions to further my learning.

AA: ADAPT AND ADJUST

AA1 I can evaluate different approaches and justify the best pathway to success.
AA4 I can create opportunities to extend my learning by remaining open-minded in any situation.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE1 I can initiate discussions with my peers and teachers about a variety of topics, respecting differing viewpoints, actively listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias.
CCE3 I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

DE: DEMONSTRATE EMPATHY

DE1 I can acknowledge, process, and respond appropriately to others' comments and perspectives.

P: PERSEVERE

P4 I can take on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging.

Understandings: Students will understand that…

- The evolutionary adaptations of equine help explain the physiological and behavioral traits, highlighting how horses have evolved to meet environmental changes over millions of years.
- Equines have a rich phylogenetic history that illustrates the complexity of evolutionary processes, including speciation, adaptation, and extinction.
- The domestication of horses has significantly influenced their evolution, morphology, and genetics, shaping the modern breeds we see today.
- Studying equine evolution provides insights into biodiversity and the importance of conservation efforts to preserve genetic diversity and protect endangered equine species.

Essential Questions:

- How have equines evolved over millions of years, and what major adaptations have they developed?
- What factors have driven the evolutionary changes observed in equines?
- How has the process of domestication affected the physical and behavioral traits of modern horses?
- What can the study of equine evolution tell us about border ecological and evolutionary theories?
- Why is it important to conserve equine species and their habits, and what strategies can be employed to achieve this?

Students will know…

- Key milestones in the evolution of equines from ancient ancestors to present-day species.
- Specific adaptations such as hoof development, dental changes, and digestive system modifications that have enabled equines to survive and thrive.
- How domestication has led to genetic bottlenecks, breed formation, and changes in physical appearance and temperament.
- A survey of current equine species, including both domesticated breeds and wild equids, and their status in the wild.
- The conservation status of various equine species and the

Students will be able to…

- Examine and interpret fossil records to understand historical equine forms and their environments.
- Apply evolutionary theories to explain the changes observed in the equine lineage.
- Identify specific anatomical and physiological adaptations in equines and relate these to environmental pressures.
- Assess the conservation needs of modern equine species and propose strategies to address these needs.
- Effectively communicate the results of their studies through presentations, reports, and discussions, using appropriate scientific terminology.

ecological roles they play in their respective environment.	

Key Vocabulary:
adaptation, biodiversity, cladistics, domestication, ecological niche, endangered species, eocene epoch, evolution, fossil record, genetic diversity, herbivore, hoofed mammals (ungulates), hyracotherium (eohippus), miocene epoch, morphology, paleontology, phylogeny, pleistocene epoch, quaternary extinction event, speciation

Assessment Evidence

Performance Tasks:
Classwork: Analyze fossil data of early equines to understand their morphological changes over time such as hoof structure, dental patterns, and size. **TI3, TCC2. DE1**

Interim: Create a detailed timeline that maps the evolutionary progression of equines from Hyracotherium to modern horses including evolutionary milestones, geological epochs, and significant environmental changes that influenced equine evolution. **P4, CCE3**

Classwork: Select a significant adaptation in equines, such as hoof development or grazing-related dental changes, to conduct a case study exploration of how this adaptation facilitated speciation and survival. **TCC3**

Other Evidence:
Classwork: Participate in a structured debate regarding the impact of human activities on the evolution of modern horses discussing the effects of domestication, selective breeding and habitat modification. **CCE1, AA1, AA4**

Summative: Written summative (test) assessment.

Classwork: Identify a currently endangered equine species and develop a comprehensive conservation strategy to address genetic diversity, habitat preservation, and potential threats. **TI3**

Learning Plan

- Students will review fossil data of early equines comparing and contrasting anatomical and physiological evolution markers. **TI3, TCC2, DE1**
- Students will create a timeline showcasing the evolutionary progression of equines. **P4, CCE3**
- Students will discuss the evolution of adaptations specific to equine animals that have developed their current and historical uses. **TI3**

Teacher Resources:
Teacher Created Resources

UNIT 2 | EQUINE SYSTEMIC ANATOMY

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resource Framework

Connecticut Agriculture, Food and Natural Resource Framework

AS.01.01.01.b Examine characteristics of animals that developed in response to environmental and production related influences.
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AS.06.02.03.c Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions.
AS.06.03.01.a Identify optimal anatomical and physiological characteristics according to established breed standards.
AS.06.03.01.b Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.
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Common Core State Standards

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ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
ELA-LITERACY.RH.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC2 I can evaluate evidence from multiple perspectives, and recognize their limitations and implications in order to justify new conclusions.

TI: TAKE INITIATIVE

TI4 I can apply my strengths and anticipate challenges to reach my current and future goals.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE1 I can initiate discussions with my peers and teachers about a variety of topics, respecting differing viewpoints, actively

listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias.
CCE2 I can assess my past successes and mistakes to change my approach.
CCE4 I can create opportunities to extend my learning by remaining open-minded in any situation.

DE: DEMONSTRATE EMPATHY

DE1 I can acknowledge, process, and respond appropriately to others' comments and perspectives.

Understandings: Students will understand that…

- Understanding the equine systemic anatomy is crucial for recognizing how interconnected systems support overall health, function, and performance in horses.
- Each systemic system has specific functions that are essential for the horse's survival, and disruptions in any system can significantly impact health and performance.
- A thorough understanding of systemic anatomy provides the foundation for effective equine care, management, and treatment, enabling handlers and caregivers to make informed health decisions.
- Equine systemic systems have evolved specific adaptations that enable horses to meet the demands of various performance and work-related activities.

Essential Questions:

- How do the major systemic systems in horses function and interact with each other?
- What are the common health issues that can arise in each of the equine systemic systems, and how can they be prevented or managed?
- How do anatomical and physiological features of these systems support a horse's ability to perform specific tasks?
- In what ways can knowledge of systemic anatomy improve our practices in equine health management and emergency response?

Students will know...

- The major systemic systems such as the cardiovascular, respiratory, and nervous systems, including their major components and functions.
- How to recognize healthy vs. abnormal function within these systems including signs and symptoms of distress or disease.
- Preventative measures and routine care practices that support the health of these systems.
- How various types of exercise and workload affect these systems and the physiological changes that occur as a result.
- Common diagnostic tools and methods used to assess the health of these systems, such as blood tests, imaging, and physical exams.

Students will be able to...

- Identify and describe the components of each major systemic system and their functions.
- Perform basic assessments to determine the health of these systems, such as checking pulse, respiratory rate, and gut sounds.
- Implement and advise on routine care practices that help maintain the health of these systems.
- Recognize early signs of system dysfunction and respond appropriately, including knowing when to seek veterinary care.
- Effectively communicate their findings and concerns regarding systemic health to veterinarians and other equine professionals.

Key Vocabulary:
alveoli, bolus, cardiovascular system, circadian rhythms, digestive system, endocrine system, enzyme, homeostasis, hormone, integumentary system, ligament, lymphatic system, musculoskeletal system, nervous system, neurons, peristalsis, renal system, respiratory system, synapse, tendon

Assessment Evidence	
Performance Tasks: *Classwork:* Label detailed diagrams of the equine cardiovascular, respiratory, and nervous systems. **CCE4** *Interim:* Analyze a series of case studies that describe various symptoms related to dysfunction in specific equine systems to diagnose potential issues and suggest appropriate management or treatment strategies. **CCE1, CCE4** *Classwork:* Role-play an emergency situation involving a horse suffering from an acute health issue working together with other role-playing participants to assess the situation, decide on immediate actions, and plan long-term management to prevent recurrence. **CCE2, TI4**	**Other Evidence:** *Interim:* Design an educational brochure for horse owners that outlines key practices for maintaining the health of each major system that includes tips on routine care, signs of potential health issues, and when to seek veterinary care. **CCE4, DE1, TCC2** *Summative:* Written summative (test) assessment.

Learning Plan

- Students will review each of the systemic anatomy systems and organs: cardiovascular, respiratory and nervous. **CCE4**
- Students will label diagrams of systemic systems to identify major organs and interactions with other organ systems. **CCE4**
- Students will communicate with professionals to create routine and emergency procedures in equine medical emergencies. **CCE4, DE1, TCC2**

Teacher Resources:
Teacher Created Resources

UNIT 3 | EQUINE ACCESSORY SYSTEMS: SUPPORTING STRUCTURES AND FUNCTIONS

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resource Framework

AS.01.01.01.b Examine characteristics of animals that developed in response to environmental and production related influences.
AS.06.01.01.b Classify animals using a taxonomic classification system.
AS.06.01.03.c Communicate knowledge of animal systems with proper classification terms to others in an effective and accurate manner.
AS.06.02.03.a Identify the properties, locations, functions and types of animal cells, tissues, organs and body systems.
AS.06.02.03.b Compare and contrast animal cells, tissues, organs, body systems types, and functions among animal species.

AS.06.02.03.c Apply knowledge of anatomical and physiological characteristics of animals to make production and management decisions.
AS.06.03.01.a Identify optimal anatomical and physiological characteristics according to established breed standards.
AS.06.03.01.b Compare and contrast desirable anatomical and physiological characteristics of animals within and between species.
AS.06.03.01.c Select animals to maximize performance based on anatomical and physiological characteristics that affect health, growth and reproduction.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
ELA-LITERACY.RH.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

Vision of A Learner Attributes: Students will be able to independently use their learning to...

TCC: THINK CRITICALLY AND CREATIVELY

TCC3 I can integrate relevant information to produce multiple valid solutions.

TI: TAKE INITIATIVE

TI1 I can implement a realistic plan and adapt when necessary to achieve my goals.
TI3 I can formulate and investigate probing questions to further my learning.

AA: ADAPT AND ADJUST

AA2 I can assess my past successes and mistakes to change my approach.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE1 I can initiate discussions with my peers and teachers about a variety of topics, respecting differing viewpoints, actively listening to others, and responding thoughtfully with peer-reviewed evidence that is free of bias.
CCE4 I can create opportunities to extend my learning by remaining open-minded in any situation.

DE: DEMONSTRATE EMPATHY

DE2 I can honor my own feelings and show empathy toward others through my actions.

P: PERSEVERE

P1 I can self-reflect and seek feedback to build upon my strengths, apply those strengths to overcome obstacles, and share my strategies with others.
P4 I can take on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging.

Understandings: Students will understand that…	**Essential Questions:**

• Accessory systems in equines, such as the integumentary (skin), urinary, and endocrine systems, play critical roles in maintaining overall health, protecting against disease, and regulating body functions. • These systems do not operate in isolation but interact closely with primary systems to ensure the horse's body functions optimally under various conditions. • Understanding the structures and functions of accessory systems is essential for preventing and managing common equine diseases and conditions. • Effective management of these systems can enhance equine performance, longevity, and welfare.	• How do equine accessory systems support the overall health and functionality of the horse? • What are the key components of the integumentary, lymphatic, and endocrine systems in horses, and what roles do they play? • How can issues within these accessory systems manifest in overall horse health, and how can they be addressed? • What preventive measures can be implemented to maintain the health of these systems? • How do environmental and management practices impact these accessory systems?
Students will know... • The functions and importance of the integumentary, lymphatic, and endocrine systems in horses. • Major components of these systems, such as skin, hooves, glands, lymph nodes, and their specific functions. • Indicators of health or dysfunction within these systems, such as skin conditions, lymphatic drainage issues, or hormonal imbalances. • Common disorders affecting these systems, such as dermatitis, lymphangitis, and metabolic diseases like Cushing's syndrome. • Effective care and management strategies that support the health of these systems, including nutritional considerations, grooming practices, and routine veterinary care.	**Students will be able to...** • Recognize and describe the key structures and functions of the integumentary, lymphatic, and endocrine systems. • Diagnose common problems related to these systems based on symptoms and provide recommendations for management or treatment. • Apply preventive care techniques to maintain the health of these systems and prevent common diseases. • Effectively communicate the care needs of these symptoms to owners and other equine professionals. • Assess and critique how different management practices affect the health and efficiency of equine accessory systems.
Key Vocabulary: adrenal glands, cushing's syndrome, dermatitis, dermis, endocrine system, epidermis, hoof abscess, hyperadrenocorticism, hypothyroidism, insulin resistance, integumentary system, laminitis, lymphangitis, lymphatic system, melanoma, metabolic syndrome, pituitary gland, sebaceous glands, sweat glands, thyroid gland	
Assessment Evidence	
Performance Tasks: *Classwork:* Create detailed diagrams to map out the structures and functions of the equine integumentary, lymphatic, and endocrine systems including annotations explaining the role each component plays in overall equine health and how these systems interact with other bodily systems. **P1, P4**	**Other Evidence:** *Interim:* Develop a comprehensive preventative health care plan focused specifically on maintaining the health of the integumentary, lymphatic, and endocrine systems to include routine care, monitoring strategies, and preventative treatments to mitigate the risk of common disorders. **TI3, TCC3, AA2**

Classwork: Review case studies that describe various symptoms affecting one or more of the equine accessory systems to diagnose the likely disorder, justify their diagnosis with supporting evidence, and propose a management or treatment plan. **CCE1, CCE4** *Classwork:* Evaluate skin quality and improvements that can be made to an equine animal's integumentary system to meet animal welfare standards. **DE2, TI1**	*Summative:* Written summative (test) assessment.

