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
Special Meeting
Curriculum Committee Meeting
Thursday, October 2, 2025; 2:15 p.m.
Central Office Conference Room

I. Call to order

II. Curriculum Documents for Approval
- A. AP Biology
- B. Biology
- C. Biotechnology
- D. World Languages - 3rd Year
- E. The Writer's Studio (ENGL 3082)
- F. Algebra 1
- G. Aquaculture 11/12 Year B
- H. Greenhouse 10 Plant Production and Processing

III. New Courses
- A. Video Game Design II/EGM201 Psychology of Gaming (Post University)
- B. Video Game Design III/EGM401 Gaming Project Management (Post University)

IV. Adjourn

AP BIOLOGY CURRICULUM

(Refer to the Curriculum Template Explanation document while writing curriculum)



Grade Level(s): 11-12

Curriculum Author(s): Toby Denman

Course Description: AP Biology is an introductory college-level biology course. Students develop understanding through inquiry-based investigations in evolution, cellular processes, energy and communication, genetics, ecology, and interactions. The course fosters scientific reasoning, data analysis, and argumentation skills while developing critical thinking, collaboration, initiative, perseverance, and adaptability—preparing students for advanced STEM study and lifelong learning.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Unit 1: Chemistry of Life	How does molecular structure determine function in biological macromolecules?	The structure of macromolecules determines their function	TCC2(9-12); CCE1(9-12); TI2(9-12)
Unit 2: Cells	How does cell structure relate to function?	Cell structures are specialized for specific functions	TCC2 (9-12); CCE3 (9-12)
Unit 3: Cellular Energetics	How do cells capture and use energy?	Energy flow is essential for life processes	TCC2(9-12); CCE1(9-12); TI2(9-12)
Unit 4: Cell Communication and Cell Cycle	How do cells communicate internally and externally?	Cell communication is critical for coordinated function	TCC3(9-12); CCE4(9-12)
Unit 5: Heredity	How is genetic information inherited?	Genetic variation arises from multiple sources	TCC4(9-12); TI3(9-12); P1(9-12)
Unit 6: Gene Expression and Regulation	How is genetic information expressed?	The central dogma describes information flow from DNA to protein	TCC2(9-12); CCE2(9-12); AA3(9-12)
Unit 7: Natural Selection	How does natural selection drive evolution?	Multiple lines of evidence support evolution	TCC1(9-12); TI4(9-12); P4(9-12)
Unit 8: Ecology	How do energy and matter cycle through ecosystems?	Ecosystems are dynamic systems of interactions	CCE1(9-12); TI2(9-12)

Unit 1: Chemistry of Life

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells
- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
- HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules

AP Biology Big Ideas:

- Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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

- TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions
- CCE1(9-12): 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
- 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…

- The unique properties of water support life on Earth.
- Living systems require a constant input of energy and exchange of macromolecules.
- Biological macromolecules have specific structures and functions that determine their roles in living organisms.

Essential Questions:

- How do the properties of water support life?
- How does molecular structure determine function in biological macromolecules?
- How do energy and matter flow through living systems?

Students will know...	Students will be able to...
• Properties of water and hydrogen bonding • Structure and function of carbohydrates, lipids, proteins, nucleic acids • Chemical reactions: dehydration synthesis, hydrolysis	• Describe and model molecular structures • Explain how structure determines function in biomolecules • Analyze and interpret data from macromolecule investigations

Key Vocabulary: Polarity, hydrogen bond, macromolecule, monomer, polymer, dehydration synthesis, hydrolysis, carbohydrate, lipid, protein, nucleic acid

Assessment Evidence

Performance Tasks:	Other Evidence:
• Laboratory investigation: Testing properties of water and macromolecule identification • Model-building: Constructing and explaining macromolecular structures	• Interim Assessment: AP-style multiple-choice and free-response questions focused on visual representation and conceptual analysis of biological macromolecules and water properties. • Assessment Options: 1. Lab Report: Conduct an investigation on water's properties (e.g., surface tension) and produce a written report with conclusions. 2. Model Creation: Create a physical or digital model of a macromolecule and present its structure and function. 3. Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Water properties demo and collaborative data analysis	HS-LS1-2	CCE1(9-12)
Macromolecule modeling with peer feedback and revision	HS-LS1-1, HS-LS1-6	TCC2(9-12)
Enzyme activity lab design and evaluation	HS-LS1-1, HS-LS1-6	TI2(9-12)

Teacher Resources:

- AP Biology CED Unit 1
- HHMI Biointeractive: Water and Macromolecules resources
- Gizmos
- AP Classroom Progress Checks
- POGIL
- Laboratory supplies

Unit 2: Cells

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

AP Biology Big Ideas:

- Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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

- TCC2 (9-12): I can evaluate evidence from multiple perspectives.
- CCE3 (9-12): I can lead group progress through active listening and questioning.

Understandings: Students will understand that...

- Cell structures are specialized for specific functions
- Membranes regulate material and information flow
- Homeostasis is maintained through feedback mechanisms

Essential Questions:

- How does cell structure relate to function?
- How do cells maintain internal environments?
- How do feedback mechanisms regulate cell processes?

Students will know...	**Students will be able to...**
● Prokaryotic vs. eukaryotic cells, organelles, membrane structure ● Transport mechanisms: diffusion, osmosis, active transport ● Feedback and homeostasis in cells	● Compare and contrast cell types and structures ● Model and explain membrane transport ● Analyze experimental data on osmosis and homeostasis

Key Vocabulary: Organelle, prokaryote, eukaryote, plasma membrane, diffusion, osmosis, active transport, homeostasis, feedback

Assessment Evidence

Performance Tasks:	Other Evidence:
Microscopy lab: Identifying and comparing cell types Osmosis/diffusion investigation with data analysis	○ AP-style questions on membrane transport. ○ Cell model construction and organelle function presentation. ○ Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	**NGSS Standard**	**VoL Attribute**
Collaborative cell structure exploration with digital models	HS-LS1-2, HS-LS1-4	CCE3(9-12)
Agar cube lab to demonstrate surface area-to-volume ratio.	HS-LS1-3	TCC2

Teacher Resources:

- AP Biology Lab Manual: Osmosis and Diffusion Lab.
- Case studies on cellular dysfunction.
- Gizmos
- POGIL
- Pivot Interactives

Unit 3 - Cellular Energetics

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy
- HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy

AP Biology Big Ideas:

- Big Idea 2: Biological systems utilize free energy and molecular building blocks to grow, reproduce, and maintain dynamic homeostasis.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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
- TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals
- 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: Students will understand that...	**Essential Questions:**
• Enzymes lower activation energy and regulate reactions • Energy flow is essential for life processes • Feedback mechanisms modulate metabolic pathways	• How do cells capture and use energy? • How do enzymes regulate biological processes? • How do feedback mechanisms affect cellular energetics?
Students will know...	**Students will be able to…**

• Enzyme structure and function, factors affecting enzyme activity • Photosynthesis and cellular respiration pathways • ATP production and energy transfer	• Design and analyze enzyme experiments • Model and explain energy transformations • Interpret data on photosynthesis and respiration

Key Vocabulary: Enzyme, substrate, activation energy, ATP, photosynthesis, cellular respiration, feedback inhibition

Assessment Evidence

Performance Tasks: • Enzyme catalysis lab with data analysis • Modeling and presenting energy flow in cells	Other Evidence: • Graphing and interpreting enzyme reaction rates • Short-answer questions on feedback mechanisms • Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Student-designed enzyme investigations	HS-LS1-3	TCC1(9-12)
Photosynthesis/respiration modeling project with adaptation	HS-LS1-5, HS-LS1-7	TI1(9-12)
Metabolic pathway challenge with reflection	HS-LS1-3, HS-LS1-7	P2(9-12)

Teacher Resources:
- AP Biology CED Unit 3
- HHMI: Enzyme and Metabolism resources
- AP Classroom Progress Checks
- Gizmos
- Pivot Interactives
- POGIL
- Laboratory supplies

Unit 4: Cell Communication and Cell Cycle

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis
- HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

AP Biology Big Ideas:

- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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

Understandings: Students will understand that...

- Cell communication is critical for coordinated function
- The cell cycle is tightly regulated for organismal health
- Disruptions can lead to disease or malfunction

Essential Questions:

- How do cells communicate internally and externally?
- What regulates the cell cycle?
- How do disruptions in communication affect organisms?

Students will know...

- Types of cell signaling, signal transduction pathways
- Cell cycle phases, regulation, and checkpoints

Students will be able to...

- Model and explain signaling pathways
- Analyze data on cell cycle regulation

• Consequences of cell cycle dysregulation	• Predict effects of communication breakdowns

Key Vocabulary: Ligand, receptor, signal transduction, cell cycle, checkpoint, apoptosis

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Signal transduction pathway modeling • Cell cycle regulation investigation	• Concept mapping of signaling pathways • Group analysis of cell cycle disorders • Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Multi-pathway signal transduction integration	HS-LS1-2, HS-LS1-3	TCC3(9-12)
Cell cycle communication presentations	HS-LS1-4	CCE4(9-12)

Teacher Resources:
- AP Biology CED Unit 4
- HHMI: Cell Signaling resources
- AP Classroom Progress Checks
- POGIL

Unit 5: Heredity

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring
- HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors
- HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population

AP Biology Big Ideas:

- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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

- TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life
- TI3(9-12): I can formulate and investigate probing questions to further my learning
- 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: Students will understand that...

- DNA and chromosomes encode heritable traits
- Genetic variation arises from multiple sources
- Inheritance patterns can be predicted and analyzed

Essential Questions:

- How is genetic information inherited?
- How do mutations and meiosis contribute to variation?
- How do environmental factors affect inheritance?

Students will know...

- Mendelian and non-Mendelian inheritance

Students will be able to...

- Solve genetics problems and predict outcomes

• Sources of genetic variation: meiosis, mutation • Environmental impacts on gene expression	• Analyze pedigrees and inheritance patterns • Make and defend claims about genetic variation

Key Vocabulary: Gene, allele, chromosome, meiosis, mutation, genotype, phenotype

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Genetics problem-solving and pedigree analysis • Genetics case study • Modeling of meiosis	• Genetics quizzes and interactive activities • Genetics case studies • Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Genetics problem-solving and pedigree analysis	HS-LS3-1, HS-LS3-3	TCC4(9-12)
Genetics case study	HS-LS3-1, HS-LS3-2	TI3(9-12)
Modeling of meiosis	HS-LS3-2, HS-LS3-3	P1(9-12)

Teacher Resources:

- AP Biology CED Unit 5
- HHMI: Genetics resources
- AP Classroom Progress Checks
- Pivot Interactives
- POGIL
- Gizmos

Unit 6: Gene Expression and Regulation

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells
- HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors

AP Biology Big Ideas:

- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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
- AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment

Understandings: Students will understand that...

- The central dogma describes information flow from DNA to protein
- Gene expression is tightly regulated
- Mutations can alter gene expression and phenotypes

Essential Questions:

- How is genetic information expressed?
- How is gene expression regulated?
- How do mutations affect gene expression?

Students will know...	Students will be able to...
● Transcription, translation, regulation mechanisms ● Types and effects of mutations ● Biotechnology applications	● Model and explain gene expression processes ● Analyze effects of mutations ● Communicate findings using scientific language

Key Vocabulary: Transcription, translation, gene regulation, operon, mutation, biotechnology

Assessment Evidence

Performance Tasks:	Other Evidence:
● Modeling gene expression and regulation ● Gel Electrophoresis Lab	● Activities investigating gene expression steps ● Case studies on the effects of mutations ● Investigation of bacterial transformation ● Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Modeling gene expression and regulation	HS-LS1-1	TCC2(9-12)
Interactive gene expression modeling with feedback	HS-LS1-1, HS-LS3-2	CCE2(9-12)
Case studies on the effects of mutations	HS-LS3-2	AA3(9-12)

Teacher Resources:
- AP Biology CED Unit 6
- HHMI: Gene Expression resources
- AP Classroom Progress Checks
- Pivot Interactives
- POGIL
- Gizmos

Unit 7: Natural Selection

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence
- HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment
- HS-LS4-3: Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait
- HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations

AP Biology Big Ideas:

- Big Idea 1: The process of evolution drives the diversity and unity of life.
- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.

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
- TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals
- P4(9-12): 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...

- Multiple lines of evidence support evolution
- Natural selection is a primary mechanism of evolution
- Genetic variation and environment influence evolutionary outcomes

Essential Questions:

- What evidence supports evolution?
- How does natural selection drive evolution?
- How do genetic variation and environment interact in evolution?

Students will know...	Students will be able to...
● Evidence for evolution: fossils, molecular, anatomical ● Mechanisms: natural selection, genetic drift, gene flow ● Population genetics and Hardy-Weinberg equilibrium	● Analyze and interpret evolutionary evidence ● Model natural selection and population changes ● Construct explanations for evolutionary patterns

Key Vocabulary: Evolution, natural selection, adaptation, genetic drift, gene flow, Hardy-Weinberg

Assessment Evidence

Performance Tasks:	Other Evidence:
● Natural selection lab ● Hardy-Weinberg equilibrium modeling	● Quizzes on evolutionary mechanisms ● Data analysis of population genetics scenarios ● Unit Test consisted of questions from AP Classroom.

Learning Plan

Activity	NGSS Standard	VoL Attribute
Natural selection lab	HS-LS4-1	TCC1(9-12)
Population genetics modeling activity	HS-LS4-2, HS-LS4-3	TI4(9-12)
Evolution case studies	HS-LS4-4	P4(9-12)

Teacher Resources:

- AP Biology CED Unit 7
- HHMI: Evolution resources
- AP Classroom Progress Checks
- Data Nuggets
- Pivot Interactives
- POGIL
- Gizmos
- Laboratory supplies

Unit 8: Ecology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Next Generation Science Standards:

- HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales
- HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity
- HS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity

AP Biology Big Ideas:

- Big Idea 3: Living systems store, retrieve, transmit, and respond to information essential to life processes.
- Big Idea 4: Biological systems interact, and these systems and their interactions possess complex properties.

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

- CCE1(9-12): 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
- 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...	**Essential Questions:**
• Ecosystems are dynamic systems of interactions • Carrying capacity is influenced by biotic and abiotic factors • Human activity can disrupt ecosystem balance	• How do energy and matter cycle through ecosystems? • What factors affect population dynamics and carrying capacity? • How can human impacts on ecosystems be mitigated?
Students will know...	**Students will be able to...**
• Energy flow and matter cycling in ecosystems • Population ecology and carrying capacity	• Model and analyze ecosystem dynamics • Design and evaluate solutions for environmental issues

• Human impacts and biodiversity	• Communicate ecological findings

Key Vocabulary: Ecosystem, carrying capacity, population, biodiversity, sustainability, human impact

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Ecosystem modeling and carrying capacity analysis • Case study human impact on biodiversity	• Data analysis of population trends • Case studies on human impacts on the environment and trophic cascades • Unit Test consisted of questions from AP Classroom.

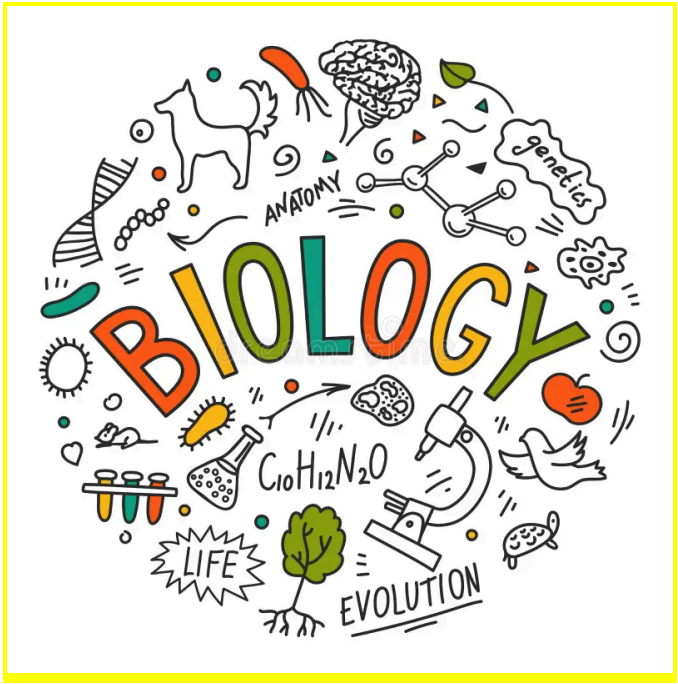
Learning Plan

Activity	**NGSS Standard**	**VoL Attribute**
Ecosystem modeling and carrying capacity analysis	HS-LS2-1	CCE1(9-12)
Case study human impact on biodiversity	HS-LS2-7, HS-LS4-6	TI2(9-12)
Biodiversity solution evaluation	HS-LS2-7, HS-LS4-6	TI2(9-12)

Teacher Resources:

- AP Biology CED Unit 8
- HHMI: Ecology and Conservation resources
- AP Classroom Progress Checks
- Data Nuggets
- Pivot Interactives
- POGIL
- Gizmos
- Laboratory supplies

BIOLOGY CURRICULUM



Grade Level(s): 10

Curriculum Author(s): Toby Denman, Shelly Stone

Course Description: This comprehensive Biology course introduces students to fundamental life science concepts through inquiry-based instruction, laboratory exploration, and real-world application. Students investigate the molecular building blocks of life, explore cellular and genetic processes, analyze evolutionary and ecological systems, and examine the structure and function of the human body. Aligned to the Next Generation Science Standards, this course prepares students to think critically and creatively about biological issues that impact individuals, communities, and the planet.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Unit 1: Molecules of Life	Life is based on the unique properties and interactions of carbon-based molecules.	Why is carbon uniquely suited to form the molecules of life?	TCC2(9-12), TI3(9-12), CCE3(9-12)
Unit 2: Introduction to Cell Biology	All living organisms are composed of cells, the basic units of structure and function.	What are the structures and functions of the major organelles in cells?	TCC3(9-12), TI1(9-12)
Unit 3: Cell Processes: Photosynthesis & Cellular Respiration	Energy is essential to all life and is transformed through the processes of photosynthesis and cellular respiration.	How do organisms obtain and use energy?	CCE4(9-12), TCC1(9-12), P2(9-12)
Unit 4: Mitosis and Meiosis	Mitosis is essential for growth, repair, and maintenance of multicellular organisms and meiosis contributes to genetic diversity in sexually reproducing organisms.	How do cells grow and reproduce in multicellular organisms?	TCC3(9-12), TCC2(9-12)
Unit 5: Mendelian Genetics	Inheritance follows predictable patterns that can be modeled and analyzed using probability.	How do traits pass from one generation to the next?	TCC1(9-12), TI2(9-12), CCE4(9-12)
Unit 6: DNA and Protein Synthesis	DNA carries genetic instructions that determine traits through the synthesis of proteins.	How does DNA control the traits of an organism?	TCC1(9-12), CCE4(9-12), TI3(9-12)
Unit 7: Human Genetics / Biotechnology	Many human traits are inherited in complex ways, including dominant/recessive, codominant, sex-linked, and polygenic inheritance. Biotechnology applications like gel electrophoresis, DNA fingerprinting, and genetic engineering provide powerful tools for analyzing, manipulating, and applying genetic information.	What are the different ways genes can influence human traits and how can biotechnology help us understand these influences?	TCC2(9-12), TI1(9-12), CCE3(9-12)

Unit 8: Evolution and Natural Selection	The theory of evolution explains the diversity and unity of life on Earth.	What evidence supports the theory of evolution?	TI3(9-12), CCE4(9-12), CCE1(9-12)
Unit 9: Microorganisms	Microorganisms are essential components of ecosystems, human health, and industrial processes.	What roles do microorganisms play in the environment and in our bodies?	CCE4(9-12), TCC3(9-12)
Unit 10: Ecology	Ecosystems are dynamic systems influenced by biotic and abiotic factors.	What factors influence population sizes and biodiversity in ecosystems?	CCE1(9-12), TCC4(9-12), P2(9-12)
Unit 11: Human Body Systems	How do the structures and functions of body systems work together to maintain life?	The human body is a complex system of interrelated parts that work together to maintain homeostasis and carry out life processes.	CCE3(9-12), DE4(9-12)

Unit 1 - Molecules of Life

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- Crosscutting Concepts (CCC): Structure and Function; Matter and Energy
- Science & Engineering Practice (SEP): Developing and Using Models; Constructing Explanations

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

- TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.
- TI3(9-12): I can formulate and investigate probing questions to further my learning.
- 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: Students will understand that...

- Life is based on the unique properties and interactions of carbon-based molecules.
- Macromolecules are essential for structure and function in all living organisms.
- Energy transformations in biological systems involve the breakdown and synthesis of molecules.

Essential Questions:

- Why is carbon uniquely suited to form the molecules of life?
- How do the structure and function of biological macromolecules relate?
- How do living organisms transform matter and energy at the molecular level?

Students will know…

- Structure of atoms: protons, neutrons, electrons
- How atoms form bonds (ionic vs. covalent)

Students will be able to…

- Model and explain the difference between ionic and covalent bonds

• How the polarity of water leads to cohesion, adhesion, and its role as a solvent • The structure and function of the four major types of macromolecules: carbohydrates, lipids, proteins, and nucleic acids. • The role of carbon in forming the backbone of organic molecules. • The basics of dehydration synthesis and hydrolysis reactions. • How energy is stored and released in chemical bonds during cellular respiration.	• Describe and investigate how water's polarity results in unique physical properties • Apply knowledge of bonding and polarity to the structure and function of macromolecules • Use models to represent molecular structures and reactions (e.g., building molecules with kits or drawings). • Compare and contrast the properties of macromolecules based on their structures. • Explain how molecules like glucose are transformed in metabolic pathways such as cellular respiration. • Analyze real-world nutritional data and connect to molecular biology concepts.
Key Vocabulary: Atom, Proton, Neutron, Electron, Ionic bond, Covalent bond, Polar molecule, Hydrogen bond, Cohesion, Adhesion, Surface tension, Solvent, Macromolecule, Monomer, Polymer, Carbohydrate, Lipid, Protein, Nucleic acid, Enzyme, Substrate, Active site, Dehydration synthesis, Hydrolysis, ATP, Cellular respiration	
Assessment Evidence	
Performance Tasks: "Organic Molecules Poster" Project: Students construct physical or digital models of macromolecules and explain how their structure enables their function. Water properties lab write-up with CER conclusion Macromolecule identification lab (e.g., using indicators: Benedict's, iodine, Biuret) Lab report: Enzyme activity investigation	**Other Evidence:** • Exit ticket: Describe how water's polarity explains one observed property • Chemistry of Carbohydrates, Lipids, Proteins lab macromolecule structures with their monomers and functions • Macromolecule Menu Analysis: Students analyze food labels or create a meal plan, identifying and categorizing macromolecules and explaining their biological importance. • Chemistry of Living Things Concept Map • Element Builder Gizmo • Enzyme Stem Case Gizmo • Bonding exit quiz (label atoms, bonds, polar vs. nonpolar) • Unit Test
Learning Plan	
VoL Attributes that are in **BOLD** will be measured.	

Lesson Activity	NGSS Alignment	VoL Attribute
Intro to atomic structure and bonding (Element Builder Gizmo)	Foundational for HS-LS1-6	TCC1, TI3
Chemistry of Living Things Concept Map	HS-LS1-2	
Bonding practice with Lewis structures -Element Builder Gizmo	SEP: Developing and Using Models	CCE3
Water Properties Lab	SEP: Planning and Carrying Out Investigations; CCC: Structure and Function	TI1, **TCC2**
Organic Molecules Poster Project	SEP: Constructing Explanations	TI2
Chemistry of Carbohydrates, Lipids, and Proteins Lab dehydration synthesis and hydrolysis	CCC: Matter and Energy HS-LS1-6	TCC2
Enzymes STEM Case (Gizmo)	HS-LS1-1	TCC2
Enzyme lab	HS-LS1-7	TCC2, P2, **TI3, CCE3**
Macromolecule Menu Analysis+ class discussion	SEP: Developing Models	CCE1, TI3

Teacher Resources:

- PhET or digital simulations or Gizmos for atomic structure and bonding
- Molecular model kits or interactive apps (e.g., MolView, BioDigital)
- Macromolecule labs with reagents (indicator tests)
- Enzyme lab materials (liver, H_2O_2, test tubes, applesauce, cellulase, pectinase)
- Infographics and food label resources for nutrient analysis

Unit 2 - Introduction to Cellular Biology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- Crosscutting Concepts (CCC): Structure and Function; Systems and System Models
- Science & Engineering Practices (SEP): Developing and Using Models; Constructing Explanations and Designing Solutions

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

- TCC3(9-12): I can integrate relevant information to produce multiple valid solutions.
- TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

Understandings: Students will understand that...

- All living organisms are composed of cells, the basic units of structure and function.
- Cellular organelles and membranes have specialized structures that support specific functions.
- The movement of substances across cell membranes is essential for homeostasis and cellular function.

Essential Questions:

- What are the structures and functions of the major organelles in cells?
- How do prokaryotic and eukaryotic cells differ and why does it matter?
- How do substances move into and out of cells, and why is that important?

Students will know...

- The components of the cell theory
- Differences between prokaryotic and eukaryotic cells
- Structures and functions of major organelles (e.g., nucleus, mitochondria, ribosome)
- Structure and function of the cell membrane
- Mechanisms of transport: diffusion, osmosis, facilitated diffusion, and active transport

Students will be able to...