Learning Plan

- Students will review each of the accessory anatomy systems and organs: integumentary, lymphatic and endocrine. **P1, P4**
- Students will communicate with professionals to create routine and emergency procedures in equine medical emergencies. **TI3, TCC3, AA2**

Teacher Resources:
Teacher Created Resources

UNIT 4 | EQUINE REPRODUCTION: FUNDAMENTALS AND ADVANCED TECHNIQUES

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resource Framework

AS.04.01.01.a Identify the male and female reproductive organs of the major animal species.
AS.04.01.01.b Analyze the functions of major organs in the male and female reproductive systems.
AS.04.01.01.c Select breeding animals based on the health of the reproductive organs (e.g., reproductive soundness exams, etc.)
AS.04.01.02.a Identify how age, size, life cycle, maturity level, and health status affect the reproductive efficiency of male and female animals.
AS.04.01.2.b Describe factors that lead to reproductive maturity.
AS.04.01.02.c Evaluate animals for reproductive readiness.
AS.04.01.03.a Summarize the importance of efficient and economic reproduction in animals.
AS.04.01.03.b Evaluate reproductive disorders that occur in animals.
AS.04.01.03.c Defend decisions to treat or cull animals with reproductive problems with both welfare and economic factors.
AS.04.02.01.a Summarize genetic inheritance in animals.
AS.04.02.01.b Analyze how genetics can optimize economic, ecological, health and welfare outcomes.
AS.04.02.01.c Evaluate breeding systems based on the principles of genetics.

AS.04.02.02.a Define inheritance and terms related to inheritance in animal breeding (e.g., dominant, codominant, recessive, homozygous, heterozygous, etc.)
AS.04.02.02.b Demonstrate how to determine the probability of one or more traits.
AS.04.02.02.c Justify the selection of breeding pairs to achieve a desired outcome.
AS.04.02.04.a Summarize different needs of breeding animals based on reproductive stage (e.g., newborn, parturition, gestation, gestation lengths, etc.)
AS.04.02.04.b Analyze the care needs for breeding stock in each stage of reproduction.
AS.04.03.01.a Identify natural and artificial breeding methods (e.g., natural breeding, artificial insemination, estrous synchronization, flushing, cloning, etc.)
AS.04.03.01.b Calculate the potential economic benefits of natural versus artificial breeding methods.
AS.04.03.01.c Select animal breeding methods based on reproductive and economic efficiency.
AS.04.03.02.a Describe the process and materials used in artificial insemination.
AS.04.03.02.b Demonstrate artificial insemination techniques.
AS.04.03.03.a Summarize the advantages and disadvantages of major reproductive management practices, including estrous synchronization, superovulations, flushing, and embryo transfer (e.g., cost, labor, equipment, etc.).
AS.04.03.04.a Describe the use of quantitative breeding values (e.g., EPDs, performance records, pedigrees) in the selection of genetically superior breedings stock.
AS.04.03.04.b Compare and contrast quantitative breeding value differences between genetically superior animals and animals of average genetic value.
AS.04.03.04.c Evaluate animals for theoretical purchase based on Expected Progeny Difference, performance records, pedigrees, and specified production scenarios.

Common Core State Standards

ELA-LITERACY.L.11-12.6 Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
ELA-LITERACY.W.11-12.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
ELA-LITERACY.W.11-12.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
ELA-LITERACY.RH.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
MATH. CONTENT.HSS.MD.A.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
MATH.CONTENT.HSN. Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Vision of A Learner Attributes: Students will be able to independently use their learning to…

TCC: THINK CRITICALLY AND CREATIVELY

TCC1 I can ask purposeful, insightful questions to find a variety of innovative solutions.

TCC3 I can integrate relevant information to produce multiple valid solutions.

TI: TAKE INITIATIVE

TI1 I can implement a realistic plan and adapt when necessary to achieve my goals.

AA: ADAPT AND ADJUST

AA2 I can assess my past successes and mistakes to change my approach.

AA4 I can create opportunities to extend my learning by remaining open-minded in any situation.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE4 I can create opportunities to extend my learning by remaining open-minded in any situation.

DE: DEMONSTRATE EMPATHY

DE4 I can work respectfully with all members of my community and support the needs of others.

P: PERSEVERE

P4 I can take on challenges and continuously engage in my own long-term strategies to overcome them to demonstrate through personal experience that failures are more instructive than discouraging.

Understandings: Students will understand that…	**Essential Questions:**
● Understanding the reproductive anatomy and physiological process of equines is crucial for managing breeding effectively and ethically. ● Effective breeding management involves timing, health considerations, genetic considerations, and ethical practices that ensure the welfare of both mare and stallion. ● The genetics of breeding stock significantly impacts the traits and potential of offspring, influencing future generations of equines. ● Modern reproductive technologies, such as artificial insemination and embryo transfer, play a vital role in equine breeding, offering solutions to breeding challenges and enhancing genetic diversity.	● What are the key components of the equine reproductive system, and how do they function? ● How can breeders effectively manage the breeding cycle of mares and stallions to optimize fertility and health? ● What genetic factors must be considered when selecting equines for breeding? ● How do modern technologies enhance or impact traditional breeding practices? ● What ethical considerations arise in equine reproduction, and how can they be addressed?
Students will know...	**Students will be able to…**
● The basic anatomy and physiology of equine reproductive systems, including hormonal cycles and their roles in reproduction. ● Various breeding techniques, including natural cover, artificial insemination, and the use of reproductive technologies like embryo transfer. ● How genetics influence traits in offspring and the importance of genetic screening and selection in breeding programs. ● Strategies for managing the health of breeding animals,	● Conduct basic assessments of reproductive health and readiness in mares and stallions. ● Develop and implement a breeding program considering genetic goals, animal health, and ethical standards. ● Apply knowledge of reproductive technologies to enhance breeding outcomes. ● Provide appropriate care and management for pregnant mares to ensure their health and the health of the foal. ● Effectively communicate breeding plans, procedures, and

including nutritional needs, disease prevention, and care during pregnancy. ● Ethical issues and legal considerations related to equine reproduction, including animal welfare and the use of biotechnologies.	outcomes to stakeholders, including horse owners, veterinarians, and peers.
Key Vocabulary: artificial insemination (AI), biotechnology, breeding soundness examination, colostrum, conception, embryo transfer, estrous cycle, fertility, foal, genetic testing, gestation, libido, live cover, mare, neonate, parturition, stallion, superovulation, teasing, twinning	
Assessment Evidence	
Performance Tasks: *Interim:* Create a comprehensive breeding program for a hypothetical equine facility including selection of mares and stallions based on genetic profiles, breeding methods, timing of breeding to optimize fertility, and protocols for handling pregnant mares. **TCC1, TCC3** *Classwork:* Perform a simulated artificial insemination procedure using a model involving preparing the semen, handling and storing it correctly and using proper techniques for insemination. **DE4, AA4, TI1** *Classwork:* Analyze a set of genetic testing results for a group of horses and interpret what the outcomes mean for a breeding program. **AA1, P4** *Classwork:* Presented with a case study of a pregnant mare, create a plan of care throughout gestation, foaling and postpartum including nutritional planning, exercise regimes, preparation for foaling, and neonatal care for the foal. **CCE4, TCC4**	**Other Evidence:** *Interim:* Engage in a structured debate on the use of advanced reproductive technologies in equine breeding, such as cloning, embryo transfer, and genetic modification. **CCE1, AA1, AA4** *Summative:* Written summative (test) assessment.
Learning Plan	
● Students will review the organs and functions of the equine reproductive system. **CCE4** ● Students will practice artificial insemination procedures for mares. **DE4, AA4, TI1** ● Students will analyze genetic data to make informed breeding decisions. **CCE4, TCC4**	
Teacher Resources: Teacher Created Resources	

DIGITAL DESIGN I / DESIGN LAB ECE CURRICULUM

Grade Level(s): 9-12	**Curriculum Author(s):** Riggi

This course is open to all students who have an interest in graphic design, and want to work with professional visual arts technology. Digital imaging, page layout, brand identity, and typography will be covered. Students will use software from Adobe Creative Cloud, including Photoshop, Illustrator, and InDesign, as well as basic workflow and file management. They will develop and utilize vocabulary and think critically about design and design software basics. Students will also research topics related to visual communications. Students will be required to exercise effort outside of class time to finish projects as needed. The goal of this course is to develop strong visual problem solving skills that can be used in various careers. The course relies on peer collaboration and group critiquing. ***Credit Type: Humanities/STEM, 1 credit (4 ECE Credits)***

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Black Square Project	How does learning about art impact how we perceive the world?	Learning about art expands our ability to observe, interpret, and appreciate the world, fostering a deeper understanding of diverse perspectives, cultures, and emotions. It enhances our perception by encouraging us to see beauty, meaning, and complexity in everyday experiences.	TCC1(9-12) & TCC3(9-12)
Art Criticism & Critique	What can we learn from our responses to art?	Individual aesthetic and empathetic awareness developed through engagement with art can lead to understanding and appreciation of self, others, the natural world, and constructed environments.	TI3(9-12) & AA4(9-12)
Copyright & Fair Use	How do people contribute to awareness and understanding of their lives and the lives of their communities through art-making?	Through art-making, people make meaning by investigating and developing awareness of perceptions, knowledge, and experiences.	TI2(9-12)
Color Theory	What factors prevent or encourage people to take creative risks?	Creativity and innovative thinking are essential life skills that can be developed.	TCC1(9-12) & TCC4(9-12)
Illustrator	How do artists and designers determine goals for designing or redesigning objects, places, or systems?	Through art-making, people make meaning by investigating and developing awareness of perceptions, knowledge, and experiences.	TCC3(9-12), TCC4(9-12), CCE3(9-12), AA1(9-12)

Photoshop	How does knowing the contexts, histories, and traditions of art forms help us create works of art and design?	Knowing the contexts, histories, and traditions of art forms helps us create works of art and design by providing a foundation of knowledge, inspiring creativity, and informing meaningful choices in style, technique, and expression.	TI2(9-12) & P2(9-12)
Web Design Portfolio	What criteria, methods, and processes are used to select work for preservation or presentation?	Artists, curators and others consider a variety of factors and methods including evolving technologies when preparing and refining artwork for display and or when deciding if and how to preserve and protect it	TCC4(9-12) & CCE3(9-12)

Unit 1 - Black Square Project

Create a composition of black squares where 5 or more verbs are defined by how the squares are arranged.

Established Goals:
VA:Cr1.2.Ia: Shape an artistic investigation of an aspect of present day life using a contemporary practice of art or design.
VA:Cr2.3.IIa: Redesign an object, system, place, or design in response to contemporary issues.
VA:Re.7.1.Ia: Hypothesize ways in which art influences perception and understanding of human experiences.
VA:Re.7.2.Ia: Analyze how one's understanding of the world is affected by experiencing visual imagery.

Vision of A Learner Attributes:
TCC1(9-12): I can ask purposeful, insightful questions to find a variety of innovative solutions.
TCC3(9-12): I can integrate relevant information to produce multiple valid solutions.

Understandings: Students will understand that...

- Collaboration expands the creative process by integrating diverse perspectives, skills, and ideas, leading to more innovative and dynamic outcomes than individual effort alone.
- Life experiences shape the way individuals perceive and relate to art, influencing their emotional responses, interpretations, and connections to the artist's message.
- Learning about art expands our ability to observe, interpret, and appreciate the world, fostering a deeper understanding of diverse perspectives, cultures, and emotions. It enhances our perception by encouraging us to see beauty, meaning, and complexity in everyday experiences.
- Creativity and innovative thinking are essential life skills that can be developed through art.

Essential Questions:

- How does collaboration expand the creative process?
- How do life experiences influence the way you relate to art?
- How does learning about art impact how we perceive the world?

Students will know...

- Will know that artistic ideas and works provide a deeper understanding of societal, cultural, and historical contexts.
- The image is universal and can be used among diverse languages.

Students will be able to...

- Interpret intent and meaning in artistic work.
- Perceive and analyze artistic work
- Refine and complete artistic work.
- Generate and conceptualize artistic ideas and work.
- Organize and develop artistic ideas and work.
- Select, analyze, and interpret artistic work for presentation.

Key Vocabulary: black square, pen tool, define, emote, arrange, align, repeat, emphasis, change, minimalistic, verbs	
Assessment Evidence	
Performance Tasks: Black Square Project: Create a composition of black squares where 5 or more verbs are defined by how the squares are arranged.	**Other Evidence:** Presenting black square composition to the class
Learning Plan	
Students can convey a word using black squares to communicate. **TCC1** Students can find more than one solution to a design problem. **TCC3**	
Teacher Resources: Teacher created resources	

Unit 2 - Art Criticism & Critique

Review the steps of art criticism to analyze and critique a work of art.

Established Goals:
VA:Re.7.1.IIa: Recognize and describe personal aesthetic and empathetic responses to the natural world and constructed environments.
VA:Re.7.2.IIa: Evaluate the effectiveness of an image or images to influence ideas, feelings, and behaviors of specific audiences.
VA:Pr4.1.IIIa: Critique, justify, and present choices in the process of analyzing, selecting, curating, and presenting artwork for a specific exhibit or event.

Vision of A Learner Attributes:
TI3(9-12): I can formulate and investigate probing questions to further my learning.
AA4(9-12): I can create opportunities to extend my learning by remaining open-minded in any situation.

Understandings: Students will understand that…

- Individual aesthetic and empathetic awareness developed through engagement with art can lead to understanding and appreciation of self, others, the natural world, and constructed environments.
- Artworks are cared for by conservators, curators, and institutions who use specialized techniques to preserve and protect them, ensuring their longevity and continued cultural significance for future generations.
- Artists and other presenters consider various techniques, methods, venues, and criteria when analyzing, selecting, and curating objects, artifacts, and artworks for preservation and presentation.
- People value objects, artifacts, and artworks because they represent cultural, historical, or personal significance. Selecting them for presentation allows individuals and societies to preserve and communicate identity, heritage, and values.

Essential Questions:

- What can we learn from our responses to art?
- How are artworks cared for and by whom?
- What criteria, methods, and processes are used to select work for preservation or presentation?
- Why do people value objects, artifacts, and artworks, and select them for presentation?

Students will know…	**Students will be able to…**

● The elements that go into perceiving and analyzing artistic work ● How to develop and refine artistic techniques and work for presentation.	● Follow 4 steps of art criticism to analyze and interpret a composition. ● Convey meaning through the presentation of artistic work. ● Interpret intent and meaning in artistic work.
Key Vocabulary: Aesthetic, composition, content, style, context, representation, analysis, interpretation, composition, medium, narrative, intention, response, expression, symbolism, critique, harmony, judgment	
Assessment Evidence	
Performance Tasks: Migrant Mother photo reference 4 steps of art criticism	**Other Evidence:** Art criticism is embedded into final project reflection
Learning Plan	
Facilitate critique with guiding questions and elements to be aware of. **TI3** Demonstrate how to word constructive feedback in a manner where it is well received. **AA4**	
Teacher Resources: Teacher created resources	

Unit 3 - Copyright & Fair Use

Discuss copyright and fair use through a controversial artist, guiding students to distinguish facts from opinions.

Established Goals:
VA:Cn11.1.IIIa: Appraise the impact of an artist or a group of artists on the beliefs, values, and behaviors of a society.
VA:Cn10.1.IIIa: Synthesize knowledge of social, cultural, historical, and personal life with art-making approaches to create meaningful works of art or design.

Vision of A Learner Attributes:
TI2(9-12): I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.

Understandings:
- Through art-making, people make meaning by investigating and developing awareness of perceptions, knowledge, and experiences.
- Making art heightens awareness of one's surroundings by encouraging close observation, emotional engagement, and reflection on the details of the environment, leading to a deeper connection with the world and its elements.
- Artists have influence over community shaping. Artists have the ability to raise questions and develop conversations around community topics and change.
- Creators must balance their creative expression with ethical and legal considerations, ensuring that their work does not infringe on the rights of others.

Essential Questions:
- How does engaging in creating art enrich people's lives?
- How does making art attune people to their surroundings?
- How do people contribute to awareness and understanding of their lives and the lives of their communities through art-making?
- What responsibilities come from the freedom to create?

Students will know...
Fair use is described as the balance of the interests of copyright owners with the public interest in the dissemination of information and creativity.

Students will be able to...
Develop their reasoning and argument of fair use for their own decision making.

Key Vocabulary: exclusive rights, public domain, fair use doctrine, purpose, licensing, transformative use, plagiarism, ethical considerations

Assessment Evidence

Performance Tasks:	**Other Evidence:**

Understand definition of copyright and fair use then argue a case regarding Shepard Fairey	Interim: Written assignment to reflect on their opinion based on education provided
Learning Plan	
Provide visual definitions of copyright and fair use and case details and diverse legal perspectives regarding the associate press and a propaganda artist. **TI2**	
Teacher Resources: Teacher created resources	

Unit 4 - Color Theory

Explore color theory in depth and have students create color families based on audience, purpose, and emotion.

Established Goals:
VA:Cr1.2.Ia: Shape an artistic investigation of an aspect of present day life using a contemporary practice of art or design.

Vision of A Learner Attributes:
TCC1(9-12): I can ask purposeful, insightful questions to find a variety of innovative solutions.
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

Understandings:

- Creativity and innovative thinking are supported by open-mindedness, a willingness to take risks, an environment that encourages curiosity, and the ability to embrace failure as part of the learning process. These conditions foster the exploration of new ideas and approaches, leading to original and inventive outcomes.
- Creative risks in art are influenced by factors such as personal confidence, societal expectations, cultural norms, and support from peers or mentors. When individuals feel supported and open to experimentation, they are more likely to take risks, whereas fear of failure or criticism can discourage artistic exploration.

Essential Questions:

- What conditions, attitudes, and behaviors support creativity and innovative thinking?
- What factors prevent or encourage people to take creative risks?

Students will know...

- Generate and conceptualize artistic ideas and work.

Students will be able to...

- Create color families.
- Understand the basics of the color wheel.

Key Vocabulary: primary, secondary, tertiary, analogous, complementary, neutral, tint, shade, swatch, color wheel, gray scale, harmony

Assessment Evidence	
Performance Tasks: Create color families	**Other Evidence:** Color theory is embedded in all interims and summatives
Learning Plan	
Demonstrate how color provides meaningful solutions to design problems. **TCC1** Demonstrate understanding and use of color theory. **TI4**	
Teacher Resources: Teacher created resources	

Unit 5 - Illustrator

Teach students to use Adobe Illustrator to create vector images, including portraits, typography, and branding.

Established Goals:
VA:Cr1.2.IIIa : Choose from a range of materials and methods of traditional and contemporary artistic practices, following or breaking established conventions, to plan the making of multiple works of art and design based on a theme, idea, or concept.
VA:Cr1.1.IIIa: Visualize and hypothesize to generate plans for ideas and directions for creating art and design that can affect social change.
VA:Cr2.2.IIIa : Demonstrate understanding of the importance of balancing freedom and responsibility in the use of images, materials, tools, and equipment in the creation and circulation of creative work.
VA:Cr2.1.IIIa: Experiment, plan, and make multiple works of art and design that explore a personally meaningful theme, idea, or concept.
VA:Cr3.1.IIIa: Reflect on, reengage, revise, and refine works of art or design considering relevant traditional and contemporary criteria as well as personal artistic vision.
VA:Re.7.2.IIa: Evaluate the effectiveness of an image or images to influence ideas, feelings, and behaviors of specific audiences.
VA:Re9.1.IIIa: Construct evaluations of a work of art or collection of works based on differing sets of criteria.
VA:Cn10.1.IIa: Utilize inquiry methods of observation, research, and experimentation to explore unfamiliar subjects through artmaking.

Vision of A Learner Attributes:
TCC3(9-12): I can integrate relevant information to produce multiple valid solutions.
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products
AA1(9-12): I can evaluate different approaches and justify the best pathway to success.

Understandings:

- Through art-making, people make meaning by investigating and developing awareness of perceptions, knowledge, and experiences.
- People evaluate art based on various criteria. A personal preference reflects individual taste, while an evaluation of artwork involves a critical assessment of its elements, techniques, and meaning based on established artistic criteria.
- Visual imagery influences understanding of and responses to the world.
- People create and interact with objects, places, and design that define, shape, enhance, and empower their lives.
- Artists and designers balance experimentation and safety, freedom and responsibility while developing and creating artworks.
- Artists and designers experiment with forms, structures, materials, concepts, media, and art-making approaches.
- Artists and designers shape artistic investigations, following or breaking with traditions in pursuit of creative art making goals.

Essential Questions:

- How do artists and designers determine goals for designing or redesigning objects, places, or systems?
- How and why might criteria vary?
- How is a personal preference different from an evaluation?
- How do images influence our views of the world?
- How do artists and designers create works of art or design that effectively communicate?
- How do artists work?
- How do artists and designers determine whether a particular direction in their work is effective?
- How do artists and designers learn from trial and error?

Students will know...

- The detailed criteria that goes into evaluating artistic work.
- The techniques and conversational terms that refine and complete artistic work.
- How to develop an artboard through research of content and technique in order to generate and conceptualize artistic ideas and work.

Students will be able to...

- Synthesize and relate knowledge and personal experiences to make art.
- Perceive and analyze artistic work
- Organize and develop artistic ideas and work.

Key Vocabulary: pen tool, vector, craftsmanship, eye dropper, layers, simplistic, memorable, emotion, typography, arrangement, color, layout, identity, repetition, pattern, brand, shape, scalability, “less is more”, audience, use, intention,

Assessment Evidence

Performance Tasks:

- Polygon Vector Portrait

Other Evidence:

- C/W: Watermark Design

• Brand Identity & Logo Creation • Character Design • Designing with Type • Type book • Font posters • Editorial spread	• Interim: Type emoting • Interim: Custom Pattern Design for Textile Use

Learning Plan

Demonstrate examples of integrating research into planning phases of a work. **TCC3**
Demonstrate tool acquisition application to several different prompts. **TCC4**
Facilitate student collaboration by students teaching one another a skill that they possess and how to seek and offer feedback. **CCE3**
Demonstrate several tools to complete one task to highlight student choice and options. **AA1**

Teacher Resources: Teacher created resources

Unit 6 - Photoshop

Teach students Adobe Photoshop for raster images, including collage, manipulation, painting, and photo editing.

Established Goals:
VA:Re.7.2.IIa: Evaluate the effectiveness of an image or images to influence ideas, feelings, and behaviors of specific audiences.
VA:Cr1.2.IIIa: Choose from a range of materials and methods of traditional and contemporary artistic practices, following or breaking established conventions, to plan the making of multiple works of art and design based on a theme, idea, or concept.
VA:Cr2.1.IIa: Through experimentation, practice, and persistence, demonstrate acquisition of skills and knowledge in a chosen art form.
VA:Cr2.3.IIa: Redesign an object, system, place, or design in response to contemporary issues.
VA:Cr3.1.IIa: Engage in constructive critique with peers, then reflect on, reengage, revise, and refine works of art and design in response to personal artistic vision.
VA:Pr4.1.IIIa: Critique, justify, and present choices in the process of analyzing, selecting, curating, and presenting artwork for a specific exhibit or event.
VA:Re.7.1.IIa: Recognize and describe personal aesthetic and empathetic responses to the natural world and constructed environments.
VA:Cn10.1.Ia: Document the process of developing ideas from early stages to fully elaborated ideas.

Vision of A Learner Attributes:
TI2(9-12): I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.

P2(9-12): I can strengthen my weaknesses by identifying, initiating, and practicing appropriate strategies to become confident in my ability to overcome my challenges.

Understandings:	**Essential Questions:**
● Knowing the contexts, histories, and traditions of art forms helps us create works of art and design by providing a foundation of knowledge, inspiring creativity, and informing meaningful choices in style, technique, and expression. ● Persistence is essential in revising and refining artwork, as it enables artists to push through challenges, explore new possibilities, and improve their work. Through continued effort, artists can achieve greater clarity, depth, and precision in their creative expression. ● Artists and designers develop excellence through practice and constructive critique, reflecting on, revising, and refining work over time.	● How does knowing the contexts, histories, and traditions of art forms help us create works of art and design? ● What role does persistence play in revising, refining, and developing work? ● How do artists grow and become accomplished in art forms?
Students will know… ● Perceive and analyze artistic work ● Synthesize and relate knowledge and personal experiences to make art.	**Students will be able to...** ● Organize and develop artistic ideas and work. ● Refine and complete artistic work. ● Select, analyze, and interpret artistic work for presentation.