- Identify and describe major organelles and their functions
- Compare and contrast prokaryotic and eukaryotic cells
- Use models to explain cell structure and transport processes
- Explain and predict the movement of substances across membranes
- Analyze experimental data related to diffusion and osmosis

Key Vocabulary: Cell theory, Organelle, Nucleus, Mitochondria, Ribosome, Endoplasmic reticulum, Golgi apparatus, Lysosome, Cell membrane, Prokaryote, Eukaryote, Diffusion, Osmosis, Facilitated diffusion, Active transport, Concentration gradient, Semi-permeable membrane, Homeostasis

Assessment Evidence

Performance Tasks:

Microscope Lab prokaryotic vs. eukaryotic cells

Diffusion/ Osmosis Lab

Other Evidence:

- Exit tickets identifying organelles and functions
- Diffusion and osmosis lab report or simulation worksheet
- Graphic organizer comparing types of membrane transport
- Cell structure and function quiz
- Transport concept check: sorting activity or digital drag-and-drop
- Cell Types, Cell Structure, Osmosis STEM Case Gizmos
- Paramecium Homeostasis Gizmo/ Goldfish NGSS Prompt
- Unit Test

Learning Plan

VoL Attributes that are in BOLD will be measured.

Lesson Activity	NGSS Alignment	VoL Attribute
Introduction to cell theory with timeline and microscope exploration/ Cell Types Gizmo	SEP: Constructing Explanations	CCE1, TI1
Microscope lab: prokaryotic vs. eukaryotic cells	HS-LS1-1	**TCC3**, CCE1
Cell Structure Gizmo	HS-LS1-1	CCE4, TI1
Cell analogy exit ticket	CCC: Structure and Function	TCC3, CCE4
Cell membrane structure lesson + interactive model/ Crash Course Membrane Transport Edpuzzle	HS-LS1-1	TCC2, CCE3
Diffusion/Osmosis lab	SEP: Planning and Carrying Out Investigations	**TI1**, TCC2

Osmosis STEM Case Gizmo/ Transport simulation or game	SEP: Developing and Using Models	CCE4, TI3
Paramecium Homeostasis Gizmo/ Goldfish NGSS Prompt	HS-LS 1-3	TI3

Teacher Resources:

- Microscopes and prepared slides (e.g., plant, animal, bacteria)
- Interactive websites and videos (CellsAlive, HHMI, Bioman, CrashCourse)
- Cell model materials (clay, craft supplies, digital tools)
- Osmosis and diffusion lab materials (gummy bears, eggs, salt solutions, dialysis tubing, cucumber, peppermint candy)
- Virtual labs or simulations (Gizmos, BioMan, PhET)
- Graphic organizers and analogy templates
- Lab safety materials and data sheets for experiments

Unit 3 - Cell Processes: Photosynthesis & Cellular Respiration

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-5: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed, resulting in a net transfer of energy.
- HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- Crosscutting Concepts (CCC): Energy and Matter; Systems and System Models
- Science & Engineering Practices (SEP): Developing and Using Models; Constructing Explanations and Designing Solutions

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.
- 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.
- 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...

- Energy is essential to all life and is transformed through the processes of photosynthesis and cellular respiration.
- Photosynthesis converts solar energy into chemical energy stored in glucose.
- Cellular respiration releases energy from glucose to power cellular activities in all living organisms.

Essential Questions:

- How do organisms obtain and use energy?
- How are photosynthesis and cellular respiration connected in the cycling of matter and flow of energy?
- What evidence supports the claim that these processes occur in cells?

Students will know...

- The overall equation and purpose of photosynthesis

Students will be able to...

• The overall equation and purpose of cellular respiration • The role of chloroplasts and mitochondria in energy transformation • How energy and matter are cycled through photosynthesis and respiration • The relationship between producers and consumers in energy flow	• Create and explain models that show the inputs and outputs of photosynthesis and respiration • Compare and contrast aerobic and anaerobic respiration • Analyze data and interpret evidence supporting energy transformation • Explain how photosynthesis and cellular respiration demonstrate conservation of matter and flow of energy
Key Vocabulary: Photosynthesis, Cellular respiration, Chloroplast, Mitochondria, Glucose, ATP, Carbon dioxide, Oxygen, Water, Light energy, Aerobic respiration, Anaerobic respiration, Reactants, Products, Chemical energy, Energy transformation	
Assessment Evidence	
Performance Tasks: • Photosynthesis Lab(Virtual Gizmo): • Yeast Fermentation Lab • Photosynthesis and Cellular Respiration Poster Project/ Respiration STEM Case Gizmo, Photosynthesis STEM Case Gizmo	**Other Evidence:** • Photosynthesis introduction and chloroplast review • Cell Energy Cycle Gizmo (Task Card) • Plants and Snails Gizmo • Cellular respiration introduction and mitochondria review • Flow Chart: Effects of Photosynthesis and Cellular Respiration with Two Snails and One Plant in 12 Hours of Light and 12 Hours of Darkness • Quick quizzes on vocabulary, equations, and function of organelles • Graphic organizer comparing photosynthesis and respiration • Exit ticket: Identify stages of respiration and their purpose • Class discussion or Socratic seminar on “What fuels life?” • Unit Test
Learning Plan	

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	NGSS Alignment	VoL Attribute

Photosynthesis introduction and chloroplast structure review	HS-LS1-5	TI3, CCE4
Photosynthesis Lab	SEP: Planning and Carrying Out Investigations	**TCC1,** TI1
Cellular respiration introduction and mitochondria review	HS-LS1-7	TCC3, CCE4
Cell Energy Cycle Gizmo	HS-LS1-5, HS-LS1-7	CCE4, TCC2
Yeast Fermentation Lab: Exploring anaerobic respiration	SEP: Developing Models	TCC2**, P2**
Photosynthesis and Cellular Respiration Poster Project/ Respiration STEM Case Gizmo, Photosynthesis STEM Case Gizmo	HS-LS1-7	**CCE4**
Energy transformation simulations and videos	CCC: Energy and Matter	TCC3, TI4

Teacher Resources:
- Yeast fermentation lab kits (yeast, sugar solutions, balloons/test tubes)
- Interactive simulations (e.g., Gizmos, BioMan, HHMI)
- Diagrams and animation resources (e.g., CellsAlive, BioInteractive)
- Graphic organizers and visual aids for photosynthesis/respiration comparison
- Assessment rubrics for poster project

Unit 4- Mitosis and Meiosis

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis.
HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits.
Crosscutting Concepts (CCC): Cause and Effect; Structure and Function
Science & Engineering Practices (SEP): Developing and Using Models; Engaging in Argument from Evidence; Asking Questions

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

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.

Understandings: Students will understand that…

- Mitosis is essential for growth, repair, and maintenance of multicellular organisms.
- Meiosis contributes to genetic diversity in sexually reproducing organisms.
- DNA is packaged in chromosomes, which carry the instructions for traits.

Essential Questions:

- How do cells grow and reproduce in multicellular organisms?
- How do mitosis and meiosis compare in purpose and process?
- Why is genetic variation important in living organisms?

Students will know...

- The stages and purpose of mitosis and meiosis
- The role of DNA and chromosomes in heredity
- How mutations or errors in meiosis can affect offspring
- Differences between sexual and asexual reproduction

Students will be able to...

- Model the stages of mitosis and meiosis
- Compare and contrast mitosis and meiosis
- Analyze how cell division relates to genetic variation
- Explain how chromosomes code for traits
- Make and support claims using genetic data

Key Vocabulary: Mitosis, Meiosis, Chromosome, Sister chromatid, Centromere, Homologous chromosomes, Diploid, Haploid, Crossing over, Independent assortment, Gamete, Fertilization, Zygote, Genetic variation, Asexual reproduction, Sexual reproduction

Assessment Evidence

Performance Tasks:

Cell Cycle and Cancer Webquest

Meowsis STEM Case

Other Evidence:

- "Cell Timeline"/ Cell cycle model
- Mitosis vs. Meiosis graphic organizer or comparison chart
- HELA Video/ Edpuzzle introduction to Mitosis
- Practice labeling diagrams or sequencing stages
- Cell Division Gizmo (e.g., ExploreLearning, BioMan) with student responses
- Mitosis Lab Alternate
- Investigation: Mitosis google slides
- Graphic organizers: mitosis vs meiosis
- Mitosis video and interactive notes on cell cycle
- Formative assessments on cell division stages and vocabulary

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	**NGSS Alignment**	**VoL Attribute**
Mitosis video and interactive notes on cell cycle	HS-LS1-4	TI2, CCE1
Cell Division Gizmo	HS-LS1-4	CCE4, TCC3
Cell Cycle and Cancer Webquest	HS-LS1-4	**TCC3**
Meiosis video + chromosomal crossover modeling activity	HS-LS3-2	TCC2, CCE3
Reebops Lab	SEP: Developing Models	TI1, TCC3
Graphic organizer: Mitosis vs. Meiosis	HS-LS1-4, HS-LS3-2	CCE4, TI2

Meowsis STEM Case	HS-LS3-1, HS-LS3-2	**TCC2**, CCE3

Teacher Resources:
- Prepared slides for onion root tip lab
- Chromosome cutouts or online meiosis simulators
- Videos (Amoeba Sisters, BioInteractive, Crash Course)
- Interactive websites and activities (BioMan, HHMI, Gizmos)
- Graphic organizer templates for comparisons and diagrams

Unit 5 – Mendelian Genetics

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits.
- HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis, errors during replication, or mutations caused by environmental factors.
- HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- Crosscutting Concepts (CCC): Cause and Effect; Patterns
- Science & Engineering Practices (SEP): Asking Questions and Defining Problems; Analyzing and Interpreting Data; Constructing Explanations

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

- TCC1(9-12): I can ask purposeful, insightful questions to find a variety of innovative solutions.
- TI2(9-12): I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.
- 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...

- Inheritance follows predictable patterns that can be modeled and analyzed using probability.
- Genes and alleles are the fundamental units of heredity that determine traits.
- Variation in traits arises through genetic recombination, mutations, and environmental factors.

Essential Questions:

- How do traits pass from one generation to the next?
- Why do offspring resemble their parents yet differ from them?
- How can probability be used to predict genetic outcomes?

Students will know...

- The principles of Mendelian inheritance: dominance, segregation, and independent assortment

Students will be able to...

- Solve genetic problems using Punnett squares
- Explain the difference between genotype and phenotype

• The roles of genotype and phenotype • How to use Punnett squares to predict outcomes • The significance of homozygous vs. heterozygous gene combinations • Patterns of inheritance such as codominance and incomplete dominance	• Analyze inheritance patterns in pedigrees • Interpret genetic ratios and make predictions using probability • Defend claims about trait inheritance using evidence

Key Vocabulary: Trait, Gene, Allele, Dominant, Recessive, Genotype, Phenotype, Homozygous, Heterozygous, Punnett square, Probability, Monohybrid cross, Dihybrid cross, Incomplete dominance, Codominance, Pedigree, Carrier, Heredity

Assessment Evidence

Performance Tasks:	Other Evidence:
Pedigree Investigation Case Study: Students analyze pedigrees to determine inheritance patterns and predict genotypes. Genetic Disorder Research Project (may be completed in Unit 7)	• Monohybrid and dihybrid Punnett square practice • Introduction to mendel video • Introduction to traits activity • Homework problems predicting trait outcomes • Short quiz on terminology and basic inheritance • Codominance and Incomplete Dominance inheritance pattern activities • Pedigree Studies • Online simulations of crosses (e.g., dragon genetics, pea plants, google slides)

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	NGSS Alignment	VoL Attribute
Mendel video/ story + intro to traits with trait inventory	HS-LS3-1	TCC1, TI2
Monohybrid cross online simulation	HS-LS3-3	TCC1
Mendel's Laws online simulation	HS-LS3-2	**TI2**
Codominance/incomplete dominance Punnett Square investigation	HS-LS3-2	TCC1

Dihybrid cross modeling	HS-LS3-3	TI2, **CCE4**
Pedigree Studies	HS-LS3-1	**TCC1**
Genetic Disorder Research + CER writing prompt	HS-LS3-2	**TI2**, CCE4
Probability Game (Reebop babies or coin crosses)	HS-LS3-3	CCE4

Teacher Resources:

- Trait inventory checklist & heredity starter activity
- Pedigree case studies and practice sheets
- Online tools like BioMan Genetics, Learn Genetics, HHMI, Gizmos
- CER scaffolds and grading rubrics
- Printable vocabulary flash cards and crossword review

Unit 6- DNA and Protein Synthesis

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits.
- HS-LS3-2: Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis, errors during replication, or mutations caused by environmental factors.
- Crosscutting Concepts (CCC): Structure and Function; Cause and Effect
- Science & Engineering Practices (SEP): Constructing Explanations; Analyzing and Interpreting Data; Asking Questions

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

- DNA carries genetic instructions that determine traits through the synthesis of proteins.
- Protein synthesis is a two-step process involving transcription and translation.
- Mutations can alter the structure and function of proteins, leading to variations in traits or genetic disorders.

Essential Questions:

- How does DNA control the traits of an organism?
- What are the steps of protein synthesis, and how do they work together?
- How can a mutation affect the structure and function of a protein?

Students will know...

- The structure of DNA and RNA
- Steps and key molecules involved in transcription and translation

Students will be able to...

- Model and explain the processes of transcription and translation
- Use a codon chart to translate mRNA sequences into amino acid chains

• The role of mRNA, tRNA, and ribosomes in protein synthesis • Types of mutations: substitution, insertion, deletion • How mutations can affect amino acid sequences and protein function	• Identify and classify mutations in DNA sequences • Predict the impact of mutations on protein structure and function • Ask and answer questions about how gene expression leads to traits

Key Vocabulary: DNA, RNA, Gene, Transcription, Translation, mRNA, tRNA, rRNA, Codon, Anticodon, Ribosome, Amino acid, Protein, Mutation, Substitution, Insertion, Deletion, Frameshift, Nucleotide, Genetic code

Assessment Evidence

Performance Tasks: - Protein Synthesis Comic Strip or Stop-Motion Animation: Students visually model the steps of transcription and translation using original illustrations or animation. - Mutation Case Study: Students analyze DNA and protein sequences to identify mutations and explain their effect on protein synthesis and function.	**Other Evidence:** Transcription and translation practice worksheets - Codon chart decoding activity - Mutation identification exit tickets - Short quiz on vocabulary and process steps - CER writing: “How can one base change affect a whole organism?”

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	**NGSS Alignment**	**VoL Attribute**
DNA vs. RNA comparison and structure notes	HS-LS1-1	TCC1
Interactive modeling of transcription (paper or digital tools)	HS-LS1-1	**TI3**
Translation activity using paper codons and amino acids	HS-LS1-1	CCE4
Codon decoding using genetic code chart	HS-LS1-1	TCC1

DNA → RNA → protein diagram drawing and discussion	HS-LS1-1	TI3
Mutation simulation activity: sequence, transcribe, translate	HS-LS3-1, HS-LS3-2	**TCC1**, **CCE4**
Case study: Sickle cell mutation and its protein impact	HS-LS3-2	TCC1, TI3
How does a mutation change a protein? Activity	HS-LS3-2	CCE4

Teacher Resources:

- Explorelearning Gizmos
- Amoeba Sisters, Crash Course videos
- Genetics case studies
- AI protein folding resources

Unit 7 Human Genetics / Biotechnology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- **HS-LS3-1**: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **HS-LS3-2**: Make and defend a claim based on evidence that inheritable genetic variations may result from new genetic combinations through meiosis, errors during replication, or mutations caused by environmental factors.
- **HS-LS3-3**: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- **HS-LS1-1**: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
- **HS-LS2-7**: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Crosscutting Concepts (CCC): Patterns; Cause and Effect; Structure and Function; Systems and System Models

Science & Engineering Practices (SEP): Asking Questions; Constructing Explanations; Analyzing and Interpreting Data; Engaging in Argument from Evidence; Obtaining, Evaluating, and Communicating Information

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.
- TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.
- 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: Students will understand that...

- Many human traits are inherited in complex ways, including dominant/recessive, codominant, sex-linked, and polygenic inheritance.

Essential Questions:

- How do human traits follow predictable patterns of inheritance?

• Genetic disorders may result from inherited mutations or chromosomal abnormalities. • Tools like pedigrees, karyotypes, and genetic tests help us understand human inheritance. • Biotechnology applications like gel electrophoresis, DNA fingerprinting, and genetic engineering provide powerful tools for analyzing, manipulating, and applying genetic information. • Genetic engineering and gene therapy offer potential treatments for genetic disorders but raise important ethical questions. • DNA analysis techniques have revolutionized medicine, forensics, and agriculture through applications in genetic screening, criminal investigations, and crop improvement.	• What are the different ways genes can influence human traits and how can biotechnology help us understand these influences? • How can inherited disorders be diagnosed and analyzed? • How can biotechnology tools be used to diagnose genetic disorders, solve crimes, and improve human health and agriculture? • What ethical considerations arise from the use of genetic technologies in medicine, agriculture, and forensics?
Students will know... • The difference between autosomal and sex-linked traits • How to identify inheritance patterns from pedigrees • Examples of common human traits and genetic disorders • The purpose and interpretation of karyotypes and genetic testing • How mutations can be passed from parent to offspring • The principles and applications of gel electrophoresis • How DNA fingerprinting works and its forensic applications • The process and applications of genetic engineering • How gene therapy works and its potential medical applications • The production and uses of genetically modified organisms (GMOs) • Ethical considerations surrounding genetic technologies	**Students will be able to...** • Analyze pedigrees to determine modes of inheritance • Identify the chromosomal basis of disorders using karyotypes • Use Punnett squares to predict outcomes of sex-linked and complex traits • Construct and support explanations for inheritance patterns in case studies • Interpret data related to human genetic variation • Analyze DNA fingerprint patterns to solve hypothetical crimes • Design experiments using biotechnology tools to answer genetic questions • Evaluate the benefits and risks of genetic technologies • Create models showing how genetic engineering produces GMOs • Communicate scientific findings about genetic technologies to diverse audiences
Key Vocabulary: Autosomal trait, Sex-linked trait, Carrier, Pedigree, Karyotype, Mutation, Genetic disorder, Down syndrome, Hemophilia, Sickle cell disease, Cystic fibrosis, Dominant, Recessive, Genetic screening, Gene therapy, Polygenic trait, Chromosome, Gel electrophoresis, DNA fingerprinting, Genetic engineering, Genetically modified organism (GMO), Restriction enzymes, DNA ligase, Plasmid, Recombinant DNA, PCR (Polymerase Chain Reaction), CRISPR, Bioethics, Genetic counseling, Pharmacogenomics	

Assessment Evidence

Performance Tasks:

- Pedigree Studies: Students receive family scenarios and construct a pedigree to track a genetic trait, then analyze inheritance patterns.
- *Genetic Disorder Case Study Presentation: In pairs, students research a specific disorder, explain its genetic cause, and present symptoms, inheritance, and treatment.*
- *Biotechnology research project*

Other Evidence:

- Sex-linked Punnett square practice
- Pedigree analysis worksheets
- Karyotype matching and diagnosis activity
- CER writing: “What causes this inherited disorder?”
- Sex-linked Punnett square practice with biotechnology applications
- Pedigree analysis worksheets incorporating genetic testing scenarios
- Karyotype matching and diagnosis activity
- Virtual gel electrophoresis lab simulation
- DNA fingerprinting pattern analysis worksheets
- GMO benefits and risks investigation
- CER writing: "How can biotechnology tools help diagnose and treat genetic disorders?"
- Ethical dilemma case study discussions
- Short quiz on key terms and biotechnology applications

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	NGSS Alignment	VoL Attribute
Human traits inventory and intro discussion	HS-LS3-1	TCC2
Autosomal vs. sex-linked Punnett square practice	HS-LS3-3	TI1

Pedigree lesson + modeling with sample families	HS-LS3-1	**CCE3**
Case study: Family inheritance of colorblindness	HS-LS3-2	TI1, TCC2
Karyotype sorting and diagnosis activity	HS-LS3-2	**TI1**, CCE3
Genetic disorder research and presentation prep	HS-LS3-2	CCE3
Investigation of dominant/recessive, codominance, sex-linked, polygenic traits	HS-LS3-3	**TCC2**

Teacher Resources:

- Pedigree modeling kits or digital software
- Sample karyotype sets (printed or interactive simulations)
- Case study handouts and guided research template
- Trait surveys and inheritance charts
- Gizmos
- BioInteractive or Learn Genetics video tools
- Rubrics for CER writing and presentations
- Slides and charts explaining inheritance patterns

Unit 8 – Evolution and Natural Selection

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS4-1: Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- HS-LS4-2: Construct an explanation based on evidence that the process of evolution primarily results from four factors.
- HS-LS4-4: Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- Crosscutting Concepts: Cause and Effect; Patterns
- Science & Engineering Practices: Constructing Explanations; Communicating Information

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

- CCE1(9-12): 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(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...

- The theory of evolution explains the diversity and unity of life on Earth.
- Natural selection is the driving force behind adaptation and change in species.
- Multiple lines of evidence support the shared ancestry of living organisms.

Essential Questions:

- What evidence supports the theory of evolution?
- How does natural selection lead to changes in populations?
- Why is genetic variation essential for the survival and evolution of species?

Students will know...

- The mechanisms of natural selection (variation, inheritance, selection, time)

Students will be able to...

- Analyze and interpret scientific evidence supporting evolution

• Evidence for evolution: fossil records, comparative anatomy, molecular biology • The difference between adaptation, natural selection, and evolution • How environmental pressures lead to survival of the fittest • Genetic drift and gene flow as additional evolutionary forces	• Construct arguments using data from simulations or case studies • Create models showing how environmental factors drive selection • Communicate how populations change over time in response to pressures

Key Vocabulary:
Evolution, Natural Selection, Adaptation, Fitness, Genetic Variation, Mutation, Fossil Record, Homologous Structures, Analogous Structures, Speciation, Gene Pool, Genetic Drift, Gene Flow, Common Ancestor

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Evolution Evidence CER: Students synthesize data from fossil records, DNA sequences, and anatomy comparisons to make a claim about common ancestry. • Simulation Project: Students use an online natural selection simulator (e.g., Peppered Moth, Finch Beak Evolution) to demonstrate how trait frequencies change over time.	• Quick quiz: Matching evidence to evolutionary concepts • Exit tickets: Identify types of selection with examples • Card sort: Lines of evidence for evolution • Data analysis: Trait frequency graphs • Reflection journal entry: “Why does evolution matter today?”

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	**NGSS Alignment**	**VoL Attribute**
Activities investigating physical and molecular evidence for evolution (Red Panda)	HS-LS4-1	**TI3, CCE4**
Natural selection simulation	HS-LS4-4	TI3
Variation and selection modeling	HS-LS4-2	TCC2, CCE1
Evolution in action activity: Antibiotic resistance or Galápagos finches	HS-LS4-4	**CCE1**, TCC4

Teacher Resources:
- HHMI Biointeractive: “Evidence for Evolution” videos, “Rock Pocket Mouse” activities
- PhET Simulation: “Natural Selection”
- Peppered Moth Simulation (online and paper-based)
- BLAST Tool: For comparing genetic sequences
- Case studies from Understanding Evolution (UC Berkeley)
- CER writing scaffold and rubric
- Laminated fossil cards or timeline kits

Unit 9 – Microorganisms

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and new compounds are formed, resulting in a net transfer of energy.
- HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms.
- Crosscutting Concepts: Systems and System Models; Energy and Matter
- Science & Engineering Practices: Developing and Using Models; Constructing Explanations; Engaging in Argument from Evidence

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

- 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.

Understandings: Students will understand that...

- Microorganisms are essential components of ecosystems, human health, and industrial processes.
- Microbes carry out life-sustaining processes such as decomposition and energy transformation.
- While some microorganisms cause disease, many are beneficial or necessary for life on Earth.

Essential Questions:

- What roles do microorganisms play in the environment and in our bodies?
- How do microorganisms contribute to the cycling of matter and energy?
- How can we use or control microorganisms to solve real-world problems?

Students will know...	**Students will be able to...**
• Major categories of microorganisms (bacteria, viruses, fungi, protists) • Key differences between viruses and living organisms • How microbes contribute to nutrient cycles and decomposition • The basics of fermentation and respiration in microorganisms • Microbial roles in health, disease, and biotechnology	• Construct models to represent microbial respiration and fermentation • Investigate microbial growth in different conditions • Explain the ecological and industrial roles of microorganisms • Evaluate claims about the effects of microbes using evidence • Communicate findings about microbial impacts on systems

Key Vocabulary: Microorganism, Bacteria, Virus, Fungi, Protist, Decomposer, Pathogen, Antibiotic, Vaccine, Fermentation, Aerobic, Anaerobic, Host, Infection, Immune Response, Microbiome

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Microbe in the News CER: Students choose a microbe-related issue (e.g., probiotics, fungal infections, viral outbreaks) and construct a CER using scientific evidence. • Yeast Fermentation Lab: Students design and carry out an experiment investigating factors that affect microbial respiration (e.g., temperature, sugar type).	• Microorganism classification quiz • Exit tickets explaining one microbe's ecological role • Graphic organizer comparing types of microbes • Virtual bacteria colony analysis (e.g., identifying zones of inhibition) • Discussion reflection: "Are all germs bad?"

Learning Plan

Lesson Activity	**NGSS Alignment**	**VoL Attributes**
Intro video & discussion: "What are microbes?"	CCC: Systems	CCE4
Interactive classification card sort: Bacteria, viruses, fungi, protists	HS-LS1-6	TI1, **TCC3**
Microscope lab: observing microorganisms	SEP: Developing Models	TCC3
Virus structure and replication simulation	HS-LS1-7	TCC3, **CCE4**

Case study: How microbes maintain ecosystem balance	HS-LS2-6	TCC3, CCE4
Microbes in industry: yogurt, bread, medicine	SEP: Constructing Explanations	CCE4, TI1

Teacher Resources:

- Microscope slides and equipment for bacteria/fungi observation
- Yeast and sugar materials for fermentation labs
- PhET simulations on viruses and respiration
- Gizmos
- Interactive websites (CDC “Solve the Outbreak,” HHMI Biointeractive)
- Short videos (e.g., Amoeba Sisters, CrashCourse on microbes)
- Microbiome and antibiotic resistance infographics
- Case study and CER scaffolds

Unit 10 - Ecology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS2-1: Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems.
- HS-LS2-2: Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations.
- HS-LS2-6: Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms.
- Crosscutting Concepts: Stability and Change; Cause and Effect
- Science & Engineering Practices: Analyzing and Interpreting Data; Using Mathematical and Computational Thinking; Engaging in Argument from Evidence

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

- TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.
- CCE1(9-12): 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.
- 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: Students will understand that...