Key Vocabulary: layer, brushes, layer mask, eye dropper, transform, adjustments, resolution, wacom tablet, pressure sensitivity,

Assessment Evidence

Performance Tasks:	**Other Evidence:**
● Photography composition ● Digital photo manipulation ● Digital painting	Interim: demonstrating use of photoshop tools

Learning Plan

Demonstrate success in meeting assignment requirements by using the most concise and effective tools and mode of visual communication. **TI2**
Demonstrate effective collaboration with peers and teacher to develop confidence and success in design abilities. **P2**

Teacher Resources: Teacher created resources

Unit 7 - Web Design Portfolio

Teach students to create an online portfolio accessible via URL.

Established Goals:
VA:Pr4.1.IIa: Analyze, select, and critique personal artwork for a collection or portfolio presentation.
VA:Pr6.1.IIIa: Curate a collection of objects, artifacts, or artwork to impact the viewer's understanding of social, cultural, and/or political experiences.

Vision of A Learner Attributes:
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.
CCE3(9-12): I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.

Understandings:
- Artists and other presenters consider various techniques, methods, venues, and criteria when analyzing, selecting, and curating objects, artifacts, and artworks for preservation and presentation.
- Artists, curators and others consider a variety of factors and methods including evolving technologies when preparing and refining artwork for display and or when deciding if and how to preserve and protect it

Essential Questions:
- How does refining artwork affect its meaning to the viewer?
- What criteria are considered when selecting work for presentation, a portfolio, or a collection?

Students will know...
Select, analyze, and interpret artistic work for presentation.
Develop and refine artistic techniques and work for presentation.

Students will be able to...
Compile their work in one place to catalog by medium and concept.

Key Vocabulary: TypographyWhitespace (or Negative Space)Grid System, Color Palette, Responsive Design, UI (User Interface), UX (User Experience), Navigation, Wireframe, Mockup, Prototyping, Above the Fold, Call to Action, Accessibility

Assessment Evidence

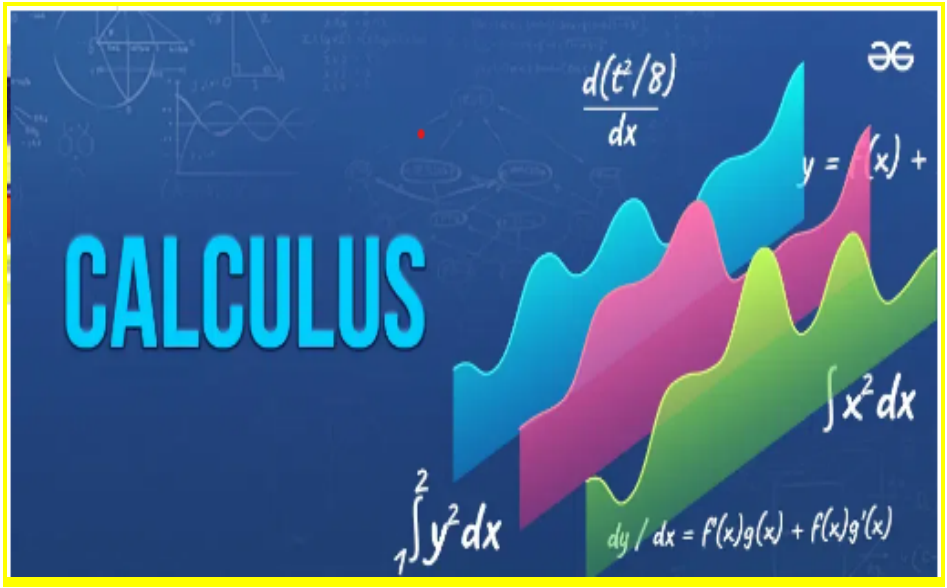
Performance Tasks:
Compile digital files, import images onto website, create theme of website, add typography

Other Evidence:
Summative is the website that highlights their portfolio

Learning Plan

Showcase a body or bodies of work on a platform for accessibility. **TCC4** Demonstrate an ability to review portfolio with classroom audience and accept modifications for prime viewer understanding. **CCE3**
Teacher Resources: Teacher created resources

AP CALCULUS AB CURRICULUM



Grade Level(s): 11-12	**Curriculum Author(s):** Laurenn Bertoglio

Course Description: AP Calculus AB is an advanced placement course designed to be the equivalent of a first-semester college calculus course. It covers topics in differential and integral calculus, emphasizing understanding the concepts, methods, and applications. Key topics include limits and continuity, derivatives, integrals and differential equations.

Course Objectives:

- Develop a deep understanding of calculus concepts.
- Apply calculus in various contexts, including physical, social, and biological sciences.
- Prepare for the AP Calculus AB exam, which can lead to college credit or advanced placement.

Skills Emphasized:

- Analytical thinking and problem-solving.
- Mathematical reasoning.

- Conceptual understanding and fluency with the language and symbols of calculus.

Prerequisites:

- Successful completion of Honors Pre-Calculus or an equivalent course.

AP Calculus AB is rigorous and demands a strong foundation in algebra and trigonometry. The course is suitable for students who plan to pursue STEM fields in college.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Precalculus Review	How does previous mathematical knowledge apply to calculus?	Mathematical rigor and precision in understanding and applying concepts are crucial for success in calculus. Students must develop a strong foundation in algebraic and trigonometric principles, which will enable them to approach calculus problems systematically and confidently.	TCC3(9-12); TCC2(9-12); TI2(9-12)
Limits and Continuity	How do limits help us understand the behavior of a function near points of interest, such as where the function is undefined or where it approaches infinity?	Limits, continuity, and rate of change are deeply interconnected concepts in calculus. Limits help us understand continuity by determining whether a function behaves consistently as it approaches specific points. Continuity, in turn, is necessary for defining and interpreting the rate of change, especially in the context of derivatives. Together, these concepts form the foundation of differential calculus, enabling us to analyze and model change in various fields.	AA1(9-12); CCE3(9-12); CCE4(9-12); TCC2(9-12)
Introduction to Derivatives	What does the derivative of a function represent, and how is it connected to the concept of the rate of change?	The derivative is a mathematical tool that measures how a function changes as its input changes. It provides a precise way to quantify rates of change, which is fundamental for understanding and modeling dynamic	AA1(9-12); TCC3(9-12); CCE4(9-12)

		processes in various fields.	
Derivatives	How do different rules and techniques for finding derivatives, such as the product rule, chain rule, and implicit differentiation, expand our ability to solve complex problems involving non-linear relationships and composite functions?	Mastery of the chain rule, implicit differentiation, and logarithmic differentiation equips students with a flexible and adaptable approach to differentiation. These techniques allow students to handle a wide variety of functions and equations, expanding their problem-solving toolkit in calculus.	AA1(9-12); TCC3(9-12); CCE4(9-12)
The Derivative as a Tool for Analysis	What is the relationship between a function and its derivative, and how does understanding this relationship allow us to predict and analyze the behavior of the function, including its critical points, intervals of increase and decrease, and concavity?	The derivative provides critical information about the behavior of functions, including identifying intervals of increase and decrease, finding local maxima and minima, and determining points of inflection. This understanding is key to analyzing and graphing functions.	AA1(9-12); TCC3(9-12); CCE4(9-12)
Applications and Extensions of the Derivative	How do derivatives help us understand and describe the behavior of changing quantities in real-world situations, and why are they a critical tool in modeling and solving problems across various disciplines?	Solving problems in optimization, related rates, and linearization requires critical thinking and careful mathematical reasoning. Mastery of these concepts develops students' problem-solving skills and their ability to apply mathematical reasoning to real-world situations.	TCC1(9-12); CCE3(9-12); TI3(9-12)
The Integral	What is an integral, and how does it relate to the concept of accumulation and the area under a curve?	Integration represents the process of accumulating quantities, such as area under a curve, total distance traveled, or accumulated volume. This understanding helps students grasp how integration extends the concept of summation to continuous functions and	CCE4(9-12); TCC2(9-12); CCE2(9-12)

		provides a way to measure quantities that vary over an interval.	
Differential Equations and Mathematical Modeling	How do differential equations and slope fields help us model, analyze, and predict the behavior of dynamic systems, and how can we use both graphical and analytical methods to understand the relationships between changing quantities?	Analytical solutions to differential equations provide precise mathematical expressions for the behavior of a system, while graphical methods, such as slope fields, offer a visual understanding of these solutions. Both approaches are interconnected and complement each other in solving and interpreting differential equations.	CCE2(9-12); CCE3(9-12); TCC1(9-12)
Applications of Definite Integrals	How can the concept of integration be used to model and solve problems involving accumulation, area, and volume, and how do these applications help us understand and describe real-world phenomena across diverse fields such as physics, economics, and biology?	Integrals can be used to find geometric quantities such as the area under a curve, the area between curves, and the volume of solids formed by revolution or with known cross-sectional areas. Understanding integrals as geometric constructs provides a concrete foundation for their application in various fields.	CCE4(9-12); AA1(9-12); TCC3(9-12)

Unit 1 - Precalculus Review

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
Common Core State Standards:

- **N.CN.C.7** Solve quadratic equations with real coefficients that have complex solutions.
- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **A.REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- **A.REI.B.4** Solve quadratic equations in one variable.
- **A.REI.B.4.B** Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
- **A.REI.D.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
- **F.IF.A.1** Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).
- **F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- **F.IF.C.7.A** Graph linear and quadratic functions and show intercepts, maxima, and minima.*
- **F.IF.C.7.B** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- **F.BF.B.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
- **F.BF.B.4** Find inverse functions.
- **F.BF.B.4.B** Verify by composition that one function is the inverse of another.
- **F.BF.B.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
- **F.TF.A.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- **F.TF.A.2** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
- **F.TF.A.3** . Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.

- **G.CO.A.1** Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
- **G.SRT.C.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- **G.GPE.B.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.
- TCC3(9-12): I can integrate relevant information to produce multiple valid solutions.
- TI2(9-12): I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.

Understandings: Students will understand that…

- Functions are essential tools for modeling relationships between quantities in various contexts. Understanding different types of functions (linear, polynomial, rational, exponential, logarithmic, and trigonometric) and their properties allows students to represent and analyze real-world situations effectively.
- The behavior of a function is determined by its key characteristics, such as its rate of change, asymptotes, and end behavior. Understanding how functions behave and how they can be transformed provides a foundation for analyzing more complex mathematical relationships in calculus.
- Algebraic and trigonometric functions are deeply interconnected, and a strong understanding of these concepts is necessary for

Essential Questions:

- How does previous mathematical knowledge apply to calculus?
- How can different types of functions (e.g., linear, polynomial, rational, exponential, logarithmic, trigonometric) be represented, analyzed, and interpreted?
- How do transformations (e.g., translations, reflections, stretches, compressions) affect the graph of a function?
- How do the properties of the unit circle help in understanding and applying trigonometric functions?
- How are exponential and logarithmic functions related, and what are their key applications?

solving complex problems in calculus. Mastery of algebraic manipulation and trigonometric identities enables students to simplify expressions and solve equations efficiently. ● Mathematical rigor and precision in understanding and applying concepts are crucial for success in calculus. Students must develop a strong foundation in algebraic and trigonometric principles, which will enable them to approach calculus problems systematically and confidently.	
Students will know… ● Parallel lines have the same slope and perpendicular lines have opposite reciprocal slopes ● There are three forms of linear equations: standard, slope intercept, and point slope ● The parent functions for quadratic, square root, cube root, and cubic functions and how to use transformations on them ● Interval notation to represent domain and range ● Exponential equations are solved using logarithms and logarithmic equations are solved using exponential equations ● Logarithmic equations can have extraneous solutions ● The unit circle values for all six trigonometric functions ● A trigonometric equation can have infinite solutions which is why we restrict the domain ● The meaning of finding the exact value of a trigonometric function	**Students will be able to…** ● Write equations of lines in slope intercept and point slope form including parallel and perpendicular lines ● Graph functions using transformations including quadratic, square root, cube root,and cubic and state their domain and range in interval notation ● Graph a piecewise function ● Perform function operations including composition and inverse ● Solve exponential and logarithmic equations and applications ● Find values of the six trigonometric functions using the unit circle along with inverse trigonometric functions ● Solve trigonometric equations
Key Vocabulary: Slope intercept and point slope form of a linear equation, parallel and perpendicular lines, x and y intercept, function, domain, range, interval notation, piecewise function, function notation, inverse function, composition function, logarithmic function, exponential function, extraneous solution, trigonometric function and equation, sine, cosine, tangent, cosecant, secant, cotangent, unit circle	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: TCC3(9-12)**	**Other Evidence:** This test is given the first week of school after reviewing the summer

Topics include: ● Write equations of lines in slope intercept and point slope form including parallel and perpendicular lines ● Graph functions using transformations including quadratic, square root, cube root,and cubic and state their domain and range in interval notation ● Graph a piecewise function ● Perform function operations including composition and inverse ● Solve exponential and logarithmic equations and applications ● Find values of the six trigonometric functions using the unit circle along with inverse trigonometric functions ● Solve trigonometric equations	packet which students completed over the summer. Students have multiple opportunities to ask questions and review before the test.

Learning Plan

This is a short unit that is meant to review the concepts learned in Precalculus that will be necessary throughout the year in Calculus. Students complete a summer packet, we discuss student questions from their packet, and a unit test is given to prove that the students have the necessary prerequisite skills.

Vision of A Learner Attributes: TCC2(9-12), TCC3(9-12), TI2(9-12)

- Students will submit completed summer work for the course. Class discourse on correct solutions. Students will ask questions and we will compare strategies for solving, including discussing the most efficient method.
- Individual/group in class practice on concepts that will be measured on the assessment.

Teacher Resources: Teacher created summer packet, mini white boards

Unit 2 - Limits and Continuity

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
Common Core State Standards:

- **N.CN.A.3** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **F.IF.B.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
- **A.APR.D.7** Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC2(9-12**): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.
- **CCE3(9-12):** I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that…	**Essential Questions:**
● The concept of a limit is fundamental to calculus, serving as the basis for defining both the derivative and the integral.	● What is the concept of a limit, and how does it describe the behavior of a function as it approaches a particular value?

Understanding limits allows us to explore the behavior of functions as they approach specific values, which is essential for analyzing change and accumulation. ● Continuity is a crucial property of functions that ensures they behave predictably without sudden jumps or breaks. A function is continuous if it is uninterrupted and smooth at every point in its domain, and this continuity is a prerequisite for applying many calculus techniques. Understanding continuity enables us to make accurate predictions about the behavior of functions and to apply calculus in a wide range of contexts. ● The rate of change is a core concept in calculus that measures how one quantity changes in relation to another. The average rate of change provides insights into how a function behaves over an interval, while the instantaneous rate of change, captured by the derivative, reveals how the function behaves at a specific point. Mastering the concept of rate of change is essential for understanding motion, growth, and other dynamic processes. ● Limits, continuity, and rate of change are deeply interconnected concepts in calculus. Limits help us understand continuity by determining whether a function behaves consistently as it approaches specific points. Continuity, in turn, is necessary for defining and interpreting the rate of change, especially in the context of derivatives. Together, these concepts form the foundation of differential calculus, enabling us to analyze and model change in various fields. ● The study of limits, continuity, and rate of change requires careful attention to mathematical rigor and precision. Developing a deep understanding of these concepts involves not just computational skills but also the ability to reason logically and critically about how functions behave and how calculus can be used to describe and solve complex problems.	● What does it mean for a function to be continuous at a point, and how can continuity be determined both graphically and analytically? ● What are the implications of a function being discontinuous at a point, and how do different types of discontinuities (removable, jump, infinite) affect the behavior of a function? ● What do limits at infinity tell us about the end behavior of a function, and how are they related to horizontal asymptotes?
Students will know… ● The limit of a function *f(x)* as *x* approaches a specific value *c* is the value that *f(x)* gets closer to as *x* gets closer to *c*.	**Students will be able to…** ● Express limits symbolically with proper notation ● Interpret limits

• For the limit $lim\ x \to c\ f(x)$ to exist, the left-hand limit and the right-hand limit must both exist and be equal. • All the methods to manipulate a function algebraically to evaluate a limit • Vertical and horizontal asymptotes are crucial for finding limits graphically and algebraically • There are 3 types of discontinuities they will need to know in this course: removable, jump, and infinite • The average rate of change gives the slope over an interval of time while the instantaneous rate of change gives the slope at an exact time • The meaning of all limit notations including one sided limits • The difference quotient finds the instantaneous rate of change at a certain x value	• Estimate limits numerically and graphically • Evaluate limits algebraically • Interpret behavior of functions using limits • Analyze functions for points of discontinuity and identify the type of discontinuity • Find the slope of a curve at a certain point using the difference quotient and find the equation of the tangent and normal line at that point • Find the average rate of change of a given function over a given interval
Key Vocabulary: Limit, secant line, tangent line, normal line, asymptote, continuous function (continuity), discontinuity, average rate of change, removable, jump, infinite discontinuities, point slope form of a linear equation, average velocity, instantaneous velocity	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** • Express limits symbolically with proper notation • Interpret limits • Estimate limits numerically and graphically • Evaluate limits algebraically • Interpret behavior of functions using limits • Analyze functions for points of discontinuity and identify the type of discontinuity • Find the slope of a curve at a certain point using the difference quotient and find the equation of the tangent and normal line at that point • Find the average rate of change of a given function over a given interval	**Other Evidence:** **Textbook problems from sections:** 2.1: Rates of change and limits 2.2: Limits involving infinity 2.3 Continuity 2.4: Rates of change and tangent lines Any AP practice questions from textbook, AP Classroom, or other resources **Activity: TCC2(9-12), CCE3(9-12), AA1(9-12)** Groups will solve limit problems taken from UConn professor and compare solutions with their peers

Learning Plan
In this unit students are introduced to the concept of a limit and the proper limit notation. They learn to evaluate limits of a function using algebraic, graphical, and numerical methods. They work with limits involving infinity and learn the properties of limits. They will learn what it means for a function to be continuous and how to find points of discontinuity and the different types of discontinuities. Most importantly, students will be introduced to the difference quotient and how it relates to the slope of a tangent/normal line and limits. They will learn the difference between the average and instantaneous rate of change. **Vision of A Learner Attributes: TCC2(9-12**), **CCE3(9-12), CCE4(9-12), AA1(9-12)** ● Students will complete textbook practice problems working in groups during class and individually outside of class ● Class discourse on correct solutions to textbook problems - compare strategies and ask questions ● Group practice with UConn limit problems ● AP practice problems- Class discourse on correct solutions- compare strategies and ask questions ● Individual/group in class practice on concepts that will be measured on the assessment
Teacher Resources: Calculus textbook, UConn extra practice, AP Classroom

Unit 3 - Introduction to Derivatives

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
Common Core State Standards:

- **N.RN.A.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 5^(1/3) to be the cube root of 5 because we want [5^(1/3)]^3 = 5^[(1/3) x 3] to hold, so [5^(1/3)]^3 must equal 5.
- **N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **N.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **F.IF.A.2** Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
- **F.IF.B.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph
- **F.BF.A.1** Write a function that describes a relationship between two quantities.
- **F.TF.A.3** . Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC3(9-12)**: I can integrate relevant information to produce multiple valid solutions.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that… ● The derivative is a mathematical tool that measures how a function changes as its input changes. It provides a precise way to quantify rates of change, which is fundamental for understanding and modeling dynamic processes in various fields. ● The derivative of a function at a specific point represents the slope of the tangent line to the function's graph at that point. ● Differentiation involves a set of rules and techniques (such as the power rule, product rule, and quotient rule) that enable us to find the derivative of a wide variety of functions. Mastery of these techniques is essential for solving complex problems in calculus. ● Derivatives have meaningful interpretations in different contexts, such as velocity in physics, marginal cost in economics, and rates of change in biology. Understanding these interpretations helps students see the practical applications of derivatives in the real world. ● Higher-order derivatives, such as the second derivative, offer additional insights into the behavior of functions. ● Not all functions are differentiable at every point. Situations where a function has sharp corners, cusps, or vertical tangents reveal important characteristics about the function and highlight the limits of differentiability. Understanding these cases is crucial for a complete grasp of the concept. ● Derivatives are a cornerstone of calculus, deeply connected to other fundamental concepts like limits and integrals. They play a vital role in both theoretical and applied mathematics, making them an essential tool for solving a wide range of problems in science, engineering, economics, and beyond.	**Essential Questions:** ● What does the derivative of a function represent, and how is it connected to the concept of the rate of change and how is it used in the context of physics (velocity) and economics (marginal cost)? ● What are the basic rules and techniques for differentiating functions, such as the power rule, product rule, and quotient rule? ● What are higher-order derivatives, and what do they tell us about the behavior of a function, such as acceleration in the context of motion? ● How does the concept of the derivative apply to functions that are not linear, and what does it tell us about the slope of the tangent line at a point on the graph of a non-linear function?
Students will know... ● When to use the the power rule, product rule, and quotient rule to find a derivative ● Higher order derivatives represent a rate of change of a rate of change	**Students will be able to…** ● Find derivatives using the proper rules ● Find higher order derivatives ● Calculate position, displacement, average and instantaneous velocity, acceleration, and speed of an object over time

• Derivative rules are just a quicker, easier way to find an instantaneous rate of change • The derivative represents the slope of the tangent line at a certain point and can be used to write the equation of the tangent line or the normal line • The difference between position, displacement, average and instantaneous velocity, acceleration, and speed of an object over time • That a function will not have a derivative at a cusp, corner, or vertical tangent. • Keywords in an application problem indicate to find the derivative.	• Calculate derivatives involving the trigonometric functions and use trig identities to manipulate them • Analyze the continuity of a function including piecewise functions • Represent derivatives graphically and describe the motion of an object based on a graph • Write the equation of a tangent/normal line to a curve using the derivative. • Use a derivative to interpret a real life situation
Key Vocabulary: Derivative, displacement, position, average velocity, instantaneous velocity, acceleration, speed, marginal cost or revenue, differentiability, discontinuity, cusp, corner, product rule, power rule, quotient rule	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** • Find derivatives using the proper rules • Find higher order derivatives • Calculate position, displacement, average and instantaneous velocity, acceleration, and speed of an object over time • Calculate derivatives involving the trigonometric functions and use trig identities to manipulate them • Analyze the continuity of a function including piecewise functions • Represent derivatives graphically and describe the motion of an object based on a graph • Write the equation of a tangent/normal line to a curve using the derivative. • Use a derivative to interpret a real life situation	**Other Evidence:** **Textbook problems from sections:** 3.1 Derivative of a function 3.2 Differentiability 3.3 Rules for differentiation 3.4 Velocity and other rates of change Students work individually and in groups on extra practice problems from the Larson Calculus textbook. Any AP practice questions from textbook, AP Classroom, or other resources

Learning Plan
In this unit, students are introduced to the concept of a derivative and how it is related to limits. They learn basic derivative rules including those for products, quotients, and trigonometric functions. They will see how derivatives are related to motion problems involving position, velocity, and acceleration, and other application problems. They learn how to analyze a function for continuity and differentiability. They will find equations of tangent/normal lines using the new derivative techniques. They will begin to analyze graphs and represent motion graphically. **Vision of A Learner Attributes: TCC3(9-12),CCE4(9-12), AA1(9-12)** ● Students will complete textbook practice problems working in groups during class and individually outside of class ● Class discourse on correct solutions to textbook problems - compare strategies and ask questions ● Group/individual practice with Larson problems ● AP practice problems- Class discourse on correct solutions including comparing strategies and asking questions ● Individual/group in class practice on concepts that will be measured on the assessment
Teacher Resources: Finney calculus textbook, Larson textbook, AP Classroom, teacher created extra practice

Unit 4 - Derivatives

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **A.APR.D.7** Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
- **F.BF.A.1.C** Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.
- **F.BF.B.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC3(9-12)**: I can integrate relevant information to produce multiple valid solutions.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that...

- The chain rule is essential for finding the derivative of a composite function, where one function is nested inside another. Understanding the chain rule allows students to differentiate more complex functions by systematically applying the rule to each layer of the function.

Essential Questions:

- What is the chain rule and how can it be applied to differentiate functions that are composed of multiple layers of functions (e.g., trigonometric, exponential, or logarithmic functions within other functions)?
- In what situations is the chain rule the most effective method for

• Implicit differentiation is a powerful tool for finding the derivative of equations where the dependent and independent variables are intertwined and cannot be easily separated. This method extends the ability to differentiate beyond explicitly defined functions, making it essential for handling more complex equations. • Implicit differentiation provides insights into the relationships between variables that are not easily solved for one variable in terms of the other. This technique is particularly useful in scenarios where the relationship between variables is defined implicitly, such as in circles, ellipses, and other non-linear curves. • Logarithmic differentiation is an effective method for differentiating functions that involve complex products, quotients, or powers. By taking the natural logarithm of both sides of an equation, this technique simplifies differentiation, especially when dealing with functions that are difficult to differentiate using standard rules. • Mastery of the chain rule, implicit differentiation, and logarithmic differentiation equips students with a flexible and adaptable approach to differentiation. These techniques allow students to handle a wide variety of functions and equations, expanding their problem-solving toolkit in calculus. • Applying these differentiation techniques requires careful attention to detail and precision in mathematical reasoning. Understanding when and how to use each technique fosters a deeper appreciation for the rigor involved in calculus and prepares students for more advanced mathematical studies. • Parametric equations provide a powerful way to represent curves that cannot be easily described using a single function in Cartesian form. By expressing both the x and y coordinates as functions of a third parameter (often time, t), parametric equations allow for the modeling of more complex and dynamic relationships between variables.	finding the derivative, and how does it simplify the differentiation process? • What is implicit differentiation, and why is it necessary for differentiating equations where the variables are not explicitly solved for one in terms of the other? • How do we find the derivative of a parametric curve, and what does this derivative represent in terms of the curve's slope or rate of change?