- Ecosystems are dynamic systems influenced by biotic and abiotic factors.
- The stability of ecosystems depends on the interactions and balance among organisms.
- Human activity can both positively and negatively affect biodiversity and ecological balance.

Essential Questions:

- What factors influence population sizes and biodiversity in ecosystems?
  How do organisms interact within ecosystems to maintain balance?
  How can humans make informed decisions to support ecosystem health?

Students will know...	**Students will be able to...**
• Definitions of ecosystem, population, community, and biosphere • Relationships such as predation, competition, and symbiosis • Concepts of carrying capacity, limiting factors, and trophic levels • The role of producers, consumers, and decomposers in energy flow • The impact of human activity on biodiversity and ecosystem health	• Analyze population graphs to identify carrying capacity and limiting factors • Interpret data about biodiversity and ecosystem changes • Use models to represent energy flow and matter cycling • Evaluate human impact on ecosystems with evidence-based reasoning • Propose strategies to maintain or restore ecological balance

Key Vocabulary: Ecosystem, Biotic, Abiotic, Biodiversity, Carrying Capacity, Limiting Factor, Food Chain, Food Web, Trophic Level, Energy Pyramid, Symbiosis, Mutualism, Predation, Competition, Decomposer, Sustainability, Conservation

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Local Ecosystem Case Study: Students research and evaluate a local or regional ecosystem's health and biodiversity using data, then present solutions to maintain or improve stability. Food Web Model + Human Impact CER: Students construct a food web and write an argument explaining how a disruption (e.g., invasive species, pollution) would affect the system.	• Energy pyramid practice problems • Graphic organizers on ecological relationships • Quiz on vocabulary and concepts • Exit tickets: identifying limiting factors or predicting changes in populations • Human impact article annotation and discussion

Learning Plan

VoL attributes in BOLD will be measured

Lesson Activity	**NGSS Alignment**	**VoL Attribute**
Interactive intro: "What is ecology?" using video and word map	CCC: Stability and Change	CCE1

Predator-prey population graph analysis	HS-LS2-1	**TCC4, P2**
Ecosystem relationships simulation/ video	HS-LS2-6	CCE1, TCC4
Energy pyramid and trophic level activity	HS-LS2-2	P2
Food web model creation with organisms of a local ecosystem	HS-LS2-2	CCE4, TI1
Biodiversity data interpretation (e.g., rainforests vs. deserts)	HS-LS2-2	TCC4
Case study: Local ecosystem issue, human impact + solution project	HS-LS2-6	TCC4, **CCE1**

Teacher Resources:
- Population and energy flow graph worksheets
- PhET and BioInteractive simulations (e.g., predator-prey, food webs)
- Gizmos
- Local ecosystem data sources (EPA, state environmental agencies)
- Graphic organizers for relationships and energy flow
- CER rubric and student templates
- Environmental news sources (Nat Geo, newspaper science section)
- Sustainable solutions project planning template

Unit 11 Human Body* (as time permits)

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- HS-LS1-3: Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- HS-LS1-4: Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

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

- 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.

Understandings: Students will understand that…

- The human body is organized in a hierarchical structure from cells to tissues to organs to organ systems, with each level having specific functions that contribute to the whole organism.
- Body systems work together through complex interactions and feedback mechanisms to maintain homeostasis and ensure survival.
- Comparative anatomy reveals evolutionary relationships and helps us understand how structure relates to function across different species.

Essential Questions:

- How do the structures and functions of different body systems work together to maintain life?
- What happens when body systems fail to maintain homeostasis, and how does the body respond?
- How does comparing human anatomy to other vertebrates (like frogs) help us understand evolutionary relationships and biological principles?

Students will know...

- The major organ systems of the human body and their primary functions

Students will be able to...

- Identify and describe the structure and function of major human body systems

• How body systems interact to maintain homeostasis • The hierarchical organization of multicellular organisms • Feedback mechanisms that regulate body processes • Comparative anatomy between humans and amphibians • Safety procedures for laboratory dissections • Ethical considerations in biological research and dissection	• Explain how multiple body systems work together to maintain homeostasis • Analyze feedback loops in biological systems • Compare and contrast human and frog anatomy • Conduct a scientific dissection following proper safety protocols • Create models to represent biological systems and processes • Evaluate evidence from multiple sources to draw conclusions about body system interactions
Key Vocabulary: Homeostasis, feedback mechanism, organ system, tissue, comparative anatomy, circulatory system, respiratory system, digestive system, nervous system, excretory system, muscular system, skeletal system, integumentary system, endocrine system, reproductive system, negative feedback, positive feedback, structure-function relationship, vertebrate, amphibian	
Assessment Evidence	
Performance Tasks: 1. Frog Dissection Lab: Students will conduct a systematic frog dissection, document their observations, compare findings to human anatomy, and present their analysis of structure-function relationships to the class. 2. Body Systems Integration Case Study: Students will research a real medical case where multiple body systems are affected (e.g., diabetes, heart disease, kidney failure) and create a multimedia presentation explaining how the disruption of one system impacts others and how medical interventions help restore homeostasis.	**Other Evidence:** • Pre/post unit concept maps showing understanding of system interactions • Weekly lab practical quizzes identifying anatomical structures • Collaborative group discussions and peer evaluations during dissection activities • Exit tickets after each lesson assessing understanding of key concepts • Digital portfolio documenting learning progression throughout the unit

Learning Plan

VoL Attributes that are in **BOLD** will be measured.

Lesson Activity	NGSS Alignment	VoL Attribute
Interactive body systems overview, homeostasis simulation activity	HS-LS1-2, HS-LS1-3	TCC2
Thermostat analogy lab, blood glucose regulation case study	HS-LS1-3	TI2
Heart dissection demonstration, lung capacity lab	HS-LS1-2	**CCE3**
Vertebrate evolution timeline, dissection safety training, ethical discussion	HS-LS1-2	**DE4**
Human-frog comparison charts, begin case study research	HS-LS1-2, HS-LS1-3, HS-LS1-4	TI2, CCE3

Teacher resources:

- Preserved frogs (1 per 2-3 students)
- Dissection kits (scissors, forceps, pins, probes)
- Dissection trays and mats
- Safety equipment (goggles, gloves, aprons)
- Magnifying glasses
- Digital cameras for documentation
- Interactive body systems websites (e.g., InnerBody, Visible Body)
- Virtual dissection software as backup/extension
- Medical case study databases
- Anatomical model apps and simulations
- Video resources from National Geographic, Crash Course Biology
- Gizmos

BIOTECHNOLOGY CURRICULUM



Grade Level(s): 10, 11 & 12th

Curriculum Author(s): Shelly Stone

Course Description:
This Biotechnology course introduces students to foundational concepts and hands-on techniques used in the biotechnology industry. Through lab-based learning and inquiry-driven investigations, students explore topics ranging from microbiology and genetic engineering to DNA analysis and bioethics. The course emphasizes critical thinking, collaboration, ethical reasoning, and real-world applications, preparing students for post-secondary study and careers in science and technology.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Unit 1 Lab Techniques: Pipettes a Solution Preparation	Why are precise lab skills essential in biotechnology?	Accurate laboratory techniques are essential to ensure reliability and safety in biotech.	P2(9-12)
Unit 2: Foundations of Biotechnology	What is biotechnology, and why is it important?	Biotechnology integrates biology and technology to solve problems and improve lives.	TCC4(9-12)
Unit 3: DNA and Molecular Biology	How can we visualize and analyze DNA to solve problems?	Understanding DNA's structure enables analysis and application in medicine and forensics.	CCE1(9-12)
Unit 4: Microbiology	How do microbes influence health and industry?	Microorganisms play a vital role in biotechnology through fermentation, health, and research.	TCC2(9-12), TI3(9-12), CCE3(9-12)
Unit 5: PCR & Genetic Engineering	How do scientists amplify and detect specific genes to solve real-world problems?	PCR is a fundamental molecular tool that enables DNA amplification for diagnostics, research, and forensics.	TI3(9-12), TI4(9-12)
Unit 6: Bioethics, Industry, and Careers	How do we balance scientific advancement with ethical responsibility?	Biotechnological advances require careful ethical consideration of benefits, risks, and societal impact	DE1(9-12), DE2(9-12), CCE1(9-12)

Unit 1 - Lab Techniques: Pipettes a Solution Preparation

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including social, cultural, and environmental impacts.
- HS-LS1-6: Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and other large carbon-based molecules.

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

- 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: Students will understand that...

- Biotechnology labs require high levels of precision and documentation.
- Safe and sterile technique ensures valid and reproducible results.
- Measurement, calculations, and equipment use are foundational to scientific investigation.

Essential Questions:

- Why are pipettes essential tools in biotechnology labs?
- How do you ensure accuracy and precision in solution preparation?
- What are potential consequences of errors in lab techniques?
- Why must biotechnology labs follow strict safety and accuracy protocols?

Students will know…

- How to operate and troubleshoot serological and micropipettes.
- Steps for preparing solutions with accurate concentrations.

Students will be able to...

- Demonstrate proper pipetting techniques, including calibration.
- Calculate and prepare solutions of specified concentrations (e.g., molarity).

• The importance of lab safety and cleanliness when using precision tools.	• Reflect on and improve lab techniques through practice and feedback.

Key Vocabulary:
MSDS, sterile, molarity, dilution, pipette, chromatography, centrifuge, balance, buffer, solution

Assessment Evidence

Performance Tasks:	Other Evidence:
• **Pipetting Skills:** Students complete a hands-on assessment to demonstrate accurate measurement and transfer of liquids using multiple styles of pipettes. • **Solution Preparation Lab:** Students prepare a 0.5M NaCl solution and complete a serial dilution, ensuring precise measurements and documentation. • **Kool-Aid Column Chromatography Lab:** Students separate the colors in Kool-Aid and complete an error analysis reflection.	• Lab Safety & Equipment Scenarios worksheets • Technique checklists • Equipment labeling and function quiz • Peer and teacher feedback on pipetting technique. • Safety Quiz • Unit Test

Learning Plan

Learning Activities:

1. Introduction to Pipettes:
    - Activity: Watch a video tutorial on pipetting basics (TI1).
    - Lab: Practice pipetting using water and colored solutions to refine techniques **(P2)**.
2. Solution Preparation Basics:
    - Lecture: Explain molarity, dilution, and solution preparation (TCC1).
    - Activity: Solve real-world molarity and dilution problems in groups (CCE3).

3. Hands-On Practice:
    - Lab: Prepare solutions of varying concentrations and practice serial dilutions (TI3).
    - Lab: Conduct a small experiment requiring the use of prepared solutions and pipettes **(P2)**.

Teacher Resources:

- MSDS Sheets
- Bio-Rad Activities 2.2–2.4
- Flinn Lab Safety guidelines
- NSTA Lab Safety modules
- Video tutorials on pipetting techniques.
- Lab materials: pipettes, tips, scales, NaCl, beakers, and graduated cylinders.
- Practice worksheets for solution calculations.

Unit 2 - Foundations of Biotechnology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-1: Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins and their role in specialized cellular functions.
- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, manageable problems that can be solved through engineering.
- HS-LS3-1: Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits.

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

- TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.

Understandings: Students will understand that...

- Biotechnology has evolved over time and continues to shape society.
- There are diverse career paths and real-world applications within biotechnology.
- Biotechnology uses living systems and organisms to develop or make products.

Essential Questions:

- What is biotechnology, and how is it used in today's world?
- How has biotechnology evolved through history?
- What career opportunities are available in the biotechnology field?

Students will know...

- Definitions and examples of biotechnology.
- Key milestones in the history of biotechnology.
- Categories and examples of biotechnology careers.

Students will be able to...

- Explain the historical development and impact of biotechnology.
- Identify and describe multiple biotechnology-related careers.
- Evaluate current uses of biotechnology in health, agriculture, and industry.

Key Vocabulary:

Biotechnology, genetic engineering, fermentation, genomics, biopharmaceuticals, ethics, bioinformatics, DNA, recombinant DNA, biotech industry

Assessment Evidence

Performance Tasks:

- **Career Infographic Presentation**: Students research a biotechnology-related career and create an infographic to present key responsibilities, education needed, and future outlook.
- **Biotech Timeline**: In small groups, students design a visual timeline highlighting major biotech breakthroughs and innovations.

Other Evidence:

- Vocabulary Quiz
- Exit tickets with essential question reflections
- Group discussions and peer reviews of infographics

Learning Plan

1.Introduction
- multimedia video introducing biotech innovations (TI3)

2.Guided inquiry:
- How is biotechnology used in our daily lives? (TI1, TCC4)

3. Group creation of biotech history timelines **(TCC4)**
- Students research different years looking for significant advancements in science using biotechnology

4. Peer presentation of infographics with feedback (CCE2)
- Students research a biotechnology-related career

Teacher Resources:

- Biotech Primer, Bio-Rad educational labs and teacher guides
- Career profiles from NIH and Biotech-careers.org
- Multimedia: PBS "Biotech in the 21st Century", NOVA Science Now series

Unit 3 - DNA and Molecular Biology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-1: Explain how the structure of DNA determines protein structure and cellular function.
- HS-LS3-1: Analyze the role of DNA and chromosomes in transmitting traits from parents to offspring.
- HS-LS3-3: Apply concepts of statistics and probability to explain trait variation.

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

- CCE1(9-12): 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.

Understandings: Students will understand that...	**Essential Questions:**
• DNA can be manipulated and visualized using lab tools. • Restriction enzymes and gel electrophoresis allow genetic analysis. • Forensic applications of DNA are widespread and impactful.	• How does DNA determine traits? • How can DNA be analyzed in the lab? • What is the role of DNA in forensics and genetics?
Students will know...	**Students will be able to...**
• Structure of DNA and enzymes. • How to cast gels and run electrophoresis. • The role of restriction enzymes and DNA fingerprinting.	• Run and analyze gel electrophoresis. • Apply restriction enzymes in DNA digestion. • Interpret DNA banding patterns.

Key Vocabulary:
DNA, nucleotide, electrophoresis, restriction enzyme, agarose gel, ladder, fragment, base pair

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• **DNA Extraction Lab:** Extract cheek cell DNA	• Restriction digest interpretation activity.

• **Casting agarose gels:** Student use gel electrophoresis equipment to prepare agarose gels • **Forensic DNA Fingerprinting Lab:** with crime case analysis. • **Dye Electrophoresis Lab:** Polarity of different compounds are evaluated using gel electrophoresis	• DNA structure quizzes • DNA Reading and worksheets • Unit Test

Learning Plan

1. DNA Extraction Genes in a Bottle Lab (TI4)
2. Enzyme cutting simulation (TCC2)
    - NEB Cutter program
3. Forensic DNA Fingerprinting Lab with crime case analysis. **(CCE1**)
    - Students receive unknown "crime scene" and suspect DNA.
      Perform restriction digests and run gels; stain and image bands.
      Measure band sizes, then analyze patterns to identify the suspect.

4.Data Analysis & Probability Calculations (TCC2)

- Calculate fragment sizes from gel visualization.
- Determine likelihood of matching patterns – include probability discussion for matching vs. random chance.
- Students identify potential errors (e.g. partial digestion, loading errors) and propose improvements.

Teacher Resources:

- Bio-Rad Activities 4.1–4.5
- DNA Learning Center animations
- HHMI Biointeractive resources
- NEB Cutter software

Unit 4 - Microbiology

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

- HS-LS1-7: Use a model to illustrate that cellular respiration is a chemical process wherein the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed.
- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, manageable problems that can be solved through engineering.
- HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs.

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

- TI3(9-12): I can formulate and investigate probing questions to further my learning.
- 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.
- TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.

Understandings: Students will understand that...

- Microorganisms play critical roles in human health, food production, and environmental sustainability.
- Microbiological techniques are used to study and manipulate bacterial behavior.
- Antibiotic resistance poses a significant global health challenge, and biotechnology offers potential solutions.
- Biotechnology advancements, such as ELISA, enable rapid disease detection and improve global health

Essential Questions:

- How can microorganisms be used to benefit society?
- What are the causes and consequences of antibiotic resistance?
- How can biotechnology help address challenges in microbiology?
- How does ELISA work, and why is it significant in biotechnology and medicine?

Students will know...

Students will be able to...

• Aseptic techniques for handling microorganisms. • Basics of bacterial growth and metabolism. • Methods for studying antibiotic resistance. • The principles of bacterial fermentation. • How ELISA is used for disease detection, including HIV, COVID-19, and other illnesses.	• Demonstrate proper aseptic techniques in a microbiology lab. • Culture bacteria and test their susceptibility to antibiotics. • Analyze the outcomes of bacterial fermentation experiments. • Perform an ELISA lab to simulate disease detection. • Discuss real-world applications of ELISA in diagnostics and research.

Key Vocabulary:
Microorganism, media, inoculation, culture, Gram stain, colony morphology, aseptic technique, microbe, Zone of Inhibition, ELISA (Enzyme-Linked Immunosorbent Assay), Antigen, Antibody, Primary and Secondary Antibodies,Enzyme-Substrate Reaction

Assessment Evidence

Performance Tasks:	Other Evidence:
• **Antibiotic Resistance Lab:** Students will culture bacteria, expose them to antibiotics, and measure zones of inhibition to evaluate resistance levels. • **Fermentation Experiment:** Students will use bacteria or yeast to conduct a fermentation process and analyze the products (e.g., lactic acid or alcohol). • **Lab: Full ELISA procedure, simulate testing** (e.g., disease markers)	• Quizzes on microbiology concepts and techniques. • Lab notebooks with detailed observations and reflections. • Group discussions on antibiotic resistance and its implications. • Group analysis of "The Tragic Case of Stan" • Unit test

Learning Plan

1. Introduction to Microbiology:
    - Video: Watch a demonstration on aseptic techniques.

2. Microbiology Techniques:
    - Lab: Practice using aseptic techniques to transfer bacteria and prepare culture plates (TI3).
3. Antibiotic Resistance:
    - Lab: Conduct an antibiotic susceptibility test using a disk diffusion method **(TI3, CCE3**).
    - Activity: Discuss real-world examples of antibiotic resistance and explore biotechnological solutions.
4. Fermentation:
    - Lab: Set up bacterial or yeast fermentation and measure the production of alcohol or lactic acid (TCC4).
    - Analysis: Compare the efficiency of different organisms in fermentation.
5. ELIZA Assay:
    - Students will simulate disease detection by adding antigen samples to wells, introducing primary and secondary antibodies, and observing enzyme-substrate color changes (**TCC2**).

Teacher Resources:

- Video: demonstration on aseptic techniques.
- Bacterial growth- Antibiotic resistance Carolina's Tragic Case of Stan Kit
- Eliza- Carolina's kit
- Fermentation Lab Kit- Carolina

Unit 5 - PCR & Genetic Engineering Organisms

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
HS-LS1-1: Construct an explanation based on evidence for how DNA structure determines protein structure and specialized cellular functions.
HS-LS3-3: Apply probability to explain variation and distribution of expressed traits.

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

TI3(9-12): I can formulate and investigate probing questions to further my learning.
TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals.

Understandings: Students will understand that...

- PCR enables exponential amplification of specific DNA segments.
- PCR is widely used to detect GMO-specific DNA sequences (e.g. CaMV 35S promoter, NOS terminator).
- Accurate PCR setup and analysis are critical for identifying GMOs in food samples.

Essential Questions:

- What steps are involved in PCR, and why is each step important?
- How does PCR ensure target DNA amplification?
- How can PCR be used to detect genetically modified organisms?

Students will know...

- PCR steps, reagents (primers, Taq, dNTPs, buffer), thermal cycles.
- GMO-targeted sequence examples (e.g., CaMV 35S promoter).
- How to interpret gel electrophoresis results indicating GMO presence.

Students will be able to...

- Set up and run PCR reactions using food DNA and controls.
- Perform gel electrophoresis and interpret bands to identify GMO DNA fragments.
- Reflect on practical implications and accuracy of GMO testing methods.

Key Vocabulary:
Polymerase Chain Reaction (PCR), thermocycler, denaturation, annealing, extension, primer, STR, GMO, Taq Polymerase, Template DNA, Amplified DNA

Assessment Evidence	
Performance Tasks: ● **GMO PCR Lab Report:** Conduct PCR on food extract (e.g., corn chips, soy), analyze for GMO bands, and conclude GMO presence or absence. ● **GMO Case Interpretation:** Write a brief report on PCR's role in GMO regulation and food labeling.	**Other Evidence:** ● Quiz on PCR theory and methodology ● Peer review during lab setup. ● Exit ticket summarizing PCR's role in detecting GMOs.

Learning Plan

1. Intro to GMO Detection by PCR (TI3, TCC1):
    - Watch a video demo (Bio-Rad or miniPCR) on PCR GMO detection.
    - Discuss sequence targets like CaMV 35S promoter and primer specificity.
2. Lab Setup – Food DNA Extraction **(TI4)**:
    - Extract DNA from food samples (corn chips, soy) using a miniPCR or EDVOTEK kit.
    - Prepare PCR reactions: positive (GMO control), negative (non-GMO), and test samples.
3. PCR Execution **(TI4**):
    - Run a thermal cycler with the correct program for GMO detection primers.
4. Gel Electrophoresis & Analysis **(TI4, TI3**):
    - Electrophorese PCR products, visualize under UV light, compare to ladder and controls.
    - Interpret bands indicating GMO presence or absence.
5. Discussion & Reflection (P1):
    - Brainstorm potential errors, false positives/negatives, and regulatory implications.
    - Complete a reflection sheet on GMO detection's real-world importance.

Teacher Resources:

- Video demo on GMO-PCR detection (Bio-Rad or miniPCR).
- Reference materials on GMO target sequences and regulatory context.
- BioRad Activity 6.2 (GMO Detection by PCR) kit and protocols
- PCR thermocyclers and reagents
- Gel electrophoresis equipment and DNA ladders
- Unknown food samples for GMO testing
- Current articles on GMO policy and labeling requirements

Unit 6 - Bioethics, Industry & Careers

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

HS-ETS1-1: Analyze a global challenge to specify solution criteria and constraints.
HS-ETS1-3: Evaluate solutions based on trade-offs, cost, safety, social/environmental impacts.

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

DE1(9-12): I can acknowledge, process, and respond appropriately to others' comments and perspectives.
DE2(9-12): I can honor my own feelings and show empathy toward others through my actions.
CCE1(9-12): 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.

Understandings: Students will understand that...

- Biotechnology advances require ethical, regulatory, and social consideration.
- Careers in biotech demand awareness of scientific, business, and ethical dimensions.
- Effective biotech solutions balance innovation with societal impact.

Essential Questions:

- What ethical principles guide biotech development?
- How do we balance innovation with safety, cost, and equity?
- How do educational and career pathways in biotech align with technological trends?

Students will know...

- Ethical principles: autonomy, justice, beneficence, non-maleficence.
- Industry regulation and IP/patenting basics.
- Biotechnology career roles (e.g., biotech researcher, regulatory specialist).

Students will be able to...

- Analyze a case using ethical frameworks.
- Evaluate biotech solutions based on provided criteria.
- Create a biotech career roadmap including education and skill goals.

Key Vocabulary: Bioethics, Autonomy, Justice, Beneficence, Equity, Patent, FDA, Biotech Regulatory Pathway, Stakeholder, Informed Consent

Assessment Evidence	
Performance Tasks: ● **Controversial Topic Research and Presentation:** Students select from topics including stem cells, human cloning, gene rights, GMOs, or animal use in research. They research and present both sides of their chosen controversy, demonstrating understanding of multiple perspectives. ● **Bioethics Class Discussion Facilitation:** Students facilitate structured class discussions on their researched topics, encouraging respectful dialogue and critical thinking among peers while maintaining neutrality as facilitators.	**Other Evidence:** ● Ethical scenario journal entries ● Self and peer feedback rubrics ● Research guides for controversial biotechnology topics

Learning Plan

1. Introduction to Bioethics and Controversial Topics -
    - Overview of bioethics principles and introduction to major controversial topics in biotechnology (stem cells, cloning, GMOs, etc.) (DE1, TCC2)
2. Research Methodology and Bias Recognition
    - Students learn how to research controversial topics objectively and identify bias in sources (TCC2, TI3)
3. Topic Selection and Research
    - Students select their controversial topic and begin comprehensive research on both sides of the issue (TI3, CCE1)
4. Student Presentations and Class Discussions
    - Students present both sides of their chosen topics and facilitate class discussions with teacher guidance **(CCE1, DE1, DE2**)

Teacher Resources:

- Research guides for controversial biotechnology topics
- Curated source lists for stem cells, human cloning, gene rights, GMOs, and animal research
- Presentation rubrics emphasizing balanced perspective and objectivity
- Discussion facilitation guides and protocols
- Current news articles and policy documents on biotechnology controversies
- Assessment tools for evaluating research quality and presentation skills

WORLD LANGUAGE YEAR 3 CURRICULUM



Grade Level(s): 9-12

Curriculum Author(s): J. Caruso, M. Greaves, K. Peterson, K. Sandor

Course Description: Students will continue to develop their target language knowledge by mastering interpretive, presentational, and interpersonal skills. Students will be able to communicate orally and in writing, focusing on the 6 themes (family, communities and traditions; science and technology; personal identity; beauty and the arts; daily life with future planning and global challenges). The students handle social interactions in everyday situations by asking and answering questions in the past tense, present and future tenses.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Unit 1: Who Am I?	How do language and culture shape identity?	Identity is shaped by personal experiences, cultural practices, and social interactions.	DE1(9-12), DE2(9-12), CCE4(9-12), TI1(9-12)
Unit 2: School & Learning	How do school experiences differ around the world?	Educational systems reflect the values and priorities of a culture	TCC2(9-12), AA2(9-12), DE4(9-12)
Unit 3: Daily Life	How does daily life reflect cultural values?	Daily lives are shaped by geography, history, and cultural traditions	TI3(9-12), P1(9-12), CCE1(9-12)
Unit 4: Food & Hospitality	What does food tell us about culture and community?	Food traditions provide insight into cultural values, geography, and social customs.	DE1(9-12), TCC3(9-12), CCE3(9-12)
Unit 5: Celebrations & Tradition	How do communities express identity through celebrations?	Traditions and celebrations preserve cultural identity and express shared values.	DE4(9-12), TI4(9-12), CCE2(9-12)
Unit 6: Travel & Geography	How do people navigate and adapt to new environments?	Geography influences lifestyles and travel experiences.	AA3(9-12), TI1(9-12), P3(9-12)
Unit 7: Global Communities & Social Media	How does social media reflect and shape culture?	Social media allows for intercultural communication and expression of identity.	CCE1(9-12), AA4(9-12), TI2(9-12)
Unit 8: Careers & Future Planning	How does language proficiency support my future?	Language skills enhance global career and education opportunities.	TI4(9-12), P4(9-12), CCE4(9-12)
Unit 9: Global Challenges	How do communities respond to shared global challenges?	Understanding diverse perspectives fosters empathy and cooperation.	DE3(9-12), TCC2(9-12), AA1(9-12)

Unit 10: My Language Journey	How can I continue to grow as a language learner?	Lifelong learning builds confidence, cultural understanding, and personal growth.	TI1(9-12), P1(9-12), TI3(9-12), CCE2(9-12)

Unit 1 - Who am I?

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.
- Relating Cultural Products to Perspective (CT Cultures 2.2 Learners use the language to explore and reflect on the products and perspectives of the cultures studied.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.
- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- 4.1 Language Comparisons Performance Descriptors: Learners use the language to investigate, reflect on, and explain the nature of language through comparisons of the language studied and their own.

Communities

- ❖ School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.
- ❖ Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

DE1(9-12): I can acknowledge, process, and respond appropriately to others' comments and perspectives.

DE1(9-12): I can acknowledge, process, and respond appropriately to others' comments and perspectives.

CCE4(9-12): I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

Understandings: Students will understand that…

- Identity is shaped by personal experiences, cultural practices, and social interactions.
- Language is a powerful tool for expressing identity and building connections.
- Understanding others' identities builds empathy and cultural competence.

Essential Questions:

- Who am I and what shapes my identity?
- How do I express who I am in another language?
- How do cultural backgrounds influence identity and self-expression?

Students will know…

- Vocabulary and structures related to personal information, interests, personality traits, and family.
- Cultural norms around introductions and identity in target language cultures.

Students will be able to…

- Exchange personal information in a culturally appropriate way.
- Describe themselves and others using practiced and original language.

• How to compare linguistic and cultural expressions of identity.	• Interpret authentic texts (bios, videos, social media) about people's identities. • Present information about themselves with some detail and connection to cultural practices.
Key Vocabulary: Personal traits, family terms, hobbies and interests, emotions, pronouns, adjectives, ser/estar (or equivalent), question words, transition words.	
Assessment Evidence	
Performance Tasks: 1. Interpersonal: Students participate in a paired interview, asking and answering questions about themselves and their partner. 2. Presentational: Students create a multimedia "Who Am I?" project that includes written and oral components to describe their identity, interests, and cultural background.	**Other Evidence:** • Graphic organizers comparing personal identity expressions in different cultures • Listening journal entries based on authentic identity-themed media • Exit tickets with reflection on growth toward Intermediate Mid proficiency
Learning Plan	
• Interpretive: Read and annotate authentic bios or social media profiles in the target language (CCE4). • Interpersonal: Conduct peer interviews and create identity maps comparing responses (DE1, CCE1). • Presentational: Compose and revise written self-descriptions; present orally to class or small groups (TI1, CCE2). • Cultural Comparison: Explore videos or articles on how teens express identity in the target language culture (DE2, 2.1). • Language Comparison: Compare use of adjectives and sentence structure when describing people (4.1). • Reflection: Create and review personal language goals using can-do statements (5.2, TI1).	

Teacher Resources:

- ACTFL Can-Do Statements
- Authentic resources: Teen bios, YouTube vlogs, Instagram profiles from target culture
- Identity-themed picture books or infographics
- Graphic organizers for identity mapping and comparisons
- Audio clips and video interviews from target language speakers
- Rubrics for interpersonal and presentational task

Unit 2 - School and Learning

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.
- Relating Cultural Products to Perspective (CT Cultures 2.2 Learners use the language to explore and reflect on the products and perspectives of the cultures studied.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.
- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- 4.1 Language Comparisons Performance Descriptors: Learners use the language to investigate, reflect on, and explain the nature of language through comparisons of the language studied and their own.

Communities

- ❖ School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.

- ❖ Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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.
AA2(9-12): I can assess my past successes and mistakes to change my approach.
DE4(9-12): I can work respectfully with all members of my community and support the needs of others.

Understandings: Students will understand that…	**Essential Questions:**
• Educational systems reflect cultural values and perspectives. • Comparing school experiences helps deepen intercultural understanding. • Language learning connects to lifelong academic and personal growth.	• How does school reflect cultural values? • How are students' experiences in school similar and different across cultures? • What role does school play in identity development?
Students will know…	**Students will be able to…**
• School vocabulary associated with class schedules, supplies, and subject names • cultural norms around education	• Compare school systems • express preferences • describe a typical school day • interpret authentic texts (schedules, videos)

Key Vocabulary: Subjects, times, school materials, frequency adverbs, expressions of opinion

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Interpersonal: Compare a school day with a partner from a target culture (real or simulated)	• Listening/viewing logs from authentic school interviews • Chart comparing school norms and expectations across cultures

• Presentational: Create a video or digital brochure of "A Day in My School Life	

Learning Plan

- Interpretive: Analyze schedules and classroom videos (TCC2)
- Interpersonal: Peer discussions about school experiences (DE4)
- Presentational: Showcase typical day via narrated photo slideshow (AA2)
- Culture: Investigate expectations of teachers and students (2.1, 4.2)

Teacher Resources:

- Authentic schedules, student interviews
- Videos from schools in target-language countries
- Edutopia, YouTube EDU in TL

Unit 3 - Daily Life & Routines

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

1.1, 1.2, 1.3, 2.1, 3.1, 4.1

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.
- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- 4.1 Language Comparisons Performance Descriptors: Learners use the language to investigate, reflect on, and explain the nature of language through comparisons of the language studied and their own.

Communities

- ❖ School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.
- ❖ Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

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

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.

CCE1(9-12): 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.

Understandings: Students will understand that…	**Essential Questions:**
• Routines reflect personal values and cultural norms. • Language supports time management and social interaction. • Routines may vary based on geography and lifestyle.	• What do our daily routines say about our culture? • How can I express my daily activities in another language? • What do I learn about myself and others through routines?
Students will know…	**Students will be able to...**
• Time phrases, pastime verbs, common activities, expressions of frequency • How and when to utilize past tense verbs based on when the action occurred and the frequency with which it occurred	• Describe daily life; • interpret infographics or video diaries; • compare with peers across cultures; • Utilize past tense verbs

Key Vocabulary: Daily life verbs, reflexive pronouns and verbs, time words, connectors/sequence.

Assessment Evidence	
Performance Tasks: • Interpersonal: Conduct a routine comparison interview with a partner • Presentational: Write and present "A Day in My Life"	**Other Evidence:** • Daily routine infographic from video clip • Personal reflection on time use and cultural patterns

Learning Plan
• Interpretive: Annotate authentic routine blog posts (TI3) • Interpersonal: Practice interviews (CCE1) • Presentational: Create schedule posters with visuals (P1) • Culture: Compare morning/evening habits across cultures (2.1, 4.1)
Teacher Resources: • Online daily vlogs • Culturegrams or National Geographic Education

Unit 4 - Food & Hospitality

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

1.1, 1.2, 1.3, 2.2, 3.2, 4.2

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Products to Perspective (CT Cultures 2.2) Learners use the language to explore and reflect on the products and perspectives of the cultures studied.

Connections

- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- Comparisons (CT 4.2 Cultural Comparisons) Performance Descriptors: Learners use the language to investigate, explain, and reflect on the concept of culture through comparisons of the cultures studied and their own.

Communities

- School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.
- Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

DE1(9-12): I can acknowledge, process, and respond appropriately to others' comments and perspectives.

TCC3(9-12): I can integrate relevant information to produce multiple valid 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.

Understandings: Students will understand that…

- Food connects to culture, identity, and community.
- Mealtime traditions reflect values and social practices.
- Sharing food experiences fosters connection.

Essential Questions:

- What can food tell us about culture?
- How do people show hospitality in different cultures?
- How do I communicate food needs and preferences?

Students will know…

- restaurant and meal preparation vocabulary
- ordering phrases
- etiquette expressions

Students will be able to...

- Order food;
- express preferences;
- describe meals;
- compare hospitality customs

Key Vocabulary: Meals, food adjectives, ordering language, manners, tableware

Assessment Evidence	
Performance Tasks: • Interpersonal: Simulate restaurant conversation using menus • Presentational: Create video "Top 3 Foods from My Culture"	**Other Evidence:** • Menu analysis • Compare food ads or meal customs
Learning Plan	
• Interpretive: Review food blogs, menus, ads (TCC3) • Interpersonal: Practice restaurant role-play (CCE3) • Presentational: Describe family food traditions (DE1) • Culture: Explore etiquette and hospitality (2.2, 4.2)	
Teacher Resources: • Authentic menus, recipe videos • Articles on cultural mealtime practices	

Unit 5 - Celebrations & Traditions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

1.1, 1.2, 1.3, 2.1, 3.2, 5.1

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Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken, signed, or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (ASL, French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.

Connections

- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Communities

- School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.

❖ Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

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

TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals.

CCE2(9-12): I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.

Understandings: Students will understand that...

- Celebrations are expressions of shared cultural values.
- Exploring traditions deepens empathy and appreciation.
- Language helps us connect to global community events.

Essential Questions:

- What do traditions reveal about a culture?
- How do celebrations bring people together?
- How do I respectfully share and learn about traditions?

Students will know...

- Holiday names
- key customs of the target language culture
- family roles
- seasonal expressions

Students will be able to...

- Describe a celebration;
- interpret visuals and narratives;
- make cultural comparisons

Key Vocabulary: Celebration terms, seasonal vocabulary, roles, expressions of joy

Assessment Evidence

Performance Tasks:

- Presentational: Digital poster comparing home tradition with TL culture

Other Evidence:

- Celebration timelines
- Listening logs from cultural videos

• Interpersonal: Discuss favorite celebrations and their meanings	
Learning Plan	
• Interpretive: Watch celebration videos; note key elements (TI4) • Interpersonal: Compare party traditions in small groups (CCE2) • Presentational: Create "Celebration Showcase" slides (DE4)	
Teacher Resources: Holiday documentaries, interviews, UNESCO cultural heritage pages	

Unit 6 - Travel and Geography

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: 1.1, 1.2, 1.3, 2.1, 3.1, 5.1

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Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.

Communities

- School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.

Vision of A Learner Attributes:

- AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.
- TI1(9-12): I can implement a realistic plan and adapt when necessary to achieve my goals.

- P3(9-12): I can accept constructive feedback and use setbacks to adjust my learning journey in order to reach my goals.

Understandings: Students will understand that...	**Essential Questions:**
• Geography shapes experiences, routines, and perspectives. • Travel encourages language growth and cultural understanding. • Preparation and adaptability enhance communication.	• How does geography shape life? • What should I know before traveling somewhere new? • How can I communicate while navigating unfamiliar places?
Students will know…	**Students will be able to...**
• Countries • Directions • Modes of transport • Landmarks • Weather • regions	• Ask for/give directions; • describe places; • plan trips; • interpret maps and itineraries
Key Vocabulary: Geography terms, transportation, weather, landmarks	
Assessment Evidence	
Performance Tasks:	**Other Evidence:**
• Presentational: Plan and present a weekend trip itinerary • Interpersonal: Role-play asking for directions or travel help	• Annotated map activities • Listening: Train station/airport announcements
Learning Plan	
• Interpretive: Explore tourism websites (P3) • Interpersonal: Practice travel dialogs (TI1)	

• Presentational: Create narrated travel slideshow (AA3)
Teacher Resources: Target culture tourism sites, maps, Lonely Planet in TL

Unit 7 - Global Communities and Social Media

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: 1.1, 1.2, 1.3, 2.2, 3.2, 4.2, 5.1

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Products to Perspective (CT Cultures 2.2 Learners use the language to explore and reflect on the products and perspectives of the cultures studied.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.
- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- 4.2 Cultural Comparisons Performance Descriptors: Learners use the language to investigate, explain, and reflect on the concept of culture through comparisons of the cultures studied and their own.

Communities

- ❖ School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.

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

P3(9-12): I can accept constructive feedback and use setbacks to adjust my learning journey in order to reach my goals.

AA4(9-12): I can create opportunities to extend my learning by remaining open-minded in any situation.

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…

- Social media reflects culture and influences identity.
- Communication styles differ across cultures.
- Language connects us across borders.

Essential Questions:

- How do people express themselves online?
- How does social media reflect cultural values?
- How can I connect safely and respectfully with others globally?

Students will know...

- Social media platforms and vocabulary associated with social media
- Culturally specific posting phrases
- Culturally specific emojis and abbreviations
- Online safety expressions

Students will be able to…

- Read/respond to sample posts;
- write about interests;
- compare online norms

Key Vocabulary: Posting language, emojis, platform terms, tone indicators

Assessment Evidence	
Performance Tasks: • Presentational: Create social media profile and post (imaginary) • Interpersonal: Exchange comments with peers in the TL	**Other Evidence:** • Analysis of social media screenshots • Comparison charts of online etiquette
Learning Plan	
• Interpretive: Review real teen posts in the TL (AA4) • Interpersonal: Comment exchange practice (CCE1) • Presentational: Profile presentation (TI2)	
Teacher Resources: Public Instagram/Twitter/TikTok TL samples, language safety guides ***(Note: students will NOT be using social media in class, but rather viewing teacher-chosen content that allows students to see cultural differences and similarities as well as social media-specific language while reflecting on how they compare to their own practices)***	

Unit 8 - Careers and Future Planning

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: 1.1, 1.2, 1.3, 3.1, 4.1, 5.2

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Connections

- Making Connections (CT Connections 3.1) Learners build, reinforce, and expand their knowledge of health, geography, literature and sociology while using the language to solve problems creatively.

Comparisons

- 4.1 Language Comparisons Performance Descriptors: Learners use the language to investigate, reflect on, and explain the nature of language through comparisons of the language studied and their own.

Communities

- Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals.

P4(9-12): 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.

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:**
• Language skills expand future opportunities. • Career paths vary across cultures and values. • Goal setting and planning are part of personal growth.	• How does language learning prepare me for the future? • What careers value multilingual skills? • How do I plan for future success?
Students will know...	**Students will be able to...**
• Career terms • Similarities and differences in the education paths of their own culture and the target language culture • job preferences vocabulary • Vocabulary for developing a resume	• Express career goals; • describe strengths; • read job profiles; • write mini resumes/curriculum vitaes

Key Vocabulary: Professions, skills, strengths, goals, future tense

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Presentational: Career vision board with oral presentation	• Compare job ads or resumes from TL countries

• Interpersonal: Mock job interview in TL	• Self-assessment and goal setting reflection
Learning Plan	
• Interpretive: Analyze job profiles (P4) • Interpersonal: Conduct mock interviews (CCE4) • Presentational: Future plan poster (TI4)	
Teacher Resources: Teen career sites, resume samples in TL, Seal of Biliteracy info	

Unit 9 - Global Challenges

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: 1.1, 1.2, 1.3, 2.2, 3.2, 5.1

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Interpersonal(CT Communication)1.1 Interpersonal Communication Performance Descriptors: Learners interact and negotiate meaning in spoken or written conversations to share information, reactions, feelings, and opinions.
- Interpretive (CT Communication 1.2): Within the topics of daily life, travel and childhood, students can identify the topic and related information from simple sentences in informational texts and short fictional texts (French, Spanish). Students can identify the main idea in short conversations (French, Spanish).
- Interpersonal (CT Communication 1.2) Request and provide information in conversations on familiar topics by creating simple sentences and asking appropriate follow-up questions. Interact with others to meet basic needs in familiar situations. Express, ask about, and react with some details to preferences, feelings, or opinions on familiar topics.
- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Products to Perspective (CT Cultures 2.2 Learners use the language to explore and reflect on the products and perspectives of the cultures studied.

Connections

- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Communities

- School and Global Communities (CT Communities 5.1): Learners use the language both within and beyond the classroom to interact with others in their community about themselves, their families, their activities, and the foods they enjoy.

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.

TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.

AA1(9-12): I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that…	**Essential Questions:**
• Communities face shared challenges like climate change, poverty, and health. • Empathy drives informed global action. • Multilingualism empowers participation in solutions.	• What challenges connect people around the world? • How can I be part of the solution? • How do different cultures address global issues?
Students will know...	**Students will be able to…**
• Global issue vocab • opinion language • possible solutions to global challenges	• Express opinions; • read about social/environmental problems; • propose solutions

Key Vocabulary: Environmental, social issues, phrases for agreeing/disagreeing, giving advice

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Interpersonal: Discuss solutions in a class roundtable • Presentational: Poster campaign about one global issue	• Opinion blog responses • Infographic analyses

Learning Plan
• Interpretive: Read NGO campaigns or news stories (TCC2) • Interpersonal: Group discussions on impact (DE3) • Presentational: Create advocacy messages (AA1)
Teacher Resources: UNICEF, WWF, news outlets in TL

Unit 10 - My Language Journey

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals: 1.3, 2.1, 3.2, 4.1, 5.2

Established Goals: Standards are based on ACTFL and ACTFL Proficiency guidelines. For more information, visit: **ACTFL Standards**; **ACTFL Proficiency Guidelines** ; **Connecticut K–12 World Language Standards 2024**

Communication

- Presentational(CT Communication 1.3) Presents personal information about life, activities, events, and everyday topics as well as explains why they feel that way using simple sentences.

Cultures

- Relating Cultural Practices to Perspective (CT Cultures 2.1) Learners use the language to explore and reflect on the practices and perspectives of the cultures studied.

Connections

- Acquiring Information and Diverse Perspectives (CT Connections 3.2) Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

Comparisons

- 4.1 Language Comparisons Performance Descriptors: Learners use the language to investigate, reflect on, and explain the nature of language through comparisons of the language studied and their own.

Communities

- Lifelong Learning (CT Communities 5.2): Learners set goals and reflect on their progress in using languages for enjoyment, enrichment, and advancement.

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

TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals.

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.

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

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: Students will understand that…	**Essential Questions:**
• How have I grown as a language learner? • What are my next steps? • How can I celebrate and share my progress?	• How have I grown as a language learner? • What are my next steps? • How can I celebrate and share my progress?
Students will know...	**Students will be able to…**
• Goal-setting terms, • portfolio terms, • self-assessment expressions	• Reflect on growth; • identify strengths; • Present their learning journey to others
Key Vocabulary: Strengths, challenges, goals, reflection language	
Assessment Evidence	
Performance Tasks:	**Other Evidence:**
• Presentational: Portfolio presentation of work with reflection • Interpersonal: Peer interviews on growth	• Language journey timeline • Rubric-based self-assessments

Learning Plan
• **Goal Setting:** Write next steps in TL (TI3) • **Interpersonal:** Feedback interviews with peers (CCE2) • **Presentational:** Final portfolio with reflections (TI1, P1)
Teacher Resources: • Can-Do checklists, sample portfolios, student models

THE WRITER'S STUDIO (ENGL 3082) CURRICULUM



Grade Level(s): 10-12

Curriculum Author(s): Kelly Nichols

Course Description: The Writer's Studio Course is a tutor training and composition course that prepares students for the responsibilities of tutoring in the NHS Writing Center and encourages students to take on the role of academic leaders. Students will self-reflect on their own experiences as writers and learners, conduct field research and collect perspectives of their peers, read current scholarship on the development and maintenance of high school writing centers, and participate in a workshop model of writing revision. As individuals and as a class, students will identify their personal tutoring values and develop actionable plans to sustain a successful writing center. Assignments in this course will emphasize self-reflection, research, inquiry, and the recursive process of writing. Students who enroll in the UCONN Early College Experience credit will complete assignments that are specific to the UCONN Writing Center standards. Additional Writer's Studio enrollments will also count toward the Humanities elective requirements.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Unit 1: My Life As a Writer	Who am I as a writer?	Self reflection on individual writing styles and habits is an essential precursor to tutoring others.	CCE2(9-12), P1(9-12), P2(9-12)
Unit 2: Writing Needs in Our Community	What challenges and needs can I identify in our school community?	Identifying the challenges and needs in our school community allows us to develop strategies as tutors to meet those needs.	TCC1(9-12), P3(9-12), AA4(9-12)
Unit 3: Tutoring Styles and Strategies	What is my tutoring style?	Developing a personalized and collective toolkit of writing, editing, and tutoring strategies is essential for developing a successful writing center.	CCE2(9-12), DE1(9-12), AA1(9-12)
Unit 4: Community Contributions	How do we use our collective values to create a successful writing center space?	Engagement and participation as academic leaders in a school community leads to an inclusive and collaborative school culture.	TCC4(9-12), DE4(9-12), TI1(9-12)

Unit 1 - My Life As a Writer (September)

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

CCSS.ELA-Literacy.W.11-12.3
Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

CCSS.ELA-Literacy.W.11-12.5
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 here.)

CCSS.ELA-LITERACY.W.11-12.10
Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

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

CCE2(9-12): I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.

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.

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: Students will understand that...	**Essential Questions:**
• composing personal writing will help us better understand ourselves. • determining our own values will help us understand others'	Who am I as a writer? What do I value as a writer and as a human?

values that emerge in their writing. ● our own cultural experiences inform how we show up in our school community. ● the best way to help others revise their personal writing is to approach the writer's work with empathy and curiosity.	How do my values and cultural experiences inform how I show up in my school community?
Students will know… ● how to craft a purposeful narrative arc ● the features of successful thesis statements ● the language of tutoring peers (domain-specific language, productive question stems, etc.) ● how to provide constructive and appropriate feedback to peers	**Students will be able to...** ● identify their own writing style, strategies, and process ● define their values and understand how they will contribute to their tutoring style ● use a workshop model of peer and self editing to give and receive useful feedback on personal writing ● develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
Key Vocabulary: Workshop model, personal narrative, memoir, autoethnography, personal culture, field research, recursive, values, thesis statement	
Assessment Evidence	
Performance Tasks: Summative Assessment: 1) Autoethnography: Self evaluation and exploration of yourself as a writer and thinker	**Other Evidence:** Formative Assessment: 1) Analyzing student sample essays (personal narrative, college essays) 2) Field research (peer surveys, interviews, etc.) 3) Aggregation of field research data 4) Writing workshops (peer and teacher) Interim Assessments: 1) Autoethnography first draft/research 2) Student-run writing workshops

Learning Plan
CCE2(9-12): Interim: Student-run writing workshops **P1(9-12):** Interim: Autoethnography Draft **P2(9-12):** Summative: Autoethnography Draft
Teacher Resources: Stephen North, “The Idea of a Writing Center” Terry Tempest Williams’ “Why I Write” Jordan’s “Change From Within: The Power of a Homegrown Writing Center” Greer and Trofimoff’s “‘Living Large and Taking Charge!’ Students Read and Write Their Way to a High School Writing Center” Excerpts from *The Bedford Guide for Writing Tutors* by Ryan and Zimmerelli Student sample college essays, personal narratives, autoethnography University of Louisville Writing Center: Writing Effective Thesis Statements

Unit 2 - Writing Needs in Our Community (October)

Desired Results - Goals, Transfer, Meaning, Acquisition
Established Goals: CCSS.ELA-Literacy.W.11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 here.) CCSS.ELA-Literacy.W.11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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.

P3(9-12): I can accept constructive feedback and use setbacks to adjust my learning journey in order to reach my goals.

AA4(9-12): I can create opportunities to extend my learning by remaining open-minded in any situation.

Understandings: Students will understand that…	**Essential Questions:**
• what we value determines how we show up as students and tutors • asking good questions is essential to understanding the individual needs of tutees • asking good questions is essential to developing complex ideas in an essay • identifying academic needs in our school community will help us build a writing center that meets those needs	What experiences have shaped my values? What is the interplay between my values and actions? What needs can I identify in our school community?
Students will know…	**Students will be able to...**
• the difference between open-ended and closed-ended questions • how to identify and develop complexity of ideas in a piece of writing • the different interpretive moves in inquiry and explanatory writing that build complexity	• define inquiry and pose higher-order inquiry questions about the academic needs of NHS students • use a workshop model of peer and self editing to give and receive useful feedback on how to write about literature • Develop complexity of ideas in an explanatory essay • develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Key Vocabulary: Inquiry, open-ended and closed-ended questions, complexity, analysis, interpretive moves

Assessment Evidence	
Performance Tasks:	**Other Evidence:**

Summative Assessment: 1) **Inquiry-Based Essay**- Identify a disconnect or inconsistency **(**between values and actions) that emerges as a problem for a high school student, pose it as a question, and answer that question in an essay.	Formative Assessment: 1) Analyzing student sample essays (AP Lit, Eng 9, 10,11) 2) Writing workshops (peer and teacher) 3) Field research (peer surveys, interviews, etc.) Interim Assessments: 1) Student Essay Evaluation (bring in a student essay and present the way you would run a tutoring session) 2) Inquiry essay first draft/research

Learning Plan

TCC1(9-12): Summative: Inquiry Essay

P3(9-12): Interim: Inquiry Essay Draft

AA4(9-12): Formative: Field research

Teacher Resources:

Excerpts from *The Bedford Guide for Writing Tutors* by Ryan and Zimmerelli
Excerpts from Harris' *Rewriting*
DelRusso's "Shifting the Center"
The International Writing Centers Association Position Statement on Secondary School Writing Centers
Student samples of AP Lit exemplars, Eng 9, 10, and 11 exemplars

Unit 3 - Tutoring Styles and Strategies (Oct-Nov)

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

CCSS.ELA-Literacy.W.11-12.5
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1-3 up to and including grades 11-12 here.)