Students will know… ● The chain rule is necessary to find the derivative of a composite function ● To use implicit differentiation when an equation is not solved for a variable ● All the derivatives of inverse trig functions and exponential and logarithmic functions ● To use logarithmic differentiation when the function has an exponent raised to another exponent ● Recognize a parametric equation when they see equations for x and y in terms of t. ● To find the equation of a tangent line you need a slope, given by the derivative which may include the chain rule, and a point on the curve.	**Students will be able to...** ● Use the chain rule to evaluate derivatives, including higher order derivatives ● Find derivatives using implicit differentiation, including higher order derivatives ● Evaluate derivatives involving the inverse trigonometric functions and exponential and logarithmic functions ● Find a derivative using logarithmic differentiation ● Find the derivative of a parametric equation ● Find the equation of the line tangent to the curve where using the chain rule is necessary
Key Vocabulary: Chain rule, parametric equation, implicit differentiation, logarithmic differentiation	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** ● Use the chain rule to evaluate derivatives, including higher order derivatives ● Find derivatives using implicit differentiation, including higher order derivatives ● Evaluate derivatives involving the inverse trigonometric functions and exponential and logarithmic functions ● Find a derivative using logarithmic differentiation ● Find the derivative of a parametric equation ● Find the equation of the line tangent to the curve where using the chain rule is necessary	**Other Evidence:** **Textbook problems from sections:** 4.1 Chain rule 4.2 Implicit differentiation 4.3 Derivatives of inverse trigonometric functions 4.4 Derivatives of exponential and logarithmic functions Any AP practice questions from textbook, AP Classroom, or other resources
Learning Plan	

In this unit, students are introduced to more difficult methods of differentiation including the chain rule, implicit differentiation, inverse trigonometric functions, and exponential/logarithmic derivatives. Higher order derivatives and parametric equations are also included. Practice is crucial for these methods.

Vision of A Learner Attributes: TCC3(9-12),**CCE4(9-12), AA1(9-12)**

- Students will complete textbook practice problems working in groups during class and individually outside of class
- Class discourse on correct solutions to textbook problems - compare strategies and ask questions
- AP practice problems- Class discourse on correct solutions- compare strategies and ask questions
- Individual/group in class practice on concepts that will be measured on the assessment

Teacher Resources: Finney Calculus textbook, AP Classroom, teacher created extra practice problems

Unit 5 - The Derivative as a Tool for Analysis

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.APR.B.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **F.IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- **F.IF.C.7.E** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC3(9-12)**: I can integrate relevant information to produce multiple valid solutions.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that... ● The derivative of a function at a specific point represents the slope of the tangent line to the function's graph at that point. This connection allows us to understand the local behavior of functions, such as whether they are increasing or decreasing. ● The derivative provides critical information about the behavior of functions, including identifying intervals of increase and decrease, finding local maxima and minima, and determining points of inflection. This understanding is key to analyzing and graphing functions. ● Higher-order derivatives, such as the second derivative, offer additional insights into the behavior of functions. For example, the second derivative indicates concavity and helps identify the nature of critical points, which is important for understanding the overall shape of a function's graph. ● The MVT (Mean Value Theorem) guarantees that if a function is continuous on a closed interval and differentiable on the open interval, there exists at least one point where the derivative (instantaneous rate of change) matches the average rate of change over the entire interval. This concept is key to understanding the behavior of functions, particularly in identifying where changes occur most significantly. ● The EVT (Extreme Value Theorem) shows that maximum and minimum values of a function can occur either at critical points (where the derivative is zero or undefined) or at the endpoints of the interval. Understanding this helps students develop strategies for finding extreme values and analyzing the overall behavior of a function.	**Essential Questions:** ● What is the relationship between the derivative and the graph of a function, particularly in terms of identifying local maxima, minima, and points of inflection? ● How can the second derivative be used to analyze the concavity of a function and the nature of critical points? ● What does the Mean Value Theorem reveal about the relationship between the average rate of change and the instantaneous rate of change of a function, and how can this understanding be applied to analyze the behavior of functions in real-world contexts? ● How does the Extreme Value Theorem guarantee the existence of maximum and minimum values for continuous functions on a closed interval, and why is this important for understanding the behavior of functions in both theoretical and practical applications?
Students will know… ● The meaning of the extreme value theorem and the mean value theorem and how it can help to analyze a graph ● How to use the derivative to analyze and interpret the properties of a function including intervals of increasing/decreasing, extreme values, intervals of concavity and inflection points. ● When and how to use a sign chart	**Students will be able to…** ● Apply the Mean Value Theorem to describe the behavior of a function over an interval ● Use the extreme Value Theorem to analyze properties of a function including extrema

• The meaning derived from the second derivative test • How to analyze a given graph	• Use the derivative to analyze a function including extrema, intervals of increasing/decreasing, concavity, and points of inflection, which will include making a sign chart • Analyze a given graph in order to find intervals of increasing/decreasing and concavity.
Key Vocabulary: Extrema, critical point, concavity, point of inflection, sign chart, 2nd derivative test, mean value theorem, extreme value theorem	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** • Apply the Mean Value Theorem to describe the behavior of a function over an interval • Use the extreme Value Theorem to analyze properties of a function including extrema • Use the derivative to analyze a function including extrema, intervals of increasing/decreasing, concavity, and points of inflection, which will include making a sign chart • Analyze a given graph in order to find intervals of increasing/decreasing and concavity.	**Other Evidence:** **Textbook problems from sections:** 5.1 Extreme values of functions 5.2 Mean value theorem 5.3 Connecting f' and f" with the graph of f Any AP practice questions from textbook, AP Classroom, or other resources
Learning Plan	
In this unit, we drive deeper into the connections between the derivatives and their graphs. We compare the function with its first and second derivative graphs. The students are introduced to two very important theorems: the extreme value and the mean value theorems, and how they can be used to justify an answer. Most importantly, students learn how to use derivatives to analyze functions and find their extrema, intervals of increasing/decreasing, concavity, and points of inflection. **Vision of A Learner Attributes: TCC3(9-12**),**CCE4(9-12), AA1(9-12)** • Students will complete textbook practice problems working in groups during class and individually outside of class • Class discourse on correct solutions to textbook problems - compare strategies and ask questions • AP practice problems- Class discourse on correct solutions- compare strategies and ask questions • Individual/group in class practice on concepts that will be measured on the assessment	
Teacher Resources: Finney Calculus textbook, AP Classroom, teacher created extra practice problems	

Unit 6 - Applications and Extensions of the Derivative

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.APR.B.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **G.GMD.A.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
- **G.MG.A.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder
- **G.MG.A.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost)

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC1(9-12)**: I can ask purposeful, insightful questions to find a variety of innovative solutions.
- **CCE3(9-12):** I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **TI3(9-12):** I can formulate and investigate probing questions to further my learning.

Understandings: Students will understand that…	**Essential Questions:**
• Optimization involves finding the best possible solution within given constraints, whether it's maximizing or minimizing a particular quantity. This process is crucial for decision-making in real-world scenarios, where resources are often limited and efficiency is key. • In optimization, critical points—where the derivative is zero or undefined—are essential for identifying potential maximum or minimum values. Additionally, analyzing boundary values within a domain is crucial for determining the optimal solution. • Optimization problems are prevalent across various fields, including economics, engineering, and biology. Understanding how to formulate and solve these problems using calculus is fundamental to applying mathematical concepts in real-world situations. • Related rates problems highlight how the rate of change of one quantity is connected to the rate of change of another, often through implicit relationships. This understanding is key to solving problems where multiple variables change simultaneously. • Implicit differentiation is a powerful tool for solving related rates problems, as it allows for the differentiation of equations where variables are interdependent. Mastery of this technique is essential for analyzing systems where direct differentiation is not possible. • Related rates problems are deeply rooted in real-world scenarios, such as the changing dimensions of a physical object, the speed of a moving object, or the growth rates in biological systems. • Linearization provides a way to approximate the behavior of a function near a given point using the tangent line. This method is valuable for making quick, reasonably accurate predictions about a function's value without requiring complex calculations. • Solving problems in optimization, related rates, and linearization requires critical thinking and careful mathematical reasoning. Mastery of these concepts develops students' problem-solving	• How do we identify an optimization problem, and what strategies in calculus can we use to find the maximum or minimum value of a function in a given context? • What are some real-world examples of optimization problems, and how does understanding the underlying mathematics help in making informed decisions? • How can related rates be used to model and analyze situations where two or more quantities are changing over time, such as the flow of water into a tank or the speed of a shadow moving across the ground? • What is linearization, and how can it be used to approximate the value of a function near a given point?

skills and their ability to apply mathematical reasoning to real-world situations.	
Students will know… ● The steps to solving an optimization or related rates problem. ● The derivative is used to find maximum or minimum values in an application problem ● A linearization problem will be solved just like finding the equation of a tangent line ● Basic geometry formulas needed to solve these application problems ● The importance of drawing a figure in these problems ● All the methods of differentiation needed to solve these ● The importance of answering the question at the end of a problem	**Students will be able to…** ● Solve application problems involving optimization and related rates ● Model a real world situation with calculus and explain how the calculus can be used to solve a problem ● Find the linearization of a function at a certain point
Key Vocabulary: Optimization, linearization, related rate	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), CCE4(9-12)** **Topics include:** ● Solve application problems involving optimization and related rates ● Model a real world situation with calculus and explain how the calculus can be used to solve a problem ● Find the linearization of a function at a certain point	**Other Evidence:** **Textbook problems from sections:** 5.4 Modeling and optimization 5.5 Linearization 5.6 Related rates Any AP practice questions from textbook, AP Classroom, or other resources **Activity: TCC1(9-12), TCC2(9-12) CCE3(9-12), TI3(9-12)** Groups will solve optimization and related rates problems taken from UConn professor and compare solutions with their peers
Learning Plan	
In this unit, students use derivatives to solve real life application problems. First are modeling and optimization problems such as designing a can	

that uses the least amount of material, or maximizing profit. Secondly, they learn related rates problems which use derivatives to find the rate of change of a quantity over time, such as how fast the volume of a balloon changes based on the rate of change of the radius. Students also solve linearization problems which is a new way of using the derivative to find the equation of a tangent line.

Vision of A Learner Attributes: TCC1(9-12),CCE3(9-12), CCE4(9-12), TI3(9-12)

- Students will complete textbook practice problems working in groups during class and individually outside of class
- Class discourse on correct solutions to textbook problems - compare strategies and ask questions
- Extra in class group practice from UConn professor and Larson book-compare strategies and ask questions
- AP practice problems- Class discourse on correct solutions- compare strategies and ask questions
- Individual/group in class practice on concepts that will be measured on the assessment

Teacher Resources: Finney Calculus textbook, extra practice from Larson textbook, AP Classroom, UConn practice problems and guided note taking sheets

Unit 7 - The Integral

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.APR.B.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
- **G.MG.A.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC2(9-12**): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.
- **CCE2(9-12**): I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

Understandings: Students will understand that…	**Essential Questions:**
● Integration represents the process of accumulating quantities, such as area under a curve, total distance traveled, or accumulated volume. This understanding helps students grasp	● What is an integral and how can we interpret the definite integral as the total accumulation of quantities, such as distance traveled or area, and what does this reveal about the behavior

how integration extends the concept of summation to continuous functions and provides a way to measure quantities that vary over an interval. ● The Fundamental Theorem of Calculus links integration and differentiation, showing that integration can be understood as the reverse process of differentiation. This connection reveals how finding antiderivatives and computing definite integrals are interconnected, deepening students' understanding of both operations. ● The definite integral calculates the total accumulation over a specific interval, while the indefinite integral represents the general antiderivative of a function. Understanding the distinction and relationship between these two types of integrals is crucial for applying integration techniques to a wide range of problems. ● Methods such as the Trapezoidal Rule and Riemann sums provide ways to approximate definite integrals when an exact solution is difficult to obtain. These numerical methods highlight the practical importance of integration and the role of approximation in real-world applications. ● The definition of a definite integral involves taking the limit of Riemann sums as the number of subintervals approaches infinity. This concept underscores the role of limits in calculus and the transition from discrete approximations to continuous integration. ● The integral can be interpreted graphically as the area under a curve or the net area between the curve and the x-axis. This visual understanding aids in conceptualizing how integration represents the accumulation of quantities and helps in solving problems involving areas and net change.	of functions? ● How are integration and differentiation related through the Fundamental Theorem of Calculus, and what does this relationship tell us about the inverse nature of these operations? ● What are some examples of how integrals are applied in fields such as physics, engineering, and economics, and how does understanding these applications enhance our ability to solve practical problems? ● How do Riemann sums and the Trapezoidal rule provide a method for approximating the area under a curve, and how does this approach lead to the definition of the definite integral?
Students will know… ● That a Riemann sum approximates an integral ● That an integral represents the area under a curve ● The difference between a definite and indefinite integral ● Some integrals can be evaluated using geometry	**Students will be able to…** ● Calculate a Riemann sum (left, right, or midpoint) to approximate the value of an integral or a real life situation ● Use proper notation with integrals ● Evaluate some integrals using geometry

• The properties of integrals • The process of integration and differentiation are inverses of each other • The trapezoidal rule is the most accurate approximation of the area under a curve • The average value of a function is found by dividing the value of the integral by the interval • The position, velocity, and acceleration of a particle over time by using the concept of an integral and what it looks like on a graph	• Evaluate a definite integral using the antiderivative • Find the average value of a function over an interval using an integral • Approximate the area under a curve using the Trapezoidal Rule. • Approximate integrals that are represented graphically, numerically, algebraically, and verbally. • Solve motion application problems using the concept of the integral including position, velocity, and acceleration
Key Vocabulary: Integral, Riemann sum, antiderivative, trapezoidal rule, indefinite and definite integral, summation notation	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** • Calculate a Riemann sum (left, right, or midpoint) to approximate the value of an integral or a real life situation • Evaluate some integrals using geometry • Evaluate a definite integral using the antiderivative • Find the average value of a function over an interval using an integral • Approximate the area under a curve using the Trapezoidal Rule. • Approximate integrals that are represented graphically, numerically, algebraically, and verbally. • Solve motion application problems using the concept of the integral including position, velocity, and acceleration	**Other Evidence:** **Textbook problems from sections:** 6.1 Estimating with finite sums 6.2 Definite integrals 6.3 Definite integrals and antiderivatives 6.4 Fundamental Theorem of calculus 6.5 Trapezoidal Rule Any AP practice questions from textbook, AP Classroom, or other resources
Learning Plan	
In this unit, students are introduced to the concept of the integral and proper use of the notation. They start by finding ways to estimate the value of an integral using rectangles and how this concept is related to the limit. They are then introduced to a definite integral and ways to calculate it including geometry and some simple integral rules and properties. They are introduced to the term antiderivative and the concept of average value of a function. They also learn the fundamental theorem of calculus in this unit and start to analyze integrals that are represented graphically,	

numerically, algebraically, and verbally. They will connect the concept of the integral to motion problems including position, velocity, and acceleration. At the end of the unit, they will approximate integrals using the Trapezoidal Rule.

Vision of A Learner Attributes: TCC2(9-12), **CCE2(9-12**), **CCE4(9-12)**

- Use guided note-taking sheets from UConn professor for initial concepts
- Students will complete textbook practice problems working in groups during class and individually outside of class
- Class discourse on correct solutions to textbook problems - compare strategies and ask questions
- AP practice problems- Class discourse on correct solutions- compare strategies and ask questions
- Individual/group in class practice on concepts that will be measured on the assessment

Teacher Resources: Finney Calculus textbook, also problems from previous edition of Finney textbook, guided note taking sheet from UConn professor on Riemann Sums, AP Classroom

Unit 8 - Differential Equations and Mathematical Modeling

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **A.REI.A.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **F.BF.B.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated)

- **TCC1(9-12)**: I can ask purposeful, insightful questions to find a variety of innovative solutions.
- **TCC3(9-12)**: I can integrate relevant information to produce multiple valid solutions.
- **CCE2(9-12)**: I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.
- **CCE3(9-12):** I can show initiative in prompting group discourse and fostering collaboration among others, providing actionable feedback, and working with others to solve problems and/or design products.
- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

Understandings: Students will understand that…

- Slope fields provide a graphical representation of the solutions to a first-order differential equation, allowing students to visualize the direction and behavior of solution curves even when explicit solutions are difficult to obtain.

Essential Questions:

- What is a slope field, how does it visually represent the solutions to a differential equation, and how can it help us understand the general behavior of solutions to a differential equation, particularly when an explicit solution is difficult or impossible to

• Slope fields are closely related to the differential equation they represent, showing how the slope of the solution curve at any given point corresponds to the value of the derivative at that point. Understanding this relationship reinforces the connection between graphical and analytical approaches to differential equations. • Differential equations are powerful tools for modeling a wide range of dynamic systems in mathematics, science, and engineering. They describe how a quantity changes over time or space based on its current state, providing insights into the behavior of physical, biological, and economic systems. • Various methods exist for solving differential equations but this course will focus on separation of variables. Understanding this method allows students to find both general and particular solutions. • Initial conditions play a crucial role in determining the specific solution to a differential equation from a family of possible solutions. Understanding how initial conditions influence the outcome of a differential equation is key to accurately modeling real-world scenarios. • Analytical solutions to differential equations provide precise mathematical expressions for the behavior of a system, while graphical methods, such as slope fields, offer a visual understanding of these solutions. Both approaches are interconnected and complement each other in solving and interpreting differential equations. • U-substitution is a powerful method for simplifying integrals, particularly those involving composite functions. By substituting part of the integrand with a single variable (u), students can transform a complex integral into a simpler one, making it easier to evaluate. • U-substitution is the reverse process of the chain rule in differentiation. This connection reinforces the idea that integration and differentiation are inverse operations, and it provides a systematic approach to handling integrals that involve composite functions.	find? • What is a differential equation, how does it represent the relationship between a function and its derivatives and how can they be used to model real-world situations, such as population growth, motion, or chemical reactions? • What are the methods for solving first-order differential equations, such as separation of variables and integrating factors, and how do these methods apply to different types of differential equations? • In what types of integrals is u-substitution most useful, and how can this technique be applied to solve integrals involving trigonometric, exponential, or logarithmic functions?

• U-substitution is applicable to both definite and indefinite integrals. In the case of definite integrals, understanding how to adjust the limits of integration after substitution is crucial for obtaining the correct result. • The process of choosing an appropriate substitution requires critical thinking and pattern recognition. Students must analyze the structure of the integrand to identify the best substitution, which fosters deeper problem-solving skills and mathematical intuition. • After integrating with respect to u, it is essential to revert the integral back to the original variable. This step ensures that the solution is expressed in terms of the original problem, emphasizing the importance of understanding the relationship between the substitution and the original function.	
Students will know… • Only certain types of differential equations can be solved by separation of variables • The difference between a general and initial value differential equation • A slope field is constructed by graphing the slope of the differential equation at particular points in the x-y plane • When to use u-substitution to solve an integral • All the steps to solve an integral using u-substitution and be familiar with the many strategies they have practiced • Differential equations can be used to solve application problems related to exponential growth and decay • When solving an indefinite integral you must add the constant of integration to the solution	**Students will be able to…** • Analyze differential equations to obtain general and specific solutions • Construct a slope field for a given differential equation. • Solve an integral (definite and indefinite) using integration by u-substitution, including many different strategies • Model an exponential growth/decay situation with a differential equation and solve • Match a slope field to the appropriate differential equation
Key Vocabulary: Differential equation, slope field, indefinite integral, constant of integration, u-substitution, separation of variables	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)**	**Other Evidence:** **Textbook problems from sections:**

Topics include: ● Analyze differential equations to obtain general and specific solutions ● Construct a slope field for a given differential equation. ● Solve an integral (definite and indefinite) using integration by u-substitution, including many different strategies ● Model an exponential growth/decay situation with a differential equation and solve ● Match a slope field to the appropriate differential equation	7.1 Slope Fields 7.2 Antidifferentiation by substitution 7.4 Exponential growth and decay **U-substitution practice: TCC1(9-12), CCE2(9-12), CCE3(9-12)** Students will work in groups to solve integrals by u-substitution Any AP practice questions from textbook, AP Classroom, or other resources

Learning Plan

In this unit students are introduced to differential equations and how to obtain general and specific solutions to them as well as slope fields and how they represent an equation. Most importantly, they are introduced to the concept of u-substitution to solve more difficult integrals. This involves many different strategies and types of problems. They will learn how to solve differential equations by separation of variables and to solve application problems involving exponential growth and decay, for example, finding the amount of time it will take for a radioactive material to decay to a certain amount of its original value.

Vision of A Learner Attributes: TCC1(9-12),TCC3(9-12), CCE2(9-12), CCE3(9-12), CCE4(9-12

- Students will complete textbook practice problems working in groups during class and individually outside of class
- Class discourse on correct solutions to textbook problems - compare strategies and ask questions
- Extra practice from Larson book- work in groups-class discourse on correct solutions- compare strategies and ask questions
- AP practice problems- Class discourse on correct solutions- compare strategies and ask questions
- Individual/group in class practice on concepts that will be measured on the assessment

Teacher Resources: Finney Calculus textbook, Larson textbook, teacher created extra practice and review, AP Classroom

Unit 9 - Applications of Definite Integrals

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **N.RN.A.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **N.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **A.SSE.B.3**.A Factor a quadratic expression to reveal the zeros of the function it defines.
- **A.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
- **G.GMD.A.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
- **G.GMD.B.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
- **G.MG.A.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Standards for Mathematical Practice

- **MP1:** Make sense of problems and persevere in solving them.
- **MP2:** Reason abstractly and quantitatively.
- **MP3:** Construct viable arguments and critique the reasoning of others.
- **MP4:** Model with mathematics.
- **MP5:** Use appropriate tools strategically.
- **MP6:** Attend to precision.
- **MP7:** Look for and make use of structure.
- **MP8:** Look for and express regularity in repeated reasoning.

Vision of A Learner Attributes: Students will be able to independently use their learning to... ("I can" statements to be demonstrated)

- **CCE4(9-12)**: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.
- **TCC3(9-12)**: I can integrate relevant information to produce multiple valid solutions.

Understandings: Students will understand that… ● The definite integral is a powerful tool for accumulating quantities, representing the total accumulation of a rate of change over an interval. It can model real-world phenomena such as distance traveled, area, volume, and other quantities that can be interpreted as the accumulation of a changing rate. ● Integrals can be used to find geometric quantities such as the area under a curve, the area between curves, and the volume of solids formed by revolution or with known cross-sectional areas. Understanding integrals as geometric constructs provides a concrete foundation for their application in various fields. ● Integrals can be represented and interpreted in multiple ways, including graphically, algebraically, and numerically. Understanding these different representations enables students to approach problems from various angles and apply the most effective method for a given situation. ● In applications of integrals, the limits of integration are crucial for defining the interval over which accumulation occurs. Whether calculating net change, total area, or volume, understanding the significance of these limits is essential for correctly setting up and interpreting the integral.	**Essential Questions:** ● How can the concept of definite integrals be used to find the total accumulation of a quantity such as distance, area, and volume? ● How can integrals be used to find the area of a region bounded by multiple functions? ● What is the difference between the disk method and the washer method, and when is each appropriate to use? ● How do you set up an integral to find the volume of a solid when rotating a curve about the x-axis or y-axis? ● How do you set up an integral to calculate the volume of a solid with known cross sections, such as squares, rectangles, triangles, or semicircles?
Students will know… ● The definite integral can be used to express information about accumulation and net change in many applied contexts ● Definite integrals can be used to find the area between two curves and finding the points of intersection is a necessary part of the problem ● The shortcuts for finding cross-sections of squares, semi-circles, and equilateral triangles ● Volumes of solids with known cross sections, including discs and washers, can be calculated with definite integrals ● How to distinguish a disk versus a washer volume problem ● Drawing a picture is an important first step when trying to	**Students will be able to…** ● Use a definite integral to solve application problems involving accumulation and net change ● Use a definite integral to find the area between two curves ● Visualize a three-dimensional object formed by the revolution of a function about a vertical or horizontal axis and use a definite integral to calculate the volume of the object, including disks and washers ● Use a definite integral to find the volume of a three dimensional shape formed by cross sections between two curves ● Solve motion problems with integrals including finding the direction of a particle, the displacement, and the distance traveled, given a graph or equation