CCSS.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.

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

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

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

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

Understandings: Students will understand that...	**Essential Questions:**
• a writing center tutor will exhibit academic leadership qualities like empathy, initiative, perseverance, professionalism, and the ability to adapt • tutees will arrive for tutoring with different strengths, weaknesses, and needs • approaching student writing with cultural sensitivity will assure that every student feels welcome in the writing center	What is my tutoring style? What is the purpose of a writing center? How do the needs of our school community inform my work as a tutor? What does academic leadership look like?
Students will know…	**Students will be able to…**

• their own strengths and weaknesses as writers and tutors • how to use a variety of rubrics to inform tutoring practices • how to approach different types of writing assignments with their tutees • how to identify and select strong, relevant evidence	• use a wide variety of strategies to meet the needs of all tutees • practice their tutoring strategies with peers • self-reflect on their current tutoring style • use appropriate question stems in a tutoring session • troubleshoot difficulties in a tutoring session
Key Vocabulary: Empathy, initiative, perseverance, adaptability, explanatory writing, claim, argument, IRR	
Assessment Evidence	
Performance Tasks: Summative Assignment: 1) **Tutoring Session Portfolio and Self Reflection:** Based on our class experiences in practice tutoring sessions, you will schedule real tutoring sessions and create a portfolio that includes one recorded tutoring session and a series of self-reflections (4-5) on your tutoring experiences.	**Other Evidence:** Formative Assessment: 1) Analyzing student sample essays (AP Seminar, Lang) 2) Writing workshops (peer and teacher) 3) Mock tutoring sessions/ scenarios 4) Finding relevant evidence Interim Assessments: 1) Graded mock tutoring session 2) Tutoring Session Portfolio Draft
Learning Plan	
Vision of A Learner Attributes: Students will be able to independently use their learning to... (“I can” statements to be demonstrated) **CCE2:** Formative: Writing Workshops **DE1:** Formative: Mock tutoring sessions; Interim: Graded mock tutoring session **AA1:** Summative: Tutoring Session Portfolio	
Teacher Resources: Excerpts from *The Bedford Guide for Writing Tutors* by Ryan and Zimmerelli Bugdal’s “Summing Up The Session: A Study of Student, Faculty, and Tutor Attitudes Toward Tutor Notes” Brooks’ “Minimalist Tutoring”	

Yan and Thompson's "Conversation Shaper: Exploring Efforts to Enact Linguistic Justice at Writing Centers"
Block's "Disruptive Design: An Empirical Study of Reading Aloud in the Writing Center"
Excerpts from Mackiewicz and Isabelle Thompson's "Motivational Scaffolding"
Student sample AP Seminar and AP Lang exemplars
UCONN recorded tutoring session videos

Unit 4 - Community Contributions (Dec-Jan)

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

CCSS.ELA-Literacy.W.11-12.6
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

CCSS.ELA-Literacy.W.11-12.4
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

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

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

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

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

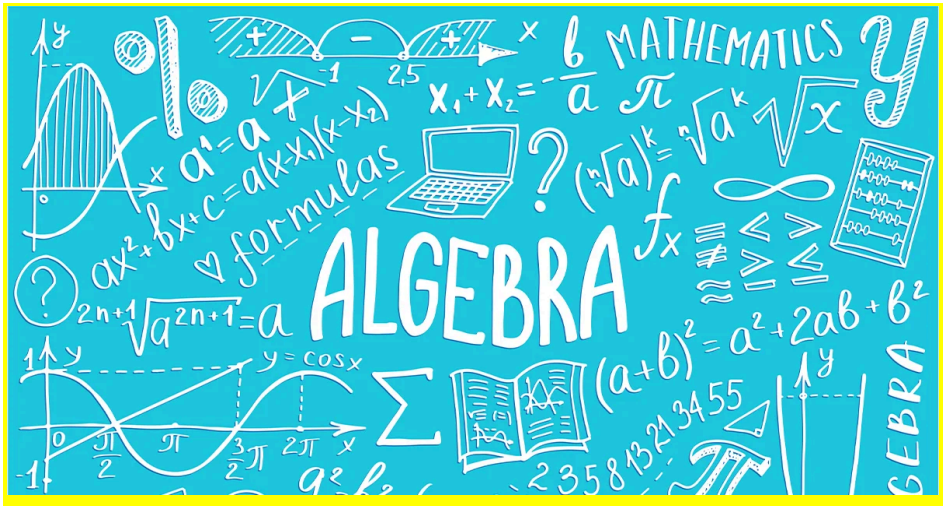
Understandings: Students will understand that…	**Essential Questions:**
• engagement and participation as academic leaders in a school community lead to an inclusive and collaborative school culture.	How do we use our collective values to create a successful writing center space?

• a successful writing center requires consistent maintenance and advocacy	What can I contribute to our school community as a writing center tutor?
Students will know… • how to tutor creative writing (poetry, plays, fiction) • how to tutor writing in other disciplines (history, science, etc.) • how to practice and develop skills as academic leaders • how to troubleshoot problematic organization in a piece of writing	**Students will be able to…** • create and enact an action plan that brings students into the writing center • use their strengths to create and maintain a welcoming writing center space • continue to self-reflect on their current tutoring style • practice tutoring strategies with students in and outside of class
Key Vocabulary: Multimodal, community, academic leadership, ethos, pathos, logos	
Assessment Evidence	
Performance Tasks: Summative: **Multimodal Writing Center Project-** Using one of your core values, create an action plan for a school initiative to encourage students to visit the NHS Writing Center. It can be a commercial, a series of ads, a TED talk, a series of tutor interviews, an easy scheduling method, or any other mode you choose.	**Other Evidence:** Formative Assessment: 1) Analyzing student sample essays (speeches, presentations, creative writing) 2) Writing workshops (peer and teacher) 3) Scheduled tutoring sessions 4) Organization workshops Interim Assessments: 1) Tutoring session observations 2) Multimodal Project Proposal 3) Project Dissemination
Learning Plan	
TCC4: Interim and Sum: Multimodal Writing Center Proposal and Project;	

DE4: Interim and Sum: Multimodal Writing Center Proposal and Project; Interim: Tutoring session observations **TI1:** Interim and Sum: Multimodal Writing Center Proposal and Project; Interim: Tutoring session observations
Teacher Resources: Excerpts from *The Bedford Guide for Writing Tutors* by Ryan and Zimmerelli John Wooden's Pyramid of Success "It's All Coming Together, Right Before My Eyes": On Poetry, Peace, and Creative Placemaking in Writing Centers Student sample speeches, presentations, creative writing, writing from other disciplines

Algebra 1 CURRICULUM

(Refer to the Curriculum Template Explanation document while writing curriculum)



Grade Level(s): 9-10	**Curriculum Author(s):** Shannon Belanger, Nicole Cowles, and Lauren O'Brien

Course Description: In Algebra 1, students will learn through cooperative investigations of the major topics of Algebra. Student literacy in the structure and application of Algebra 1 is the goal of the course. Topics include: one- and two-variable statistics, linear equations in one and two variables, systems of linear equations and inequalities, functions, exponential relationships, and quadratic functions. This course is designed to improve student discourse and critical thinking skills.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Solving Linear Equations & Inequalities	How can equations and inequalities be used to model information?	To obtain a solution to an equation, no matter how complex, it always involves the process of undoing the operation. Each step in solving an equation must maintain the equality of the statement.	DE1(9-12); DE4(9-12)
Introduction to Functions	How can mathematical functions be used to represent, analyze, and solve real-world problems, and what insights do different forms of representation provide?	Understanding the different representations of functions—verbal, graphical, using tables, and algebraic—allows us to model real-world situations, identify relationships, make predictions, and solve problems effectively. Different representations provide unique insights into the behavior and characteristics of functions.	TCC1(9-12); AA1(9-12)
Linear Functions	How can understanding linear functions and their multiple representations help us model real-world situations, interpret relationships, and solve problems effectively?	Linear functions describe relationships and quantities with a constant additive rate of change, known as the slope.	CCE4(9-12); AA1(9-12)
Systems of Equations and Inequalities	How do systems help us solve real-world problems with multiple constraints?	A solution to a system of equations is the point where all equations intersect. A solution to a system of inequalities is the region of the coordinate plane that contains the ordered pairs that satisfy all of the inequalities.	TCC3(9-12); TCC4(9-12); AA1(9-12)

Introduction to Statistics	How can we use statistics to summarize and describe sets of data?	Graphs and summary statistics can be used to describe one variable data; scatterplots and trend lines can be used to describe two variable data.	TCC3(9-12)
Exponential Functions	What are the characteristics of exponential growth and decay and how is this reflected in real-world phenomena?	Exponential functions represent relationships involving a constant multiplicative rate of change, which represent rapid growth or decay.	TCC3(9-12); TI3(9-12); CCE4(9-12)
Operations with Polynomial Expressions	How can you verify two algebraic expressions that appear to be different are equivalent?	Polynomial expressions can be simplified and factored using different strategies.	TCC2(9-12); CCE4(9-12)
Introduction to Quadratic Functions	What are the characteristics of quadratic functions and how can they be used to model real-world phenomena?	Understanding multiple representations—graphical, numerical, algebraic, and contextual—of quadratic relationships allows us to analyze and solve real-world problems involving solutions and maximum or minimum values.	TCC3(9-12); AA1(9-12)

Unit 1 - Solving Linear Equations & Inequalities

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear*** *and quadratic functions, and simple rational and exponential* ***functions.***
- **A.CED.A.3 Represent constraints by equations on inequalities,** and by systems of equations and/or inequalities, and **interpret solutions as viable or nonviable options in a modeling context**.
- **A.CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- **A.REI.A.1** Explain each step in solving a simple equation as follows from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- **A.REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
- **A.SSE.A.1** Interpret expressions that represent a quantity in terms of its context.*
    - **A.SSE.A.1.A** Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it.
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
- **N.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.
- **N.Q.A.2** Define appropriate quantities for the purpose of describing modeling.
- **N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

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)

- **DE1(9-12):** I can acknowledge, process, and respond appropriately to others' comments and perspectives.
- **DE4(9-12):** I can work respectfully with all members of my community and support the needs of others.

Understandings: Students will understand that...

- Algebra consists of numbers, variables, operations, and rules for relationships between those entities.
- A variable represents an unknown quantity.
- Real-life situations can be modeled algebraically.
- To obtain a solution to an equation, no matter how complex, it always involves the process of undoing the operation. Each step in solving an equation must maintain the equality of the statement.
- Inequalities express a range of possible solutions, rather than a single answer.

Essential Questions:

- How can the algebraic properties of real numbers extend beyond integers?
- What methods or strategies do you use to decide how to solve a problem? How does this extend to the validity of a solution to a problem?
- Does each equation have a distinct solution and how do you know?
- How can equations and inequalities be used to model information?
- How do inequality properties compare to those of equations? How are they similar? How are they different? What characteristics drive using an inequality instead of an equal sign?
- What is a solution set for a linear inequality?

Students will know...

- Explain the steps in solving equations.
- Understand how the properties of equality and inverse operations are used to solve equations and inequalities in one-variable.
- Understand the difference between the properties of equality vs. combining like terms and when to use each (seeing structure).
- The order of operations and apply it when simplifying expressions or solving equations.
- Explain the steps in solving inequalities.
- Understand how the properties of inequalities and inverse operations are used to solve inequalities.
- Understand the difference between the properties of equations vs the properties of inequalities (i.e.: multiplying or dividing by a negative).
- The difference between equations and inequalities.
- Some equations have no solution, one solution, or infinitely many solutions.

Students will be able to...

- Solve multi-step equations, justifying each step in the solving process.
- Solve equations with variables on both sides, including examples of special cases with no solutions or infinite solutions.
- Rewrite and explain literal equations (equations with formulas).
- Translate real-world problems into algebraic equations.
- Solve absolute value equations and apply to real-world situations such as tolerance or error analysis.
- Solve and graph multi-step inequalities in one-variable.
- Solve and graph compound inequalities in one-variable.
- Model real-world situations using inequalities. Apply compound inequalities to real-world situations.

• Inequalities express a range of possible solutions rather than a single answer.	

Key Vocabulary:
Part 1 Solving Equations: Argument, Coefficient, Combine Like Terms, Constant, Difference, Distributive Property, Expressions, Equation, Equality, Infinite Solutions, Interpret, Inverse Operation, Justify, Like Terms, Modeling, No Solution, Order of Operations, PEMDAS, Persevere, Product, Properties of Equality, Proportional, Quotient, Rate, Ratio, Solve, Solution, Sum, Term, Variable

Part 2 Solving Inequalities: At Least, Compound Inequality, Greater Than, Inequality, Interpret Less Than, Modeling, No More Than, Solution, Solution Set

Assessment Evidence

Performance Tasks:

Summative Assessment: Unit 1 Test **DE1(9-12); DE4(9-12)**
- Solving multi-step equations
- Solving multi-step inequalities
- Solving compound inequalities
- Modeling equations and inequalities

Other Evidence:

Building Thinking Classrooms Problem Sets:

Common Formative/Interim Assessment:
- Applications of one and two step equations
- Multi-step equations and with variables on both sides (include absolute value)
- Types of solutions
- Multi-step inequalities
- Literal Equations
- Solving compound Inequalities

Learning Plan

Given the wide-range of student abilities entering Nonnewaug High School from our multiple sending districts, this first unit is split into two key ideas: solving linear equations in one-variable and solving linear inequalities in one-variable. Our students are entering NHS with varying mathematical experiences, some students using Illustrative Math, while others have different 8th grade math experiences from their sending school district. Therefore, there is a need to utilize just-in-time intervention opportunities throughout this first unit. By spiraling in review of middle school concepts, such as distributive property, combining like terms, and solving simple one-, two-, and multi-step equations teachers will scaffold in learning opportunities and can adjust to meet students' learning needs. The beginning of the school year is paramount to establishing routines, including the use of Building Thinking Classrooms in Mathematics as an instructional strategy, building community, and integrating to the expectations at the high school.

Part 1: Solving Linear Equations in One-Variable. Prerequisite skills for just-in-time intervention could include: adding/subtracting or multiplying/dividing with positive and negative numbers, simplifying expressions using the order of operations, combining like terms, the

distributive property.

- Solve multi-step equations, justifying each step in the solving process and deepening an understanding of opposite operations and preserving equality. **DE1(9-12); DE4(9-12)**
- Solve equations with variables on both sides, including examples of special cases with no solutions or infinite solutions.
- Rewrite and explain literal equations (equations with formulas). This practices “seeing structure” which is a critical skill assessed on the SAT.
- Translate real-world problems into algebraic equations to model and solve application questions.
- Solve absolute value equations and apply to real-world situations such as tolerance or error analysis.

Part 2: Solving Linear Inequalities in One-Variable. Prerequisite skills for just-in-time intervention could include: plotting points on a number line and revising the idea of less than and greater than (i.e. x>-4 means that x could be -3, -2, -1.5, etc.)

- Solve and graph multi-step inequalities in one-variable.
- Solve and graph compound inequalities in one-variable.
- Model real-world situations using inequalities including applying compound inequalities to real-world situations.

Teacher Resources: Algebra 1 Textbooks; IM Algebra 1 Unit 2: Linear Equations, Inequalities, and Systems; State of CT Algebra 1 Model Curriculum Unit 2; Desmos; IXL; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 2 - Introduction to Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **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
- **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.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**
- **F.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).** *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
- **F.BF.A.1** Write a function that describes two quantities.
- **F.LE.A.2 F.LE.A.2 Construct linear** and exponential functions**, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).**
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

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.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that...

- A function maps each input (domain) to exactly one output (range), and is often expressed as f(x).
- Function notation helps evaluate and interpret functions in different contexts, connecting mathematical expressions to real-world situations.
- Understanding the different representations of functions - verbal, graphical, using tables, and algebraic - allows us to model real-world situations, identify relationships, make predictions, and solve problems effectively. Different representations provide unique insight into the behavior and characteristics of functions.

Essential Questions:

- How do you distinguish between relations and functions?
- What is a function, and how can we represent it using equations, graphs, and tables?
- How do we use function notation to evaluate and interpret functions?
- In what ways do different representations of a function (graph, table, equation) provide unique insights into its behavior?
- How can mathematical functions be used to represent, analyze, and solve real-world problems, and what insights do different forms of representation provide?

Students will know...

- Functions are relations with each element domain paired with exactly one element of the range.
- Methods for determining if a relation represents a function.
- Function notation is another way to represent your dependent variable.
- Functions can be represented by tables, equations, graphs and mapping diagrams.
- Through graphical representations, students can visually analyze key features such as intercepts, domain and range and maximums/minimums in the context of a problem.
- Domain is the set of all x-values and range is the set of all y-values in a relation.

Students will be able to...

- Understand that a function is a relationship where each input (domain) has exactly one output (range).
- Represent relations in tables, graphs, equations and mapping diagrams.
- Identify the domain (set of possible inputs) and range (set of possible outputs) from a graph, mapping diagram, or table.
- Use function notation to represent functions and evaluate them for given inputs.
- Solve for the input given an output of a function from an equation.
- Interpret and plot functions on a coordinate plane, recognizing how graphs represent the function's behavior.
- Interpret graphs to find key features in a scenario.
- Use functions and function notation to describe contextual situations.

Key Vocabulary: Function, domain, range, function notation, independent variable, dependent variable, element, input, output, graph of a function, evaluate, maximum, minimum, y-intercept, x-intercept, table of values, equation of a function, mapping diagram, Vertical Line Test, discrete, continuous

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Merry Go Round Performance Task **AA1(9-12)** Data collection and graphical analysis Summative Assessment ● Evaluating functions ● Representing relations ● Identifying the domain & range ● Is it a function? ● Represent situations using Function notation ● Analyzing a graph using function notation	Common Formative/Interim Assessment:**TCC1(9-12)** ● Representing relations & identifying whether a relation is a function Quiz ● Function notation (evaluating) quiz

Learning Plan

In this unit on Functions, students will develop an understanding that a function is a relation in which each element of the domain is paired with exactly one element of the range. Understanding functions is foundational to preparing students for studying the functions studied in Algebra 1 and Algebra 2. Essential questions such as *"How do we represent and interpret functions?"* and *"In what ways do different representations of a function provide unique insights?"* will guide their exploration and deepen their conceptual understanding. Students will

- Explore various ways to represent functions, including equations, graphs, tables, and mapping diagrams, gaining insights into how each form highlights different features of the function. These multiple representations of functions will extend to the functions studied in Algebra 1, Algebra 2, Pre-Calculus, and Calculus.
- Through the use of function notation, students will learn to evaluate and interpret functions in diverse contexts, connecting mathematical expressions to real-world scenarios. By analyzing graphs, they will identify key features such as intercepts, domain, range, and maximums/minimums, and understand how these features describe the function's behavior. **TCC1(9-12)**
- Students will be able to determine whether a relation is a function and explain why, using evidence from different representations. The learning will extend to modeling real-world situations with functions, allowing students to visualize and solve practical problems. This includes a Merry Go Round performance task where students will collect data and create and analyze its graphical representation. **AA1(9-12)**

By the end of the unit, students will be equipped to begin to represent, evaluate, and analyze functions, both in mathematical and real-world contexts.

Teacher Resources: Algebra 1 Textbooks; IM Algebra 1 Unit 4: Functions; State of CT Algebra 1 Model Curriculum Unit 3; Desmos; IXL; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 3 - Linear Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **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.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.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.A Graph linear** and quadratic **functions and show intercepts**, maxima, and minima.
- **F.IF.C.8** Write a function defined by an expression in different by equivalent forms to reveal and explain different properties of the function.
- **F.LE.A.2 Construct linear** and exponential functions, **given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).**
- **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)**. *The example in the standard is the focus of instruction in Algebra 1, not the formal proof. We want students to be able to write the equation parallel and perpendicular and identify parallel/perpendicular pairs from equations.*

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.

Understandings: Students will understand that...

- Linear functions describe relationships and quantities with a constant additive rate of change, known as the slope.
- Equations represent relationships between quantities and can be graphed on a coordinate plane.
- The graph of a linear function (a line) represents a set of infinite solutions to a two variable equation.
- The average rate of change describes how a function's output changes over an interval.
- Graphs of functions reveal key features like intercepts and its slope.

Essential Questions:

- How can understanding linear functions and their multiple representations help us model real-world situations, interpret relationships, and problem solve effectively?
- What is a linear function, and how can it be represented using equations, graphs, and tables?
- What is the significance of a linear function's slope and y-intercept in the context of modeling linear applications?
- How do changes in the form of a linear equation affect its graph and the relationship between variables?
- What is the significance of parallel and perpendicular lines in solving geometric and algebraic problems?

Students will know…

- Linear functions do not include exponents, variables in the denominator, or variables under radicals.
- Linear functions have three accepted forms: slope intercept, standard, and point-slope.
- Linear functions can be identified from equations, graphs, and tables.
- Slope is a constant rate of change that can be calculated from a graph, table, equation, or two points.
- The y-intercept is often referred to as the initial value. It can be identified from an equation or from a graph.
- The x-intercept is often referred to as the zero of the function - when the value of the function is zero.
- Linear functions can be built from graphs, descriptions, or input-output pairs.
- To write the equation of a line, at least one point and the slope are needed.
- Parallel and perpendicular lines can be identified and written using slope criteria. Parallel lines have the same slope while perpendicular lines have opposite reciprocal slopes.

Students will be able to...

- Identify and classify linear functions from graphs, tables, and equations.
- Calculate the slope of a line from a graph, table, equation, and/or two points.
- Interpret the meaning of intercepts given a situation, equation, or graph.
- Graph linear functions using slope-intercept form.
- Graph linear functions in standard form by rewriting into slope-intercept form or by finding the intercepts.
- Graph linear equations in point-slope form.
- Write equations of linear functions given a graph, a context, a point and slope, or two points.
- Write equations of parallel and perpendicular lines given a line and a point not on the line.
- Solve problems involving parallel and perpendicular lines.
- Translate between different representations of linear functions (graph, table, equation).
- Create equations to model situations using linear functions.
- Analyze and interpret the slope and intercepts of a linear

	function in real-world situations.
Key Vocabulary: Linear Function, Linear Equation, Graph, Table, Slope, Constant Rate of Change, Y-intercept, X-intercept, Slope-Intercept Form, Standard Form, Point-Slope Form, Parallel Lines, Perpendicular Lines, Domain, Range, Function Notation, Coordinate Plane, Origin, Solution, Intercept	
Assessment Evidence	
Performance Tasks: Summative Assessment: **AA1(9-12)** ● Matching equations to graphs ● Identifying slope and y-intercept ● Completing coordinate tables for linear equations ● Horizontal and vertical lines ● Writing equations ● Graphing linear equations ● Identifying linear vs. nonlinear relationships ● Interpreting real-world situations with linear equations ● Finding break-even points and calculating profit	**Other Evidence:** Common Formative/Interim Assessment: **CCE4(9-12)** ● Calculating slope and identifying if a relation is linear ● Graphing and applying slope intercept form
Learning Plan	
Linear functions are the first function family studied in high school. Students will explore linear relationships, learning to represent them using equations, graphs, and tables. The purpose of this unit is to introduce the connection between graphs and linear equations in two variables. Students will discern the best approach for graphing based on the form of the equation and equation writing based on the information given. ● Students will identify linear versus non-linear relations and understand that a linear function pairs each input (domain) with exactly one output (range). ● They will calculate and interpret slope as the rate of change. Additionally, students will recognize the y-intercept's significance, beginning in the context of application problems and then making the connection to the equation. ● Students will graph linear functions in various forms, which include slope-intercept, standard, and point-slope forms. Students will identify key features of the function, including slope, the y-intercept, and x-intercept. Using these features they will graph lines and translate between forms of the equation. **CCE4(9-12)** ● Real-world problems will help students apply their skills, modeling situations with constant rates of change and solving linear equations. ● Students will be able to graph linear equations, solve real-world problems, and write equations that represent linear relationships. **AA1(9-12)**	
Teacher Resources: Algebra 1 Textbooks; IM Algebra 1 Unit 2: Linear Equations; State of CT Algebra 1 Model Curriculum Unit 4; Desmos; IXL, TI Smartview Software; Teacher created in-class notes, activities, and problem sets	

Unit 4 - Systems of Linear Equations and Inequalities

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.CED.A.3** Create equations that describe numbers or relationships. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
- **A.REI.C.5** Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
- **A.REI.C.6** Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- **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).
- **A.REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear**, polynomial, rational, absolute value, exponential, and logarithmic functions.*
- **A.REI.D.12** Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

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.
- **TCC4(9-12)**: I can integrate my learning to adapt to experiences in the classroom, career and life.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success

Understandings: Students will understand that...

- Systems of equations and inequalities can model real-world scenarios involving more than one variable.
- A solution to a system of equations is the point where all equations intersect.
- A solution to a system of inequalities is the region of the coordinate plane that contains the ordered pairs that satisfy all of the inequalities.
- Multiple methods can be used to solve systems, each with its own advantages.

Essential Questions:

- What does it mean for an ordered pair to be a solution to a system?
- How do you determine the most efficient method to solve a system?
- How does the number of solutions of a system connect to its graph?
- How do systems help us solve real-world problems with multiple constraints?

Students will know…

- Expressions can be substituted in for variables.
- The solution to a system of linear equations is the ordered pair which is a solution to each linear equation in the system.
- There are multiple methods to solve systems of equations. All methods result in the same solution, but one method may be more efficient.
- Some systems have infinitely many solutions (graphically they are the same line) or no solution (graphically it results in parallel lines).
- Systems can be used to determine break-even points and to analyze data relative to the break-even point.
- An inequality divides the coordinate plane into two half-planes. One side of the boundary line will represent solutions and is shaded to show this.
- The solution to a system of inequalities is the overlapping region of these shaded half-planes, known as the feasible region.

Students will be able to…

- Solve a system of linear equations using graphing, substitution, and elimination methods.
- Determine the most efficient method to solve a system of linear equations.
- Solve a system of linear inequalities by graphing.
- Algebraically check solutions to a system of linear equations and to a system of linear inequalities.
- Determine the number of solutions to a system of linear equations.
- Write and solve systems of linear equations and of linear inequalities to model real world problems.

Key Vocabulary: linear equation, linear inequality, system of linear equations, system of linear inequalities, equivalent equation, solution, graphing method, substitution method, elimination (linear combination) method, inconsistent, consistent, independent, dependent, infinitely many solutions, no solution, revenue, profit, break even point

Assessment Evidence	
Performance Tasks: ● Amusement park problem - introduction to systems of linear equations **AA1(9-12)** ● Donut problem - introduction to systems of linear inequalities **TCC3(9-12)** ● Summative test on systems of linear equations and linear inequalities **TCC4(9-12)**	**Other Evidence:** Common Formative/Interim Assessments: ● Solving systems of equations by graphing ● Solving systems of equations by substitution and elimination ● Number of solutions and systems of linear inequalities

Learning Plan

The purpose of this unit is to introduce the connection between graphs and linear equations in two variables given multiple equations. Students will discern the best approach for writing systems of equations and solving based on the information given. Systems of equations then extends to systems of inequalities, where there is a feasible region for the solution set.

- This unit starts with an informal introduction to systems of equations through the amusement park problem **AA1(9-12)**. Students create tables, graphs, and equations to model three different membership plans at an amusement park. Students compare these plans and look for break even points.
- Students will solve systems by the graphing method, both by hand and using technology (TI graphing calculator, desmos calculator). Students also solve application problems by graphing.
- Students learn algebraic methods for solving systems of equations. Students solve problems that are stand alone and real world problems by substitution and by elimination.
- Students will learn about special cases - inconsistent and dependent systems of equations.
- Students are introduced to systems of linear inequalities using the donut problem **TTC3(9-12)**.

The unit will conclude with a summative test on all topics **TCC4(9-12).**

Teacher Resources: IM Algebra 1 Unit 2: Linear Equations, Inequalities, and Systems; State of CT Algebra 1 Model Curriculum Unit 6; Teacher created worksheets and assessments; Desmos; Khan academy; IXL; Socrative; Blooket; Quizizz; Kahoot

Unit 5 - Introduction to Statistics

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **S.ID.A.1** Represent data with plots on the real number line (dot plots, histograms, and box plots).
- **S.ID.A.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- **S.ID.A.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
- **S.ID.B.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- **S.ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
    - **S.ID.B.6.A Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear,** quadratic, and exponential models.
    - **S.ID.B.6.C** Fit a linear function for a scatter plot that suggests a linear association.
- **S.ID.C.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
- **S.ID.C.8** Compute (using technology) and interpret the correlation coefficient of a linear fit.

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.

Understandings: Students will understand that...	**Essential Questions:**
● Data can be represented in multiple graphical ways to reveal	● How can data be represented and interpreted to make real-wold

trends and insights. • Measures of center and spread can be used to summarize quantitative data. • The context of data matters when interpreting statistical findings. • Bivariate data can be analyzed using scatterplots and equations of the line of best fit.	decisions? • What can measures of center and spread tell us about a data set? • How do outliers and distribution shape influence interpretation of data? • How can the equation of a trend line be used to make predictions about bivariate data?
Students will know... • Data involving one quantitative variable can be displayed and analyzed using dot plots, histograms, and box plots. • Mean and median are used to describe and compare the center of a distribution; interquartile range (IQR) and standard deviation are used to describe and compare the spread of a distribution. • Data involving two categorical variables can be displayed and analyzed using two way tables. • Data involving two quantitative variables can be displayed and analyzed using scatterplots.	**Students will be able to...** • Create and analyze dot plots. • Create and analyze histograms. • Calculate the mean, median, mode, range, and IQR. • Use technology to calculate the five-number summary and the standard deviation. • Interpret the standard deviation and compare the standard deviation between two data sets. • Create and analyze box plots. • Interpret the skewness of data. • Use a two-way table to describe categorical data • Create a scatterplot to display quantitative data • Describe a scatterplot in terms of direction and strength • Sketch a line of best fit for a scatterplot • Use technology to calculate the equation of the line of best fit and to calculate the correlation coefficient • Use the equation of the line of best fit to make predictions about the data set
Key Vocabulary: Box Plot, Dot Plot, Histogram, Interquartile Range, Mean, Median, Mode, Outlier, Range, Skewed Left, Skewed Right, Skewness, Standard Deviation, Two way table, Scatterplot, Direction, Strength, Correlation, Extrapolation, Interpolation	
Assessment Evidence	
Performance Tasks: Summative Project - Students create a set of data relating their height versus the number of steps taken; they use the graphing calculator to determine the equation of the line of best fit and then answer questions related to this line. Students also calculate measures of center and spread and create a histogram of the class data. **TCC3(9-12)**	**Other Evidence:** Common Formative/Interim Assessments: • Creating and analyzing graphs • Calculating and comparing measures of center and spread • Two way tables

Learning Plan
This unit is designed to have students learn how to summarize data, both graphically and through statistics. ● Students study one variable quantitative data. Students create and analyze dot plots, histograms, and boxplots. They discuss the shape of these graphs, focusing on symmetry and skewness. ● Students use one variable statistics to summarize data. They calculate mean, median, mode, range, the 5 number summary, and the interquartile range (IQR) by hand, before learning how to calculate these using technology (graphing calculator and desmos calculator). Students use technology to calculate the standard deviation. ● Students look at two variable categorical data, which is summarized in two way tables. They create tables based on data, and they describe the data by calculating relative frequencies. ● Students study two variable quantitative data by creating and describing scatterplots. They use technology (graphing calculator and desmos calculator) to determine the equation of the line of best fit and to calculate the correlation coefficient. They interpret the slope and y-intercept of the trend line and use the trend line to make predictions about the data. The unit concludes with a final project where students collect data to analyze the relationship between their height and the number of steps taken. **TCC3(9-12)**
Teacher Resources: Algebra 1 Textbooks; IM Algebra 1 Unit 1: One-Variable Statistics; IM Algebra 1 Unit 3: Two-Variable Statistics; State of CT Algebra 1 Model Curriculum Unit 5; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets; Desmos; Khan academy; IXL; Socrative; Blooket; Quizizz; Kahoot

Unit 6 - Exponential Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, 3^2 times 3^(-5) = 3^(-3) = 1/3^3 = 1/27.*
- **N.RN.A.1** Explain how the definition of the meaning of a rational exponent 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.
- **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.* (For this unit, we will be discussing finding the asymptote and y-intercept).*
- **F.IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**
- **F.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand and in simple cases 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.
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
    - **F.I.C.8.B** Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^(12t), y = (1.2)^(t/10), and classify them as representing exponential growth and decay.*
- **F.IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
- **F.BF.A.1** Write a function that describes a relationship between two quantities.*
- **F.LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.
    - **F.LE.A.1.A** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
    - **F.LE.A.1.B** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

- **F.LE.A.1.C** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- **F.LE.A.2 Construct** linear and **exponential functions,** including arithmetic and **given graph, a description of a relationship, or two input-output pairs (including reading these from a table).**
- **F.LE.A.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantitative increase linearly, quadratically, or (more generally) as a polynomial function.
- **F.LE.B.5** Interpret the parameters in a linear or exponential function in terms of a context.
- **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).
- **A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **S.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

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.
- **TI3(9-12)**: I can formulate and investigate probing questions to further my learning.
- **CCE4(9-12)**: I can communicate and express my understanding in authentic, respectful, and relevant ways, using the most efficient mode of expression.

Understandings: Students will understand that...

- Exponential functions represent relationships involving a constant multiplicative rate of change.
- Exponential functions represent relationships involving rapid growth or decay and can model real-world situations involving finance, medicine, and populations.
- Exponential and linear models both involve a constant rate of change. Exponential models are a multiplicative rate of change while linear models are an additive rate of change.

Essential Questions:

- How are exponential properties related to observed patterns?
- What are the characteristics of exponential growth and decay and how is this reflected in real-world phenomena?
- How can you differentiate between an exponential model and a linear model?

Students will know...	**Students will be able to...**
• The properties of exponents are specific rules derived from observed patterns in mathematics. These include the product, quotient, and power rules, as well as the zero exponent and negative exponent rules. • Rational exponents allow you to convert expressions to simplify. • Radical expressions can be simplified by removing any perfect-square factors. • Exponential functions change by a constant factor. • Simple and compound interest is an exponential growth model. • Depreciation and half-life are exponential decay models. • Interest can compound in different time intervals. • The graphs of exponential functions include a horizontal asymptote.	• Simplify expressions using properties of exponents, including integer and rational exponents. • Convert between radicals and rational exponents to simplify expressions. • Simplify radical expressions. • Distinguish between exponential and linear models given graphs, tables, and equations. • Determine the growth/decay rate of an exponential model from tables, graphs, equations, or application problems. • Represent exponential functions graphically or as equations, including situations involving growth, decay, and compound interest. • Model exponential equations from situations involving growth and decay, such as student loan interest or half-life. • Use technology to model and evaluate exponential relations to solve problems. • Graph exponential functions; identify the y-intercept and asymptote.

Key Vocabulary: Appreciation, Base, Compound Interest, Cube Root, Decay, Decay Factor, Depreciation, Expont, Exponential Function, Growth, Growth Factor, Initial Value, Integer Exponents, Negative Exponent, Power, Power Rule, Product Rule, Quotient Rule, Radical, Rational Exponent, Square Root

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Summative Assessment: Test Unit 6 TCC3(9-12); CCE4(9-12). Topics will include: • Simplifying expressions using the properties of exponents • Converting between rational and radical form • Identifying linear and exponential relations • Graphing exponential functions • Applications problems to model exponential growth and decay using the simple and compound interest formulas	In-class activity: • Exploration of the properties of exponents to derive the rules for the product, quotient, and power rules. **TI3(9-12)** • Properties of exponents maze activity Common Formative Assessment/Interim: • Properties of exponents • Modeling with the simple and compound interest formulas.

Learning Plan

In this unit, students will explore the properties of exponents and exponential functions, including their applications to everyday life. Students will distinguish between linear functions and exponential functions. This is also the first function in which students are exposed to the idea of an asymptote, a line that the graph approaches, and functions with range restrictions.

- Students will investigate the properties of exponents and simplify expressions using the properties of exponents. **TI3(9-12)**
- Students will extend the properties of exponents to rational exponents and convert between rational exponents and radical expressions. **TCC3(9-12)**
- Students will compare linear and exponential models.
- Students will construct exponential functions to model growth and decay using simple and compound interest. This will include examples of tax, loans, car value, and population modeling.
- Students will graph exponential functions including their key features of the horizontal asymptote, y-intercept, and 1-2 other points.

Teacher Resources: Algebra 1 Textbooks; IM Algebra 1 Unit 5: Introduction to Exponential Functions; State of CT Algebra 1 Model Curriculum Unit 7; Desmos; TI Smartview Software; Teacher created in-class notes, activities, and problem sets

Unit 7 - Operations with Polynomial Expressions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **A.SSE.A.1** Interpret expressions that represent a quantity in terms of its context.*
  - **A.SSE.A.1.A** Interpret parts of an expression, such as terms, factors, and coefficients.
- **A.SSE.A.2** Use the structure of an expression to identify ways to rewrite it. For example, see x^4 – y^4 as (x^2)^2 – (y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2 – y^2)(x^2 + y^2).
- **A.SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
  - **A.SSE.B.3.A** Factor a quadratic expression to reveal the zeros of the function it defines.
  - **A.SSE.B.3.B** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
- **A.APR.A.1** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
- **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.
- **F.IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
  - **F.IF.C.8.A** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

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.

- **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... • Polynomial expressions can be simplified and factored using different strategies. • Operations on polynomials follow similar rules to operations on integers. • Factoring allows us to identify important features such as zeros of a function.	**Essential Questions:** • How can polynomials be classified and simplified? • What is the difference between a constant, linear, quadratic, and cubic polynomial? • How do operations on polynomials reflect operations on numbers? • How can you verify two algebraic expressions that appear to be different are equivalent? • How do you determine which strategy to use when factoring polynomial expressions?
Students will know... • Polynomials are classified by the degree and number of terms (Monomial, Binomial, Trinomial, Polynomial, Constant, Linear, Quadratic, Cubic, Quartic, Quintic). • Distribution is an extension of the properties of exponents and multiplication. • Like terms mean the same variable and the same degree. • Standard form is the highest degree term to the lowest degree. • Factoring is the inverse of a product. • The mathematical rules for adding, subtracting, and multiplying polynomials. • Various methods of factoring including GCF, grouping, difference of squares, and trinomials.	**Students will be able to…** • Classify a polynomial by its degree and number of terms. • Simplify/Perform the operations of adding, subtracting, and multiplying on polynomial expressions. • Write a polynomial expression in standard form. • Factor the GCF from a polynomial expression. • Factor trinomials, binomials (difference of squares), and polynomials with 4 terms (grouping). • Recognize that the sum of two squares cannot be factored under the real numbers.
Key Vocabulary: polynomial, degree, term, monomial, binomial, trinomial, constant, linear, quadratic, cubic, quartic, quintic, factor, GCF (greatest common factor), difference of two squares, grouping, distributive property, like terms, factor completely, perfect square trinomials, standard form	
Assessment Evidence	
Performance Tasks: **Summative Assessment: Test Unit 7 TCC2(9-12); CCE4(9-12)** Topics will include: • Classifying polynomial expressions • Simplify polynomial expressions and rewrite in standard form	**Other Evidence:** Common Formative/Interim Assessments: • Vocabulary, adding and subtracting polynomials • Multiplying polynomials • Factoring the GCF

• Multiply polynomial expressions • Factor polynomial expressions including GCF, difference of two squares, a=1, and a>1 (if time permits).	• Factoring trinomials when a=1, • Factoring a difference of squares • Factoring polynomial expressions by grouping
Learning Plan	
This unit begins with students developing an understanding of what it means to be a polynomial. Examples and non-examples are compared to arrive at a definition. Students will classify polynomials by their degree and number of terms. Students learn to add, subtract, and multiply polynomials. Students learn how to factor the greatest common factor from a polynomial, and how to factor a trinomial into two binomials.Students learn to factor binomials when they are a difference of squares. Finally, students will use factoring by grouping to factor polynomials with 4 terms.	
Teacher Resources: Algebra 1 Textbooks; IM Algebra 2 Unit 2: Polynomials and Rational Functions (lessons 1-4); State of CT Algebra 1 Model Curriculum Unit 8; Teacher created worksheets and assessments; Desmos; Khan academy; IXL; Socrative; Blooket; Quizizz; Kahoot	

Unit 8 - Introduction to Quadratic Functions

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Common Core State Standards (* indicates a modeling standard. For standards that encompass several different topics/concepts, the bolded part is the focus for this unit. If no bolding, the entire standard pertains to this unit.)

- **A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems.** *Include equations arising from linear and **quadratic functions**, and simple rational and exponential functions.*
- **A.CED.A.2** Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **A.REI.A.1** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- **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.
- **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.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*
- **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.A** Graph linear and quadratic functions and show intercepts, maxima, and minima.*
- **F.IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
- **F.BF.A.1** Write a function that describes a relationship between two quantities.*
- **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. *An exploratory introduction if time permits. This is not assessed in Algebra 1, it will be taught and assessed in Algebra 2.*
- **S.ID.B.6.A** Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or

choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.

- **N.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.*
- **N.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.*
- **N.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*

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.
- **AA1(9-12)**: I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that...

- Quadratic functions model situations involving parabolic patterns.
- The features of a parabola can be interpreted to make predictions and draw conclusions.
- If the product of two quantities equals zero, at least one of the quantities equals zero.
- There are a variety of methods to solve a quadratic equation and often one method will be more efficient than the others.

Essential Questions:

- Why is it useful to write a polynomial in factored form?
- How do you determine the most efficient method to solve a quadratic?
- How do quadratic functions model real world phenomena?
- What do the vertex and intercepts tell us about the function?

Students will know...

- Quadratic functions can be represented graphically, algebraically, or numerically.
- The best method for solving a quadratic equation depends on the original format of the equation.
- Quadratic functions have an axis of symmetry through the vertex.
- The y-value of the vertex is the maximum or minimum of the

Students will be able to...

- Solve quadratic equations using square roots, factoring, and the quadratic formula.
- Defend/justify the most efficient approach to solving a quadratic equation.
- Graph quadratic functions in standard form.
- Connect the solutions of the equations with the x-intercepts of the function and connect the vertex with the maximum or

quadratic function. ● The x-intercepts of the graph are the solutions of the equation. ● Previous knowledge (for example, area is length x width, revenue is product x price, etc.) can be represented by/applied to quadratic equations/functions.	minimum value. ● Use quadratic reasoning (for example, area is length x width, revenue is product x price, maximum = vertex, etc.) to solve problems.
Key Vocabulary: Quadratic function, axis of symmetry, maximum, minimum, x-intercept, y-intercept, roots, solutions, zeros, standard form, intercept form, quadratic formula, vertical motion model, zero product property	
Assessment Evidence	
Performance Tasks: **Summative Assessment: Test Unit 8 TCC3(9-12); AA1(9-12)** ● Solve quadratic equations using most efficient method ● Graph parabolas and identify key features ● Write a quadratic function to model projectile motion and other real world phenomena	**Other Evidence:** Common Formative/Interim Assessments: ● Solving by square roots ● Solving by factoring ● Solving by quadratic formula ● Graphing parabolas and identifying key features
Learning Plan	
This unit continues the introduction to quadratics that students had in the polynomial unit. ● Students learn how to calculate the vertex of a parabola and use that to create a complete graph of a quadratic. ● Students identify the vertex, axis of symmetry, x-intercepts, y-intercept, domain, and range of a parabola. ● Students learn to calculate the values of the x-intercepts by solving the quadratic equation using square roots, factoring, and the quadratic formula. ● Students investigate the most efficient method for solving a quadratic equation. ● Students write quadratic equations to model real world situations, such as projectile motion or area. The unit concludes with a summative test. **TCC3(9-12); AA1(9-12)**	
Teacher Resources: State of CT Algebra 1 Model Curriculum Unit 8; Algebra 1 Textbooks; Teacher created worksheets and assessments; Desmos; Khan academy; IXL; Socrative; Blooket; Quizizz; Kahoot	

FRESHWATER AQUACULTURE CURRICULUM

NONNEWAUG AQUACULTURE	REGION 14 SCHOOL DISTRICT VISION OF A LEARNER
Grade Level(s): 11 and 12	**Curriculum Author(s):**

Course Description: This course introduces students to the diverse world of freshwater aquaculture, exploring various species and production methods used within the industry. Students will investigate freshwater fish and aquatic organisms, while examining key systems such as those found in Connecticut State Hatcheries, National Hatcheries, Koi and ornamental fish production, Aquaponic production, crawfish farming, and the management of common freshwater diseases. Through hands-on activities and guided inquiry, students will build a strong foundation in freshwater aquaculture practices and develop critical thinking skills related to aquatic science and animal health. In addition to their academic studies, students will work on their National FFA Proficiency Applications and pursue their FFA State Degrees. They will also play an active role in FFA chapter events, leadership development, and planning activities throughout the school year.

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of a Learning "I Can" statements**
CT State Fish Hatcheries	Why are fish hatcheries so vital to aquatic environments and the aquaculture industry?	Fish hatcheries support wild populations, aid conservation, supply aquaculture, and promote sustainability and education.	TCC1(9-12), CCE4(9-12), DE1(9-12), TI2(9-12)
Koi and Ornamental Fish	What impact does ornamental fish have on the aquaculture industry?	Ornamental fish boost aquaculture by expanding markets, supporting small farms, driving innovation, and promoting conservation awareness.	TCC2(9-12), CCE4(9-12), DE1(9-12), DE4(9-12), AA4(9-12)
Aquaponics	What impact does aquaponics have on the aquaculture industry?	Aquaponics supports aquaculture by recycling waste, conserving water, promoting sustainability, and offering educational and business opportunities.	TCC1(9-12), TCC3(9-12), TCC4(9-12), CCE2(9-12), TI2(9-12), TI3(9-12), AA1(9-12), AA2(9-12)
Crayfish/Prawns	What impact does crayfish/prawns have on the aquaculture industry?	Crayfish and prawns boost aquaculture by diversifying production, supporting jobs, offering high market value, promoting sustainability, and driving research.	TCC1(9-12), CCE4(9-12), DE1(9-12), P4(9-12), AA4(9-12)
Freshwater Fish Diseases	What impact do diseases have on the aquaculture industry?	Diseases in aquaculture reduce fish health and production, raise costs, and threaten sustainability.	TCC1(9-12), TCC3(9-12), TCC4(9-12), CCE1(9-12), CCE3(9-12), DE4(9-12), TI1(9-12), P2(9-12), AA1(9-12)

Unit 1 - CT State Fish Hatcheries

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Natural Resource Standards

NRS.01.01.03. Analyze how species evolve, are naturally selected, and adapt.
NRS.01.02.04.a .Define the characteristics used to identify aquatic species.
NRS.01.02.04.b. Apply identification techniques to determine the species of an aquatic organism.
NRS.01.02.06.a .Identify the purpose and value of resource inventories and population studies.
NRS.02.01.02.c. Evaluate the impact and effectiveness of agencies and organizations associated with natural resources systems (e.g., regulation of consumption, prevention of damage to natural resources systems, management of ecological interactions, etc.).

Common Core State Standards

CCSS.ELA-LITERACY.W.11-12.2.B Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Next Generation Science Standards

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Connecticut of Aquaculture

CT-AQ.02.01.02.a. Classify the following species of aquatic organisms as fresh water, marine, or diadromous, of the major aquatic species. species for various applications in the and by their genus and species: tilapia- aquaculture industry. Oreochromis mossambicus and Oreochromis nilotica, Atlantic salmon- Salmo salar, chinook salmon- Oncorhynchus tshawyscha, coho salmon- Oncorynchus kisutch, eastern oyster- Crassostrea virginicia, hard clam-Mercinaria mercinaria, American lobster- Homerus americanus, sugar kelp- Saccharina latissima, rainbow trout- Oncorynchus mykiss, Brook Trout-Salvelinus fontinalis, brown trout- Salmo trutta, channel catfish- Ictalurus punctatus, blue catfish- Ictalurus furcatus, white catfish- Ictalurus catus.* CT Assessment Standard, AQ 1.
CT-AQ.03.02.03.a. Understand the lifecycle of aquatic animals.
CT-AQ.08.01.01.a. Evaluate the effects of aquaculture on the environment
CT-AQ.08.01.01.b. Outline the methods of reducing the effects of aquaculture on the environment
CT-AQ.08.01.01.c. Apply sustainable principles and practices to aquaculture production and management
CT-AQ.08.02.02.a. Apply environmental and ecological concepts to aquaculture

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

TCC: THINK CRITICALLY AND CREATIVELY

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

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE4: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

DE: DEMONSTRATE EMPATHY

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

TI: TAKE INITIATIVE

TI2: I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.

Understandings: Students will understand that…	**Essential Questions:**
• National Fish Hatcheries focus on conservation and endangered species, while State Hatcheries mainly raise fish for recreational fishing and tourism. Though both raise fish, their goals and funding differ. • Connecticut's State Fish Hatcheries boost recreation and tourism by stocking millions of trout and salmon each year, supporting a $400 million fishing economy. They also promote conservation, education, and community involvement. • Connecticut hatcheries support trout and salmon by stocking fish, conserving native species, and offering education, but must be managed to protect genetics and ecosystems. • Connecticut's Wild Trout Management Plan protects native trout by conserving habitats, using science-based regulations, and promoting sustainable fishing and public stewardship. • Fish hatcheries support the aquaculture industry by providing young fish, improving genetics, advancing research, and boosting both economic growth and sustainability efforts.	• What is the difference between National Fish Hatcheries and State Fish Hatcheries? • What impact does CT State Fish Hatcheries have on recreational fishing in Connecticut? • What impact do hatcheries have on the Trout and Salmon populations in Connecticut? • What is the importance of the Connecticut Trout Management Plan? • What impact do the fish hatcheries have on the aquaculture industry?
Students will know…	**Students will be able to…**
• Students will know the physical differences between Trout fish species • Students will know the physical differences between Salmon fish	• Students will be able to identify the difference between Brown Trout, Rainbow Trout, Brook Trout, Tiger Trout and Lake Trout. • Students will be able to identify the difference between Kokanee

species • Students will know the trout life cycle stages • Students will know the different fish hatcheries in Connecticut • Students will know what the Connecticut's Wild Trout Management Plan is and its effects on the trout population.	Salmon and Atlantic Salmon. • Students will be able to identify each stage of the trout life cycle. • Students will be able to list the 3 main fish hatcheries in Connecticut. • Students will be able to name the 4 pillars of Connecicut's Wild Trout Management Plan
Key Vocabulary: Ripe, Milt, Eggs, Fry, Juvenile, Larvae, Fingerling, Fertilize, Strip Spawning, Photoperiod, Hatch House, Intermediate Tanks, Growout Tanks, Broodstock Raceways, Alveins, Parr, Adults, National Hatcheries, State Hatcheries, Hen, Cock/Buck, Redds, Precocious Parr, Eyed Ova, Feeding lie, Resting lie, priscovorous, feroz trout, bottleneck effect, limiting factor	
Assessment Evidence	
Performance Tasks: *Formative and Interim:* Trout and Salmon Identification: **TCC2** *Formative and Interim:* Connecticut's Plan for Conservation and Management of Wild Trout Populations Pillars Project: **TCC2, CCE4**	**Other Evidence:** *Formative*: Trout Life Cycle Worksheet *Formative:* Burlington State Fish Hatchery Worksheet *Formative*: Quinebaug State Fish Hatchery Worksheet *Summative*: Connecticut's Plan for Conservation and Management of Wild Trout Populations Pillars Project
Learning Plan	
• Students will learn and identify different types of trout and salmon: **TCC1** (Trout and Salmon Trivia - Students will work in teams to test and build their knowledge of trout and salmon species by matching pictures, common names, and scientific names using interactive trivia card sets.) • Students will learn all pillars of Connecticut's Wild Trout Management Plan: **CCE1, CCE4** (CT Wild Trout Management Plan - Students will work collaboratively in groups to become *experts* on a specific pillar from the Connecticut Wild Trout Management Plan. Each group will research their assigned pillar in detail, then create a student-friendly worksheet to teach their peers about the key concepts, goals, and importance of that pillar.) • Students will learn each stage of the trout life cycle: **CCE1, CCE3** (Life Cycle Chart - Students will explore the development of trout by creating a detailed Trout Life Cycle Chart, allowing them to visually identify each stage and explain the biological processes that occur throughout the life cycle.) • Students will learn and understand the difference of the 3 state hatcheries in Connecticut: **DE1, AA4** (Virtual Tour, Field Trip and Powerpoints - Students will explore the differences between each of Connecticut's State Hatcheries through virtual tours, visual PowerPoint presentations, and hands-on field trips.)	