visualize a volume of revolution or a cross section. ● The type of integral that represents parts of the motion application problem	
Key Vocabulary: Solid of revolution, cross section, displacement	
Assessment Evidence	
Performance Tasks: **Summative Unit Assessment: AA1(9-12), TCC3(9-12), CCE4(9-12)** **Topics include:** ● Use a definite integral to solve application problems involving accumulation and net change ● Use a definite integral to find the area between two curves ● Visualize a three-dimensional object formed by the revolution of a function about a vertical or horizontal axis and use a definite integral to calculate the volume of the object, including disks and washers ● Use a definite integral to find the volume of a three dimensional shape formed by cross sections between two curves ● Solve motion problems with integrals including finding the direction of a particle, the displacement, and the distance traveled, given a graph or equation	**Other Evidence:** **Textbook problems from sections:** 8.1 Accumulation and net change 8.2 Areas in the plane 8.3 Volumes Any AP practice questions from textbook, AP Classroom, or other resources
Learning Plan	
In this last unit, students will solve application problems using integrals. They will solve motion problems using integrals, for example finding displacement and total distance traveled, and using integrals to represent accumulation such as consumption of oil in the US over a certain time. Next they will find the area under a curve using an integral, given a graph or an equation. Lastly, they will learn to visualize a three-dimensional object formed by the revolution of a function about a vertical or horizontal axis and use a definite integral to calculate the volume of the object, including disks and washers. This will also include finding the volume of a three dimensional shape formed by cross sections between two curves. **Vision of A Learner Attributes: AA1(9-12), TCC3(9-12), CCE4(9-12)** ● Students will complete textbook practice problems working in groups during class and individually outside of class ● Class discourse on correct solutions to textbook problems - compare strategies and ask questions ● Extra practice from Larson book- work in groups-class discourse on correct solutions- compare strategies and ask questions	

• AP practice problems- Class discourse on correct solutions- compare strategies and ask questions • Individual/group in class practice on concepts that will be measured on the assessment
Teacher Resources: Finney Calculus textbook, Larson textbook, teacher created extra practice and review, AP Classroom

Regional School District 14 Textbook Adoption Proposal Form

Instructions - After the text selection process is finished, please submit the following to the Director of Teaching and Learning for the chosen text:

- Completed adoption proposal form
- A copy of the cost proposal/quote from the vendor
- 1-3 copies of the Student Textbook and the Teacher's Guide for review.

School/Grade/Department:NHS/11-12/Science	Date: 11/1/2024
Evaluating Team Members: Kathleen Yocis & Toby Denman	
Textbook Information	
Title of the Proposed Textbook: Environmental Science for the AP Course	Edition: 4th
Author(s)/Editors: Friedland & Relyea	
Publisher (please include name of contact person, address, phone, and fax)BFW Publishing, Becky Anderson | Senior Publisher's Representative | **C** 207.540.0909 | banderson@bfwpub.com	
Text Readability Level:	Copyright Year: 2023
Is this a more current edition of an approved text already in use? (If yes, please include the title, copyright date, and publisher of the text being replaced) Yes replaces 3rd Edition of Environmental Science for the AP Course 2019 BFW Publishing	
Proposed Textbook Cost	
Cost of The Proposed Text:	$153.98/book + $39.00e-book add on
Number of Texts Requested:	x 35
Approximate Cost of Shipping:	$347.50
Total Cost:	$7101.80
Additional Information Required	
Titles of Other Texts Reviewed: Environmental Science: Your World, Your Turn: Savvas Learning Company; AP Environmental Science College Board 2019 CED (with 2020 amendments) 1st edition by Biozone	

Advantages of The Proposed Text: This text is more up to date with current environmental issues, It is ordered and aligned with the current AP exam, Text font and diagrams much easier to read and not as wordy as last edition. Plus e-book so students always have access and includes practice quizzes and test banks aligned with AP exam for instructor.
Other School Districts Utilizing The Proposed Text: Bethel Danbury Farmington Groton Region 9 (Redding) Milford Newington North Haven Norwich Free Academy RSD 1 RSD 20 Southington Stonington Suffield Windham

Evaluation of The Proposed Textbook			
Content - Please place an "x" in the appropriate rating.	**Yes**	**No**	**N/A**
1. Are the instructional goals clearly stated in terms of what students should know and be able to do?	X		
2. Does the content align with the state and district curriculum standards?	X		
3. Does the content challenge students of varying levels?	X		
4. Is the content age appropriate in terms of interests, concepts, etc.?	X		
5. Does the content reflect recent scholarship in this subject area?	X		
6. Are there connections made within and across content areas?	X		
7. Are gender, racial, ethnic, religious, and socio-economic groups, past and present, accurately and fairly represented?	X		
8. Does the content (both pictorial and written) reflect the pluralistic, multi-ethnic nature of our global society?	X		
9. Are all sides of a controversial issue treated objectively?	X		
Please provide a brief explanation any "no" responses above:			
Assessment of Student Learning - Please place an "x" in the appropriate rating.	**Yes**	**No**	**N/A**
1. Are there formal and informal assessment practices integrated throughout the text?	**X**		
2. Do the assessments provide a balanced profile of students' acquisition of skills, knowledge, understanding, and their ability to apply their learning to real world situations?	**X**		
3. Will the assessments provide meaningful feedback to teachers to improve instruction and learning?	**X**		
Please provide a brief explanation any "no" responses above:			
Instructional Support - Please place an "x" in the appropriate rating.	**Yes**	**No**	**N/A**
1. Are there up-to-date reference sources listed?	X		

2. Is there a focus on higher level thinking skills?	X		
3. Are the units and lessons organized in a manner that are easy to use?	X		
4. Do the activities engage students in problems and questions before solutions and answers are introduced?	X		
5. Do the materials allow for a variety of activities that address different learning styles?	X		
6. Do the materials provide ways of building students' competency with the Vision of A Learner attributes?	X		
7. Do the materials provide opportunities for parents and community members to be involved in learning activities?	X		
8. Are the typeface, type size, illustrations, and visual aids suitable for the students who will be using this text?	X		
9. Is the text/supplemental material available in different languages?	x		
10. Is the text/supplemental material available on audiobook?		X	
11. Do the instructional methods reflect current learning theory and pedagogy?	X		
12. Are the authors (contributors) recognized for their expertise in this subject area and their experience with students at a similar level to those who will be utilizing this text?	X		
Please provide a brief explanation any "no" responses above:			
Overall Summary and Rationale for Utilizing This Textbook:			

Approval Signatures	
Department Chairperson:	Date:
Principal:	Date:
Director of Teaching and Learning:	Date:

4134

Personnel - Certified

Tutoring (Draft)

It is expected that every effort will be made by the Principal and teacher to resolve the learning problems of a student at school. The Board of Education believes that by maintaining high quality instructional staff and providing for a rich, varied curriculum, the need for individual tutoring is minimized. Should, however, individual tutoring be pursued by parents/guardians, the following regulations will protect both the school system and the teachers from charges of conflict of interest.

In accordance with standard professional ethics, no teacher shall be permitted to receive compensation for privately tutoring any students for which the teacher has instructional responsibilities. This does not include teachers employed by the Board who provide homebound instruction assigned by the district.

Region 14 certified faculty members who privately tutor students must adhere to the following:

1. All private tutoring must occur outside of contractual hours.
2. Any teacher using district facilities to provide private tutoring must complete a facilities use form indicating the date, time, and location of the tutoring session(s) and receive approval prior to tutoring.
3. Private tutoring is outside of the scope of a teacher's employment with Region 14. Region 14 assumes no duty of care or other responsibility to such tutors or to parents engaging such tutors, as any such tutoring engagement is a private commercial matter between the parties.

Legal Reference: Connecticut General Statutes

53-392a -53-392e All related to academic crimes.

53-392b Preparation of assignments for students attending educational institutions prohibited.

Personnel -- Certified/Non-Certified

Recruitment and Selection

The Board desires the Superintendent to develop and maintain a recruitment program designed to attract and hold the best possible personnel who are "effective teachers" as defined by federal law in the District's schools. All District teachers must meet applicable state certification and licensure requirements, including any requirements for certification obtained through alternate routes to certification.

The school district recognizes the heterogeneity of the people who live in the school district and believes that this characteristic should have an important bearing on all aspects of the school district's activities.

The Board of Education believes it is especially important that this heterogeneity of population be recognized in the recruitment and assignment of personnel.

To this end, the Board of Education shall develop and implement a written plan for minority staff recruitment. The administration is directed to make a serious effort to see that the recruitment procedures of the district produce a total staff representative of the total population of the district and that the assignment procedures of the district bring to each school staff members representative of the population represented by the student membership in each local school.

The schools shall engage in fair and sound personnel practices in the appointment of all district employees. The administration shall be responsible for establishing recruitment, selection and appointment procedures.

The Superintendent shall insure that the District is in compliance with the provisions of Title I and the Every Student Succeeds Act. Manuals and handbooks shall comply with federal law as to the qualifications for instructional personnel. Parents/guardians of students in Title I schools shall be informed annually, at the beginning of each school year, of their right to request information about whether their child's teacher has met state qualifications and licensing criteria for the grade levels and subject areas in which the teacher provides instruction; is teaching under emergency or other provisional status through which state qualifications or licensing criteria have been waived; and is teaching in the field of discipline of the certification of the teacher. The qualifications of services provided by paraprofessionals shall also be provided. Timely notices shall also be provided to parents/guardians that the student has been assigned, or has been taught in a Title I school for 4 or more consecutive weeks by a teacher who does not meet applicable state certification or licensure requirements at the grade level and subject area in which the teacher has been assigned.

Personnel -- Certified/Non-Certified

Recruitment and Selection (continued)

Hiring of Retired Teachers

A **retired** teacher receiving benefits from the Teachers Retirement Board (TRB) may be reemployed by the Board for up to one full school year in a position (1) designated by the Commissioner of Education as a subject shortage area, or (2) at a school located in a priority school district for the school year in which the teacher is being employed. Such employment may be for up to one full school year. Such reemployment may be extended for an additional school year, provided the Board (a) submits a written request for approval to the Teachers' Retirement Board, (b) certifies that no qualified candidates are available prior to the reemployment of such teacher and (c) indicates the type of assignment to be performed, the anticipated date of rehire and the expected duration of the assignment. The forty-five percent limitation applies, as described below, if the retired teacher described in this paragraph, works in excess of two years in either a subject shortage area and/or in a school in a priority school district.

The salary of such teacher shall be fixed at an amount at least equal to that paid other teachers in the District with similar training and experience for the same type of service.

Except as indicated in the first paragraph in this section, a certified educator receiving retirement benefits from the Teachers Retirement Board (TRB) may not be employed in a certified position receiving compensation paid out of public money appropriated for school purposes except that such educator may be employed in such a position and receive no more than forty-five percent of the maximum salary level for the assigned position. Any certified educator who receives in excess of such amount shall reimburse the Board for the amount of such excess. Fringe benefits offered by the District, if taken by the employed retired individuals, are included in the maximum compensation. The individual can continue to pay TRB for health insurance as a retired member in the same manner as prior to the post retirement employment. (Health insurance from the Board is not legally required to be offered.)

(cf. 4115 – Evaluation)

Legal Reference: Connecticut General Statutes

10-151 Employment of teachers. Notice and hearing on termination of contract (as amended by P.A. 12-116 An Act Concerning Educational Reform)

10-153 Discrimination on account of marital status.

Personnel -- Certified/Non-Certified

Recruitment and Selection

Legal Reference: Connecticut General Statutes (continued)

10-183v Reemployment of teachers, as amended by P.A. 10-111, An Act Concerning Education Reform in Connecticut, P.A. 16-91, An Act Making Changes to the Teachers' Retirement System, and PA 17-173 An Act Concerning Minor Revisions and Additions to the Education Statutes and PA 18-42 An Act Concerning a Provision Concerning Reemployment of Certain Teachers.

10-220 Duties of Boards of Education.
31-126 Unfair Employment Practices.

46a-60 Discriminatory employment practices prohibited.

Title IV Equal Employment Opportunities.

34 C.F.R. 200.55 Federal Regulations.

P.L. 114-95 Every Student Succeeds Act, S.1177-55, 56

Executive Order No. 14E, Protection of Public Health and Safety During COVID-19 Pandemic – Re-employment of Retired Teachers to Help Address Teacher Shortage

Policy adopted:
rev 6/17
rev 6/18
rev 9/20
rev 1/22
rev 12/22