Teacher Resources:

Connecticut's Plan for Conservation and Management of Wild Trout - This is Connecicut's official plan on how the state's regulations help with trout management and recreational use of the Trout and Salmon industry

Trout Lifecycle - This is an online website that allows students to learn about a trout's life cycle and the importance of each stage in a Trout's life

National Broodstock Program's Egg Distribution Service - This is an online informational website from U.S. Fish & Wildlife Service about the National Broodstock Egg Distribution

National Fish Hatchery System | U.S. Fish & Wildlife Service - This is an online informational website from the U.S. Fish & Wildlife Service about National Hatcheries and how they impact the aquaculture industry

CT DEEP Spawning Seeforellen Brown Trout - This is an informational video from the DEEP on the spawning process of Brown Trout

Unit 2 - Koi and Ornamental Fish

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut of Aquaculture

CT-AQ.06.01.01.c. Select breeding species based on characteristics of the reproductive organs

CT-AQ.06.02.01.a. Explain how age, size, life cycle, maturity level and health status affect the reproductive efficiency of male and female aquatic animals.

CT-AQ.06.03.01.a. Explain genetic inheritance in aquatic species.

CT-AQ.01.01.b. Evaluate and describe characteristics of aquatic animals that developed in response to the aquatic species' environment and led to their commercial use.

Common Core State Standards

CCSS.ELA-LITERACY.W.11-12.2.D Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.

CCSS.ELA-LITERACY.W.11-12.3.C Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution).

Next Generation Science Standards

HS-LS4-3 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

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

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.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE4: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

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.

AA: ADAPT AND ADJUST

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

Understandings: Students will understand that... ● Ornamental fish boost aquaculture through trade, jobs, and innovation in breeding and tank systems. They support education and conservation but can harm ecosystems if released improperly. ● Koi fish are valuable to aquaculture for their high economic worth, cultural significance, and role in advancing breeding techniques and education. ● Koi fish are central to the ornamental fish industry due to their high value, cultural significance, striking appearance, and influence on breeding and market growth. ● Color is important in the ornamental fish industry because it boosts appeal, value, signals health, and drives selective breeding and consumer demand.	**Essential Questions:** ● What impact does ornamental fish have on the aquaculture industry? ● What significance do Koi fish have on the aquaculture industry? ● What significance do Koi fish have on the ornamental fish industry? ● Why are colors so significant in the ornamental fish industry?
Students will know... ● Students will know the different colors in Japanese ● Students will know the different scale patterns on Koi fish ● Students will know the different color patterns on Koi fish ● Students will know the how various Ornamental fish are bred in the United States ● Students will know the breeding process of Koi fish in Japan ● Students will know how biological pigments work in ornamental fish ● Students will know the science of how colors are created within a fish's skin	**Students will be able to...** ● Identify different colors, using Japanese terms. ● Identify at least 3 different scale patterns on Koi fish. ● Identify at least 5 different color patterns on Koi fish. ● Identify what state in the United States is the number one Ornamental Fish producer. ● List 3 factors that Koi farmers look for when sorting through Koi fry. ● List the 3 main pigments that affect ornamental fish.

• Students will know the process of wild caught ornamental fish	

Key Vocabulary: Colorants, Chromatophores, Biological Pigments, Mineral Pigments, Synthetic Pigments, Biochromes, Chlorophyll, Cartenoids, Melanophore Cells, Cyanophores, Xanthphores, Erythrophores, Leucophores, Iridophores, Astaxanthins, Canthaxanthi, Structural Colors, Hi, Shiro, Sumi, Ogon, Muji, Kohaku, Inazuma, Sanke, Bekko, Utsuri, Showa, Gonsanke Varieties, Wagoi, Kujaku, Gin Rin Kujaku, Doitsu, Kawi Goi, Kagami Goi, Yoroi Goi, Continuous, Step, Tancho, Kuchibeni, Hikarimuji, Yamabuki Ogon, Platinum Ogon, Orengi Ogon, Hi Ogon, Nezu Ogon, Hariwake, Lemon Hariwake, Hikarimoyo

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Formative and Interim: Color Pattern Identification: **TCC4** *Formative and Interim:* Scale Pattern Identification: **TCC4** *Interim:* Identifying male vs. female Koi fish: **TI4, P3** *Formative and Interim:* Ornamental Fish Identification: **TI3, AA2**	*Formative:* Florida's Ornamental Fish Lab Worksheet *Formative:* Amazon's Wild Caught Fish Video *Formative:* Let's Get Colorful Worksheet *Formative*: Koi Colors and Patterns Worksheet *Summative:* Watercolors for Koi Project

Learning Plan

- Students will learn to identify different color patterns on koi fish: **TCC3, CCE4** (Koi Identification - Students will carefully remove koi from their tanks and begin identifying the various color patterns observed on our own fish.)
- Students will learn to identify different scale patterns on koi fish: **TCC3, CCE2 (**Koi Identification - Students will carefully remove koi from their tanks and begin identifying the various color patterns observed on our own fish.)
- Students will learn and understand and explain the breeding process of koi fish: **CCE1, TI3,** (Koi Breeding video - Students will watch a documentary focused on the proper techniques for breeding koi, featuring insights and information directly from leading koi producers.)

Teacher Resources:

https://youtu.be/WjNfep_ISdc?si=aS3mRbq04VJ2RNt4 - Informational video on how ornamental fish are caught in the Amazon, and the impact that aquaculture has had on Amazonian life

ORNAMENTAL FISHES IMPORTANT SPECIES – MPEDA - A list of common ornamental fish that are in the ornamental fish aquaculture industry

A Comprehensive Guide to Koi Colors and Patterns - Online informational article that focus on various Koi colors and patterns, along with their Japanese terms and definitions

Breeding The Most Expensive Koi Fish In The World! - Informational video on how Koi are bred for the most beautiful colors

Japan's Secrets: Farming The Most Expensive Fish in The World! - Informational video on how koi are bred and raised in Japan

Unit 3 - Aquaponics

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut of Aquaculture

CT-PS.02.03.01.a. Identify the essential nutrients for plant growth and development and their major functions.

CT-PS.02.03.01.c. Monitor plants for signs of nutrient deficiencies and prepare a scouting report.

CT-PS.03.02.01.b. Select and demonstrate appropriate planting procedures and post-planting care techniques.

CT-PS.03.02.05.c. Design the layout of the planting area to maximize the use of growing space and produce quality crops.

Common Core State Standards

CCSS.ELA-LITERACY.W.11-12.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-LITERACY.W.11-12.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Next Generation Science Standards

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

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

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.

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.

TI: TAKE INITIATIVE

TI2: I can evaluate my objectives and a 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.

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

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

• The purpose of aquaponics is to create a sustainable and efficient system for growing both fish and plants together. It combines aquaculture and hydroponics in a closed-loop system. • Aquaponics is sustainable in aquaculture because it recycles water and waste, reduces environmental impact, and supports efficient, chemical-free food production. • Hydroponics uses chemical nutrients for plants, while aquaponics uses fish waste as a natural nutrient source, combining plant and fish farming in one system. • The nitrogen cycle in aquaponics turns fish waste into nitrates, which plants use as nutrients, while keeping the water safe for fish.	• What is the purpose of aquaponics? • How is aquaponics a sustainable practice within the aquaculture industry? • What is the difference between hydroponics and aquaponics? • What role does the nitrogen cycle play in aquaponics?
Students will know... • Students will know the various methods that are utilized in aquaponics • Students will know the history of aquaponics and where this industry originated from • Students will know how an aquaponics system efficiently functions, in order to grow plants	**Students will be able to...** • Students will be able to list 3 different types of methods that are used in the aquaponics industry. • Students will be able to state what group of people initiated the idea of aquaponics and their role in the industry. • Effectively create a running aquaponics system and grow their own plants.
Key Vocabulary: Aquaponics, Hydroponics, Nitrogen Cycle, Sustainable, PVC Pipes, Ornamental Plants, Photosynthesis, Nurseries, Raft Boards, Aztecs, Nutrient Film Technique, Media-Based	
Assessment Evidence	
Performance Tasks: *Formative:* Identify media-based aquaponics: **TCC3** *Formative:* Identify Nutrient-film technique aquaponics: **TCC3** *Formative:* Identify raft-board aquaponics: **TCC3** *Summative:* D.I.Y. Aquaponics Systems Project: **TCC3, CCE2, CCE4,**	**Other Evidence:** *Formative:* A Brief History of this Integrated Fish and Veggies System *Interims*: Types of Aquaponics Systems Mini Project *Formative:* Nitrogen Cycle Podcast *Formative:* Texas Aquaponics Tour Video

DE2, DE4, TI2	*Formative:* Florida Aquatic Nurseries Video *Summative:* Freshwater Plant Identification *Interim:* Aquatic Plant Design Challenge

Learning Plan

- Students will understand and explain how aquaponics works: **CCE1,TCC2** (Aquaponics Farm Virtual Tours - Students will take virtual tours of some of the largest aquaponics farms in the U.S., gaining insight into how plants, systems, and equipment are managed and maintained.)
- Students will effectively create a D.I.Y. homemade aquaponics system: **P4, AA1, AA3, AA4, CCE3** (D.I.Y. Aquaponics Project - Students will work in randomly assigned small groups to design and build an efficient, functional aquaponics system using materials available at home or in the Aquahouse lab space.)
- Students will effectively grow plants using their homemade aquaponics system: **P4, AA1, AA3, AA4, CCE3** (D.I.Y. Aquaponics Project - Students will collaboratively use the aquaponics systems they built to grow and maintain a variety of vegetables.)

Teacher Resources:

Aquaponics: A Brief History of This Integrated Fish & Veggies System - Milkwood: permaculture courses, skills + stories - This article focuses on the base of where the idea of aquaponics originated and how it has overall grown

Tour an AQUAPONICS FARM in Texas 🐟 + 🌿= 🤠 Sustainable Harvesters - This video takes students on a virtual tour of a commercial aquaponics facility in Texas

Aquaponics Academy #14: The Nitrogen Cycle - This is a podcast on the Nitrogen cycle and its importance within aquaponics

12. Freshwater Plant Guide - This is a comprehensive list of common aquatic plants that are grown within the aquaculture industry/aquaponically

Florida Aquatic Nurseries - This is a video from one of the largest aquatic nurseries in Florida and how different methods are used for different plants

Dan Barber: How I fell in love with a fish - This is a ted talk about the sustainability of aquaponics

Unit 4 - Crayfish/Prawns

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Natural Resources Systems

CT-NRS.06.02.04.a. Identify environmental hazards associated with groundwater supplies.

Career Ready Practices

CRP.11.01.01.b.Analyze advantages and disadvantages of new technologies, tools, and applications to maximize productivity in the workplace and community.

Environmental Sustainability

ESS.03.02.04.b. Assess the effectiveness of precautions taken to prevent or reduce contamination of groundwater.

ESS.03.02.03.a. Explain how the physical qualities of soil influence the infiltration and percolation of water.

Agribusiness Systems

ABS.03.01.01.a. Identify components of cash budgets (e.g.,anticipated revenue, production costs,overhead costs, profit, etc.).

ABS.03.01.02.a. Identify factors that impact management of cash budgets in AFNR businesses (e.g.,changes in price of inputs/outputs, financial/investment performance, capital purchases,human resources, etc.).

Common Core State Standards

CCSS.ELA-LITERACY.RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) 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... (“I can” statements to be demonstrated)

TCC: THINK CRITICALLY AND CREATIVELY

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

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY

CCE4: I can communicate and express my understanding in an authentic, respectful and relevant way, using the most effective mode of expression.

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.

AA: ADAPT AND ADJUST

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

Understandings: Students will understand that…	**Essential Questions:**
• The crawfish industry supports the economy, promotes sustainable farming with rice, and offers educational value. It's low-impact but faces weather and market challenges. • The crawfish industry boosts Louisiana's economy, creates jobs, supports farming, and is key to its culture. • Crawfish are raised in flooded ponds, grow naturally, and are harvested with traps, often in rotation with rice farming. • Crawfish are a key part of Southern culture and cuisine, especially in Louisiana. They're central to social events, traditional dishes, and local festivals, symbolizing community and heritage. • Prawns need warm water, intensive care, and commercial feed, while crawfish thrive in natural pond systems, often rotated with rice, and are easier to manage.	• What impact does the crawfish industry have in aquaculture? • What impact does the crawfish industry have in Louisiana? • What is the process of crawfish production? • What is the impact that crawfish has on southern culture and cuisine in the United States? • What is the difference between prawn production and crawfish production?
Students will know...	**Students will be able to...**
• Students will know the production process of crawfish • Students will know the life cycle of a crawfish • Students will know the importance pond design has on crawfish production • Students will know the importance crawfish have in Louisiana and in southern culture and cuisine • Students will know the difference between multicropping farms and monocropping when producing crawfish • Students will know what wild crawfish we have here in Connecticut	• Students will be able to identify 3 key parts of the crawfish production process • Students will be able to list the life cycle of a crawfish in order • Students will be able to list 3 main pond types that can be used for crawfish production • Students will be able to successfully create an authentic crawfish boil, using Louisiana seasonings • Students will be able to list 3 types of crops that crawfish can be grown with in a pond. • Students will be able to identify 3 species of crawfish that can be

• Students will know the difference between rotational crop ponds and single crop ponds	found in Connecticut, and determine if they are native or not • Students will be able to list 3 types of rotational crop ponds • Students will be able to list the 3 principal types of single-crop ponds
Key Vocabulary: Antenna, Cheliped (claw), Rostrum, Eye, Mouth, Carapace, Walking Legs, Abdomen, Male Gonopod Swimmerets, Tail, Uropod, Telson, Cephalothorax, Earthen ponds, Hydrological cycles, Burrows, Monoculture Ponds, Baffle Levees, Pyramid traps, Sustainable, Single-crop ponds, Rotational ponds, Detritus, Ratoon crop, Cultivated forage ponds, Wooded ponds, Naturally vegetated ponds, Prawns, Crawfish, Shrimp	
Assessment Evidence	
Performance Tasks: *Formative:* Identify different parts of a crayfish: **AA2, TCC4** *Interim:* Physically catch crayfish in Nonnewaug River: **CCE3, DE1** *Formative:* Identify different types of crayfish found in Connecticut: **AA4, TCC1** *Interim:* Crawfish Boil: **TI4, P1, P3**	**Other Evidence:** *Formative:* Crayfish of Connecticut Worksheet *Formative:* Hi-Tech Crawfish Farm in Cambodia Video *Formative:* Crawfish Production: Pond Construction Worksheet *Formative:* Crawfish Production: Production Systems and Forages *Formative:* Pond Production of Freshwater Prawn in Temperate Climates *Summative:* Seafood Creation Project
Learning Plan	
• Students will learn the differences of crayfish, prawns and shrimp: **TI3, TCC3** (Comparison Chart - Students will create a comparison chart highlighting the similarities and differences between prawns and shrimp) • Students will learn the importance of pond construction for crayfish production: **TCC2, CCE1** (Pond Construction and Water Requirements Worksheet: Students will read and analyze articles written by industry professionals that outline the key components required for successful crayfish production.) • Students will learn the importance of pond construction for prawn production: **TCC2, CCE1** (Pond Construction and Water Requirements Worksheet: Students will read and analyze articles written by industry professionals that outline the key components required for successful crayfish production.)	
Teacher Resources: The Next Generation of Storytelling | ArcGIS StoryMaps Timeline - Online article on types of crawfish in CT	

Crawfish Production - Production Systems and Forages - Article on various production systems and forages and how they impact crawfish production

Pond Production of the Freshwater Prawn in Temperate Climates | Aquaculture - Article on prawn production and how impactful climate is to production seasons

Hi-Tech Crawfish Farm: How I Grow The Best Crawfish | On The Red Dot | Full Episode - Informational video on how crawfish production is done globally

Crawfish Production: Pond Construction and Water Requirements - Article on what water requirements are vital to crawfish production and how to properly construct a safe and efficient pond for crawfish production

DAY IN THE LIFE OF A LOUISIANA CRAWFISH FARMER (this is where crawfish come from) - Informational video on crawfish production in Louisiana and

Farming fresh water PRAWNS (shrimp) in the U.S.A - Informational video on how prawn production is done in a south using different methods

Unit 5 - Freshwater Fish Diseases

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Aquaculture

CT-AQ.04.01.02.b. Diagnose illnesses and disorders of aquatic species based on symptoms and problems caused by diseases, parasites and physiological disorders.

CT-AQ.04.01.04.c. Perform surgical and nonsurgical veterinary treatments and procedures in aquatic animal health care.

CT-AQ.04.02.06.a. List and define the categories of infectious diseases: bacterial, fungal, viral, and parasitic.* CT Assessment Standard, AQ 8.

Common Core Standards

CCSS.ELA-LITERACY.W.11-12.1.A Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

CCSS.ELA-LITERACY.W.11-12.1.C Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

Ready Career Practices

CRP.08.03.01.a. Identify different types of problem-solving models.

Animal Systems

AS.02.01.02.b. Analyze animal welfare procedures used to ensure safety and minimize stress during management practices.

AS.07.01.03.b. Analyze illnesses and disorders of animals, based on symptoms and problems caused by wounds, diseases, parasites, and physiological disorders.

AS.07.01.01.c. Select tools, techniques, and technology to meet specific animal health management goals.

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

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.

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

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

TI: TAKE INITIATIVE

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

P: PERSEVERE

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

AA: ADAPT AND ADJUST

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

Understandings: Students will understand that...	**Essential Questions:**
• Disease in aquaculture reduces fish health and production, increases costs, and can limit trade, making prevention and management essential. • Fish in aquaculture can get bacterial, viral, parasitic, and fungal diseases, as well as stress-related issues from poor water or nutrition. Good management helps prevent outbreaks. • Disease diagnosis in aquaculture is essential for early detection, proper treatment, and maintaining healthy, sustainable fish production.	• What impact does disease have within the aquaculture industry? • What types of diseases can fish get in aquaculture facilities? • How important is it for disease diagnosis in aquaculture?
Students will know...	**Students will be able to...**
• Students will know the different classifications of diseases • Students will know the symptoms of different diseases • Students will know various diseases that are common in aquaculture facilities • Students will know how to treat various diseases in Koi	• Students will be able to list the different classifications of diseases • Students will be able to define each classification of diseases • Students will be able to list at least 3 common symptoms of disease

• Students will know the importance that the mucus coat can give to diagnose or find diseases	• Students will be able to identify at least 10 common diseases that present themselves in aquaculture facilities • Students will be able to explain how to treat ulcers in koi fish that live in a pond • Students will be able to explain how to treat pond lice for Koi • Students will be able to complete a proper skin scrape on the fish • Students will be able to identify if fish have a disease under a microscope looking at the mucus coat
Key Vocabulary: Viral, Bacterial, Fungal, Parasite, Stress, over-hydrate, Mucus coat, Chemical stress, Metamorphic data, External examination, Histopathology, Antibiotics, Skin scape, Hot spots, Fish lice, gills	
Assessment Evidence	
Performance Tasks: *Formative and Interim:* Koi Skin Scrapes: **TI3, CCE2** *Formative:* Identifying diseases under a microscope: **TCC3, CCE2**	**Other Evidence:** *Formative:* Types of Diseases and Classifications Worksheet *Summative:* Types of Diseases and Classifications Project *Interim:* Disease Scenarios *Formative:* Fish Diagnostics Laboratory Video *Formative:* Treating Koi Lesions and Ulcers Video *Formative:* Treating Pond Lice for Koi
Learning Plan	
• Students will explain the difference in disease classifications: **TCC2,** (Types of Diseases and Classifications Worksheet/Project - Students will investigate the differences between bacterial, viral, fungal and parasitic diseases and fill out the provided chart that separates the different classes of diseases.) • Students will explain treatment plans of common diseases for fish: **CCE4, TI2** (Types of Diseases and Classifications Project - Students will research common freshwater fish diseases and identify corresponding treatment plans for each condition. Disease Scenarios -Students will read a variety of provided scenarios to diagnose potential fish diseases and develop an appropriate treatment plan based on their findings.) • Students will learn how to identify diseases under the microscope: **TCC4, CCE1** (Skin Scrape and Virtual tutorial - Students will examine slides made from fish skin scrapings under a microscope, using a virtual tutorial to help identify potential signs of disease.) • Students will learn how to properly do a fish skin scrape: **P4, AA1, AA3, DE4** (Fish skin scrapes - Students will learn how to perform fish	

skin scrapes on koi and collect samples to examine under a microscope, helping them identify any potential signs of disease.)

Teacher Resources:

chapter11 Aquaculture Text 3rd Edition.pdfPDF - Students will use this textbook chapter to help diagnose various diseases

Fish Diagnostics Laboratory Tour - Great Lakes Aquaculture Days PresentationYouTube video - This is an informational video that goes through the process of proper disease diagnosis for fish

Bad advice leads to fish pond deaths, treating fish lice, birds ...YouTube · The Fish DoctorDec 21, 2019 - This is an informational video that goes through the process of how to treat koi lice

Treating Koi Pond parasites, Costia, flukes, fish scratching themselves and developing ulcers. - This is an informational video that goes through the process of how to treat koi lesions and ulcers

GREENHOUSE 10 PLANT PRODUCTION & PROCESSING CURRICULUM



Grade Level(s): Grade 10

Curriculum Author(s): Eric Birkenberger

Course Description: This course introduces students interested in plant science to the field of greenhouse plant production and management, plant processing and interior landscaping. Students will be given the opportunity to produce and manage crops while studying production structures, cultural requirements, and pest and disease management. Students will design with plants to construct several basic industry products. Credit Type: STEM .5 credit

Year At A Glance			
Unit Title	**Overarching Essential Question**	**Overarching Enduring Understanding**	**Vision of A Learner "I Can" Statements**
Careers and Industry	What is the size and scope of the floriculture industry and what jobs are available for me?	There are many dimensions to the floriculture industry. Knowing the diversity of the industry and available careers will help when selecting a job in which to succeed.	TCC2(9-12); TI2(9-12); AA1(9-12)
Interior Landscaping	How can I properly select and maintain plants in an interior environment?	Different species of plants are used in the indoor environment. Knowing how to identify each plant and the cultural requirements will help maintain plant health.	TCC4(9-12); TI4(9-12); AA3(9-12)
Wearable Flowers	How can I construct a corsage and boutonniere according to industry standards?	Basic skills, techniques and knowledge of the tools and plant material are needed to be able to construct industry acceptable arrangements.	AA1(9-12); P4(9-12)
Plant Health/IPM	How can I maintain optimum plant health?	Pests have to be managed in order to reduce damage to plants that can cause a decrease in the aesthetic and monetary value.	TCC3(9-12); TCC4(9-12); CCE4(9-12)
Floral Design	How can I construct floral arrangements according to industry standards?	Basic skills, techniques and knowledge of the tools and plant material are needed to be able to construct industry acceptable arrangements.	TCC1(9-12); CCE2(9-12); AA2(9-12)

Care & Conditioning of Cut Flowers and Foliage	How can I care for cut flowers and foliage to have them last as long as possible and have them ready for use.	Many factors contribute to the longevity/vase life of cut flowers and foliage. Different species and categories of flowers and foliage have different requirements that help them last longer.	TCC3(9-12); TCC4(9-12); TI3(9-12); AA1(9-12)

Unit 1 - Career Exploration

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resources Content Frameworks

CRP.10.01. Performance Indicator: Identify career opportunities within a career cluster that match personal interests, talents, goals and preferences.

CRP.10.02. Performance Indicator: Examine career advancement requirements (e.g., education, certification, training, etc.) and create goals for continuous growth in a chosen career.

CRP.10.03. Performance Indicator: Develop relationships with and assimilate input and/or advice from experts (e.g., counselors, mentors, etc.) to plan career and personal goals in a chosen career area.

CRP.10.04. Performance Indicator: Identify, prepare, update and improve the tools and skills necessary to pursue a chosen career path.

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

- TCC2(9-12): I can evaluate evidence from multiple perspectives, and recognize their limitations and implications, in order to justify new conclusions.
- TI2(9-12): I can evaluate my objectives and a variety of credible resources to find the best solutions for any challenge.
- AA1(9-12): I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that…

1. It is important to plan education and career paths aligned to personal goals, skills, interest, ability, and be able to identify resources to assist in planning and execution.

Essential Questions:

1. What types of careers are available to me?
2. What careers match me?
3. What are the different educational and training opportunities available?
4. Where can I obtain valuable information about careers?

Students will know...	Students will be able to…
• What programs and different levels of education are available for Post Secondary training. • Career clusters and identify potential career opportunities based on personal interests, talents, goals and preferences. • How interests and experiences can influence career choices	• Determine personal interests, talents, goals and preferences for potential careers. • Assess and select areas for growth and improvement based upon analysis of personal interests for potential careers. • Plan a career path based on personal interests, goals, talents and preferences. • Analyze skills needed for potential careers and compare and contrast skills needed with personal interests, talents, goals and preferences. Match potential career opportunities in career clusters with personal interests, talents, goals and preferences. • Select a career based on personal likes, dislikes, characteristics and wants.

Key Vocabulary: Career Clusters, Certificate Programs, Associates, Bachelors, Masters, Doctorate, SMART Goals, Entrepreneurship, Hort Careers (large list)

Assessment Evidence

Performance Tasks:	Other Evidence:
Summative: Multimedia research presentation on a floriculture career, explaining the educational requirements, salary, advancement opportunities, and more. Students will have a choice on the career and format of presentation. **TCC2, TI2**	**Interim:** Use of Jobs in Horticulture Magazine. **TCC2, AA1** **Interim:** Development of questions for guest speakers and evaluate the information presented.

Learning Plan

Teach the basics of types of education and training including degrees and certificates
Where do you find the information about careers
Matching interest, skills and abilities to the careers
Guest speaker
Content-based quiz on key vocabulary and concepts
Written responses and/or discussions on videos and articles (especially those in the resources below)

Participation assessments (guided notes, peardeck, etc…)
Teacher Resources: Textbook – *Introduction to Horticulture* Textbook - *Floriculture – Designing and Merchandising* Trade Magazines (Florists' Review, Floral Management, Grower Talks, Greenhouse Grower) Individuals in the industry – CFA & CGGA Members – Field Trips Jobs in Horticulture - Newspaper

Unit 2 - Interior Landscaping

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

Connecticut Agriculture, Food and Natural Resources Content Frameworks

PS.01.01. Performance Indicator: Determine the influence of environmental factors on plants
PS.01.04. Performance Indicator: Develop and implement a fertilization plan for specific crops and plants.
PS.02.01. Performance Indicator: Classify plants according to taxonomic systems
PS.02.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems
PS.02.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems
PS.04.01. Performance Indicator: Evaluating, identifying and preparing plants to enhance an environment

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

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

TI: TAKE INITIATIVE
TI4(9-12): I can apply my strengths and anticipate challenges to reach my current and future goals.

AA: ADAPT AND ADJUST
AA3(9-12): I can adjust my expectations and behaviors to succeed in a changing and unpredictable environment.

Understandings: Students will understand that...	**Essential Questions:**
● Scientific names for plants are written using the standard Latin binomial system of nomenclature. ● Meeting the needs of plants requires attention to detail and an	● How can understanding of Latin Names be valuable in the Interior Landscape industry? ● What plant health and wellness requirements need to be met to

understanding of the requirements for plant growth. ● Watering is the single most important factor affecting plant health. ● Interior landscapes and the plants within have many benefits to the people that enjoy that space.	care for interior plants? ● How can interior space be designed to meet the needs of plants in order to improve plant health? ● How does water affect the plants normal growth and development? ● How do plants affect people?
Students will know... ● Common tropical foliage plant species. ● The basic needs of plants and how to monitor for those needs. ● Different techniques for maintaining the health and physical appearance of plants. ● What functions plants have in interior spaces? ● What sparked the Interior Landscaping industry?	**Students will be able to...** ● Identify common tropical foliage plants ● Identify and summarize the three measurements of light – color, intensity and duration – that affect plant growth. ● Analyze and describe plant responses to light color, intensity and duration. ● Analyze plant responses to varied light color, intensity and duration and recommend modifications to light for desired plant growth. ● Design a planter and select plants based on the environment
Key Vocabulary: Light intensity, acclimatization, light quality, LED, low pressure sodium, tropical foliage plants, temperate plants, growing medium, interior landscaping, foot candles, mealy bug, mulch, genus, species, variety, Aquamate, pubescent, glossy, hand pruner, lopper, floral sheer, plant nomenclature, potted flowering plants	
Assessment Evidence	
Performance Tasks: *Summative:* Demonstration of plant maintenance techniques including the preparation and use of the “Aquamate” portable watering system. **AA3**	**Other Evidence:** *Interim:* Plant Identification Interim (quiz) assessment (common name and Genus) *Interim:* Select areas around the school that would be appropriate for interior plants. Analyze the site, select the plants and planters.**TCC4** *Classwork:* Completion of guided notes and other formatives *Interim:* Adopt a plant - Students will be given a plant to “adopt”. They

	will have to research its characteristics and care for the plant for the remainder of the semester. Complete a Google Doc/Lab Report.**TI4**
Learning Plan	
Maintain plants around the building and conservatory Utilize the Aquamate/Greenmachine to maintain plants Identify common tropical foliage plants Content based quiz on plant identification, interior plant maintenance and the industry	
Teacher Resources: Ornamental Horticulture – *Science, operations, & Management (Chapter 8)* *The Manual of Interior Plantscaping - A guide to Design, Installation and Maintenance* Live specimens around the school and in the conservatory	

Unit 3 - Wearable Flowers

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

PS.02.02 Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems

PS.04.01 Performance Indicator: Evaluating , identifying and preparing plants to enhance an environment.

PS.04.02 Performance Indicator: Create designs using plants.

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

AA: ADAPT AND ADJUST
AA1(9-12): I can evaluate different approaches and justify the best pathway to success.

P: PERSEVERE
P4(9-12): 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...

- There are a variety of wiring techniques based on the fresh material being used and the goal trying to achieve.
- There are many tools and supplies that are used specifically when creating “Flowers to Wear”.
- Flowers can be worn anywhere on the body from the head to the feet.
- Making a bow is not easy and there are a variety of techniques.
- Designing a corsage to match a theme can be fun and challenging

Essential Questions:

- Why do wiring techniques differ from flower to flower?
- What are the different wiring techniques and how are they used?
- What supplies are specific to the construction of wearable flowers?
- What are the characteristics of a good bow and how do you make one?
- What design principles can be applied to wearable flowers

Students will know...	**Students will be able to...**
• Where flowers can be worn or displayed and which are the most popular or common • For what occasions are flowers worn • How to construct a corsage and boutonniere • Design guidelines for wearable flowers	• Identify the common tools and supplies used in the construction of corsages and boutonnieres. • Make and package a corsage and boutonniere • Make and attach a corsage bow • Evaluate based on the design guidelines

Key Vocabulary: Corsage, Wristlet, Boutonniere, Flowers to Wear, Calyx, Antitranspirant, Transpiration, Flock wire, Stephanotis Stem, Daisy Hook, Pierce, Wrap-around wiring (bunch/clump), Stitch,

Assessment Evidence

Performance Tasks:	**Other Evidence:**
Summative: Make, package and evaluate a corsage. **P4**	*Classwork:* Make a standard corsage bow *Homework*: find pictures of unique and creative wearable flower designs **AA1** *Classwork:* Demonstrate 4 different wiring techniques *Interim:* Unit Exam

Learning Plan

make corsages and boutonnieres.
construct a standard corsage bow
identify and use the common materials and supplies used when constructing corsages.

Teacher Resources:
Textbook - The Art of Floral Design - Second Edition (Norah T. Hunter)
Google Search

Unit 4 - Plant Health

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
PS.01.01 Performance Indicator: Determine the influence of environmental factors on plant growth

PS.02.01 Performance Indicator: Classify plants according to taxonomic systems

PS.03.03 Performance Indicator: Develop a plan for integrated pest management for plant production

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

TCC: THINK CRITICALLY AND CREATIVELY
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.

CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY
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…

- Pests have to be managed in order to reduce damage to plants and facilities that can cause a decrease in aesthetic and monetary value.
- There are many methods used to control pests with chemicals as a last resort
- There is a threshold that has to be determined that will help make decisions about control measures

Essential Questions:

- Why do pests have to be managed
- At what point are chemicals used to control pests
- What can the evidence tell you about the specific pest
- What types of pests are common in bedding and tropical foliage plants
- What is the factor that is used to determine control measures
-

Students will know...

- What are some key identifying features of insects and other

Students will be able to...

- Scout and monitor for pests

pests • The three levels of toxicity • How to control pests with as little impact to the environment as possible • What information is required to be on a pesticide label	• Identify common greenhouse pests and their mode of destruction • Select plants that are resistant to common pests • Read a pesticide label • Monitor for plant pests and keep accurate records
Key Vocabulary: IPM, Plant Health, Scouting, Monitoring, Infectious Diseases, Non-infectious Diseases, Economic Threshold, Plant Pathogens, Larva, Pupa, Nymph, Parasite, Nematode, Pesticide, Herbicide, Insecticide, Cultural Control Methods, Biological Control, Systemic Pesticide	
Assessment Evidence	
Performance Tasks: • *Summative*: CSI Projects **TCC3, CCE4** • Develop an IPM program for a specific pest in our GH or Conservatory or one that is assigned.	**Other Evidence:** • Identify the pests from photo and live specimens • Create their own pesticide label **TCC4**
Learning Plan	
Monitor and scout for pests in the conservatory and greenhouse Show live specimens of common greenhouse pests CSI Project - completed by students and presented in class **CCE4**	
Teacher Resources: Visit local greenhouses, garden centers and nursery's - The Garden, The Farm, White Flower Farm *Textbook - Ornamental Horticulture, Science, Operations, Management* - Chapter 6 Materials - Flowering Potted Plants Trade Magazines - Greenhouse Grower, Grower Talks, Greenhouse Product News	

Unit 5 - Floral Design - Arrangements

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:

PS.04.01 Performance Indicator: Evaluating, identifying and preparing plants to enhance an environment.

PS.04.02 Performance Indicator: Create designs using plants.

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

- **TCC: THINK CRITICALLY AND CREATIVELY**
  - TCC1(9-12): I can ask purposeful, insightful questions to find a variety of innovative solutions.
- **CCE: COLLABORATE AND COMMUNICATE EFFECTIVELY**
  - CCE2(9-12): I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.
- **AA: ADAPT AND ADJUST**
  - AA2(9-12): I can assess my past successes and mistakes to change my approach.

Understandings: Students will understand that…

- Many construction techniques are universal when designing arrangements
- Different flower material might require different tools
- There are four parts to every arrangement
- There are things that can be done to extend the life of floral arrangements

Essential Questions:

- How does the fresh material determine how it is used?
- What determines the tool that will be used?
- What can be done to make the floral arrangement last as long as possible?

Students will know...

- How to construct a mound and a long and low arrangement
- How to prevent fresh flowers and greens from being damaged

Students will be able to...

- List the steps to construct a mound and long and low centerpiece.

during their selection and use • Where tools and materials are located/stored • How to properly soak foam and secure it to its container	• Safely demonstrate the proper use the tools • Implement basic designing techniques to prevent material breakage/loss
Key Vocabulary: Container, Design Bowl, Floral Foam, Floral Shears, Floral Knife, Hand Pruner, Primary Flower, Secondary Flower, Filler Flower	
Assessment Evidence	
Performance Tasks: *Summative:* Make an arrangement and complete a lab report **TCC1, AA2** *Interim* - **Lab skills assessmen**t - complete a lab skills assessment rubric based on tool use, arranging techniques, cleaning the lab space at completion, other **CCE2**	**Other Evidence:** *HW/CW* - worksheet to categorize the 4 parts of an arrangement and create a design using 4 parts that are unique. *HW/CW* - use phones to take photos of the finished arrangement and add it to their Horticulture Portfolio *HW/CW* - Fall River Florist Supply scavenger hunt **TCC1**
Learning Plan	
Students will be able to make a variety of styles of arrangements (mound, long and low) Students will be able to follow instructions meant to instruct on common issues and how to avoid Students will be able to prepare the hard goods and live material for use/insertion making the arrangement Students will be able to clean their lab area (return tools, sweep up garbage and compost scraps) Students will take photos of their arrangements to be used in their Horticulture Portfolio	
Teacher Resources: Textbook - The Art of Floral Design - Second Edition (Norah T. Hunter) Magazine - Florist Review	

Unit 6 - Care and Conditioning of Cut Flowers and Foliage

Desired Results - Goals, Transfer, Meaning, Acquisition

Established Goals:
PS.01.01 Performance Indicator: Determine the influence of environmental factors on plant growth

PST.02.02 Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems

PS.03.06 Performance Indicator: Haul and sore crops according to industry standards.

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

TCC: THINK CRITICALLY AND CREATIVELY
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.

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

AA: ADAPT AND ADJUST
AA1(9-12): I can evaluate different approaches and justify the best pathway to success.

Understandings: Students will understand that…

- Proper care and conditioning and storage of cut flowers and foliage can have a major effect on their vase life.
- Different types of flowers have different storage requirements.
- Floral preservative is essential to extend the life of cut flowers and foliage

Essential Questions:

- What are the proper methods necessary to extend the life of cut flowers and foliage?
- What is the proper way to handle and use a floral knife?
- What does floral preservative provide for cut flowers and foliage and how does that help extend the vase life?

Students will know...	**Students will be able to...**
• The growers role in harvesting, pretreating, packing, and shipping cut flowers • The chain of Life for cut flowers and foliage • How to carry out the procedures for processing floral shipments **AA1** • What the primary ingredients are in commercial floral preservative and what does each contribute to flower longevity • Common techniques for working with specific species of flowers and foliage **TI3, AA1**	• Create a visual diagram of chain of distribution of cut flowers and foliage **TCC3** • Recommend different preservative products based on the flowers being used **TCC4** • Identify the characteristics retail florists look for when they are purchasing flowers from growers or wholesale florists

Key Vocabulary: Abscission, Shattering, Vase Life, Carbohydrates, Senescence, Care and Handling, Chain of Life/Distribution, Processing, Woody Stem, Herbaceous Stem, Latex, pH, Hardness, Acidic, Alkaline, Floral Preservative, Sanitation, Bent Neck, Ethylene,

Assessment Evidence

Performance Tasks:	**Other Evidence:**
• Properly condition/process flowers based on the species purchased/delivered (complete performance assessment, **Summative**, after conditioning/processing a delivery)	**Interim**: Google Form Quiz

Learning Plan

Watch the flower auction video (Alsmare Flower Auction)
Visit the Chrysal website to identify the variety of products that are available to extend the vase life of cut flowers
Set up an experiment to test environmental factors and the effectiveness of floral preservative
Condition/process flowers

Teacher Resources:
Textbook - The Art of Floral Design - Second Edition (Norah T. Hunter)
Magazines - Florist Review
Chrysal website - chrysal.com
Floral Design Institute

Regional School District 14 New Course Proposal

Course Title: Video Game Design II/EGM201 - Psychology of Gaming (Post University)

Grade Level(s): 9-12

Department: Elective

Faculty Member(s) Submitting Course Proposal: Katie Blake

Course Description: *(Please include a brief description of the course, the graduation requirements the course would help students meet (STEM/Humanities), and whether it is a year-long or semester-long course.)*

PLEASE NOTE THAT THIS COURSE PROPOSAL REPRESENTS A SIGNIFICANT SHIFT FROM THE CONTENT OF THE PREVIOUSLY APPROVED VIDEO GAME DESIGN II COURSE APPROVED BY THE BOARD ON 1/22/24 IN ORDER TO ALIGN WITH POST UNIVERSITY'S EGM201 COURSE. THE PREVIOUSLY APPROVED COURSE PROPOSAL IS ATTACHED AT THE END OF THIS DOCUMENT.

For the 2025-2026 school year and beyond, I am proposing a dual enrollment option between Nonnewaug High School and Post University:

Grade Level:9-12
Credit Value: 0.5 (Fine Arts) with 3 credits from Post University under EGM201 – Psychology of Gaming

This course will support the students in understanding the gamer as a customer/consumer so they can create games with a broader audience in mind. This course seeks to explore the behavior of the individual as it is determined by the isolation and/or social situations specifically created within the field of game play. Among the topics covered are attention, aggression, socialization, social perception, achievement, & addiction.

Rationale for Offering this New Course: *(Please include the anticipated impact on students, how it complements existing course offerings, and the identified educational need this course would address.)*

Upon successful completion of this course, you will be able to do the following in relation to game development:

a. Demonstrate an understanding of the psychological factors that surround the competitive electronic game play such as competitiveness, drive, & achievement orientation.
b. Demonstrate an understanding of the psychological factors that surround casual and competitive electronic game play such as attention span, socialization, & reactions to social perceptions.
c. Demonstrate an understanding of the psychological risk factors that surround casual and competitive electronic gaming such as aggression, addiction and isolation.

d. Recognize and articulate the psychological implications within the ecosystem and how this translates to be an emotionally aware leader in the industry.

Prerequisites: *(Please list any prerequisite knowledge, skills, or coursework that must be completed for students to be prepared for the course.)*

Prerequisite: Students need to complete Video Game Design I to be enrolled in Video Game Design II

Long-Term Course Outcomes: *(Please list the projected long-term student outcomes as a result of students being enrolled in the course.)*

Video Game Design is a growing industry expected to see some changes due to the growth of AI. AI will change game development, but human creativity will stay at the center. Therefore, this course will give our students an advantage to understand the reasons behind gamers selecting and staying loyal to certain games so they can consider these reasons as they develop their own games.

Apply Psychological Insights Beyond Gaming

- Recognize how competitive and recreational activities influence human behavior in broader social and professional settings.

Develop Critical Awareness of Media & Technology

- Approach digital environments and interactive media with a critical, evidence-based lens.
- Identify both the positive and negative psychological impacts of gaming culture, applying this awareness to future studies, careers, and personal life.

Strengthen Emotional Intelligence & Leadership

- Cultivate self-awareness of personal responses to competition, achievement, and social interaction.
- Practice empathy and perspective-taking to lead or participate in groups with emotional sensitivity.
- Apply understanding of psychological risks (addiction, aggression, isolation) to promote healthy digital communities.

Enhance Research and Analytical Skills

- Evaluate research studies on gaming and psychology with critical thinking.
- Collect, analyze, and interpret behavioral observations in gaming contexts, developing transferable research literacy skills useful across disciplines.

Prepare for Professional and Academic Pathways

- Build a foundation for future work in psychology, education, media studies, esports management, counseling, or related fields.
- Demonstrate the ability to articulate psychological principles in clear, professional communication (oral, written, and digital formats).

Foster Lifelong Learning Habits

- Develop strategies for self-regulation and balance when engaging with games and digital media.
- Continue to question and explore how technology shapes human behavior, staying adaptive in a

rapidly evolving digital culture.

Scope and Sequence: *(Please provide a bulleted overview of the course content to include anticipated units, skills students will develop, Vision of A Learner attributes that will be practiced/demonstrated, and any resources that have already been identified for use.)*

The core content of this class will remain with game creation using our Unity gaming engine but the dual enrollment class will be woven into each week for a greater understanding of video game design as a whole. A valuable component to guide students to the understanding of why gamers play games and how designers create content that is relevant, relatable, and engaging.

Course Outline:

Unit 1 **(Think critically and creatively)**	Drive and Achievement	• Review the Course Information page. • Download/save the course syllabus. • Introduce yourself in the Introduction discussion forum. • Read chapters 5 & 6 (*Getting Gamers*), chapter 7 (*Esports Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 1 Assignment.
Unit 2 **(Demonstrate empathy)**	Emotions of Competitive Play	• Read chapter 1 (*Getting Gamers*), chapter 1 (*Esports Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 2 Assignment.

Unit 3	Attention Span and Focus (Demonstrate empathy)	• Read chapter 15 (*Getting Gamers*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion.
Unit 4	Socialization and Social Perceptions (Collaborate and communicate effectively)	• Read chapter 12 (*Getting Gamers*), chapter 5 (*Esport Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 4 Assignment.
Unit 5	Aggression, Bullying, and Toxicity **(Demonstrate empathy)**	• Read chapter 14 (*Getting Gamers*), chapter 2 (*Esport Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 5 Assignment.
Unit 6	Addiction and Isolation **(Demonstrate empathy)**	• Read chapter 4 (*Esport Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion.
Unit 7	Leading with Emotional Regulation (Self Awareness) (Adapt and adjust) (Take initiative)	• Read chapter 3 (*Esport Play*), view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 7 Assignment.
Unit 8	Leading with Emotional Regulation (Managing Others) (Persevere)	• • Read chapter 7 (*Esport Play*), Conclusion (*Getting Gamers*), view, and engage

Required Resources and Projected Financial Needs: *(Please list any resources that would be required to teach the course and their projected cost.)*

- No cost to the district. Resources provided by Post University.

Madigan, J. (2016). *Getting gamers: The psychology of video games and their impact on the people who play them*. Rowman & Littlefield. o This book is available through the VitalSource link provided in the course. Karhulahti, V. (2020). *Esport play: Anticipation, attachment, and addiction in psycholudic development*. Bloomsbury Academic. o This book can be accessed through links in the readings and resources section of each unit in the course.

- Post University credit cost for student: $150 (optional)

PREVIOUSLY BoE APPROVED VIDEO GAME DESIGN II COURSE
APPROVED 1/22/24
Regional School District 14 New Course Proposal

Course Title: Video Game Design 2

Grade Level(s): 10 - 12
0.5 Credit - half year

Department: Tech Ed Media Arts

Faculty Member(s) Submitting Course Proposal: Will Michael

Course Description: *(Please include a brief description of the course, the graduation requirements the course would help students meet (STEM/Humanities), and whether it is a year long or semester long course.)*

This course will use Gdevelop Game Design Software to code and design games. This will meet a STEM graduation requirement. A Prerequisite is Video Game Design 1. Students will expand into more detailed hierarchies of coding and game creation. Increased number of codes, variables, and behaviors will be practiced in Game Design 2. This course can be offered as a full-year with half year option for students that have completed Game Design 1.

Rationale for Offering this New Course: *(Please include the anticipated impact on students, how it complements existing course offerings, and the identified educational need this course would address.)*

Video Game Design 1 is the most popular class that I currently teach regarding student numbers. Currently, students do not have a second level course to pursue an interest in video game design. The work in video game design 1 offers practice in learning common codes found in 5 genres of games. Game Design 2 would allow for further development of details and quality in platform and side scrolling games. It would also allow for practice in additional games genres.

Prerequisites: *(Please list any prerequisite knowledge, skills, or coursework that must be completed in order for students to be prepared for the course.)*

Students should complete and pass Video Game Design 1.

Long-Term Course Outcomes: *(Please list the projected long-term student outcomes as a result of students being enrolled in the course.)*

Long term outcomes include:
Knowledge in coding logic including:
Conditions, actions, boolean, number variables, input controls, menus, and structures, sprite creation, spriter interactions, level design, game layout and game flow.

If desired, students have the opportunity to share their designs with college admissions agents and community members. For students interested in pursuing game design as a career or in higher education, the material can be shared or used to develop their own games that could someday become commercially successful.

Scope and Sequence: *(Please provide a bulleted overview of the course content to include anticipated units, skills students will develop, Vision of A Learner attributes that will be practiced/demonstrated, and any resources that have already been identified for use)*

Game design provides a heavy amount of problem solving and multiple-solution outcomes. There are several methods to create a specified action within a game. Depending on the game developer's particular way to solve a coding problem, various codes will be created. Additionally, feedback is important to game development as troubleshooting is a major component of coding. It takes collaboration to help determine what line of code is broken. Some VOL attributes are outlined below to serve as an example:

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.
TCC4(9-12): I can integrate my learning to adapt to experiences in the classroom, career and life.
CCE2(9-12): I can give and receive actionable and relevant feedback with openness to be able to determine meaningful revisions for success.

An overview of topics covered include, but not limited to:

- Game Menu creation - create menus to select items that players can choose between.
- Add save-data to game - information will be carried to multiple levels to create and preserve sequential game progress
- Open world game with rooms and tasks integrating number and boolean variables
- Grid motion to snap objects to grid for defined motion
- Physics engine for realistic object interaction with boundaries
- *Boolean logic - True/False code statements that allow code to be turned off and on based on particular variables*
- *Number variables - Create code that counts items to be used for tallying objects within a game.*
- *Array variables - Build code that allows lists to be created for variables including high-score storage.*
- *Input variations including keyboard vs mouse control*

A note on collaboration:

Collaboration with the coding class run by the math department. Students can work to identify needs and work to create platforms that address those areas.

Through all content created in class:
Students will troubleshoot and repair problems within their own codes and provide feedback to the games that other students developed.
Class-code-bank will serve as a communal portal of solutions and codes that help achieve a desired game action.

Required Resources and Projected Financial Needs: *(Please list any resources that would be required to teach the course and their projected cost.)*

Gdevelop Software.
(Nonnewaug High School already used this software. There is no additional cost)

Regional School District 14 New Course Proposal

Course Title: Video Game Design III/EGM401 Gaming Project Management (Post University)

Grade Level(s): 10-12

Department: Elective

Faculty Member(s) Submitting Course Proposal: Katie Blake

Course Description: *(Please include a brief description of the course, the graduation requirements the course would help students meet (STEM/Humanities), and whether it is a year-long or semester-long course.)*

For the 2025-2026 school year and beyond, I am proposing a dual enrollment option between Nonnewaug High School and Post University that will focus on project management and will allow students the opportunity to work on a project of their choice to demonstrate skills and content understanding. The 2024-2025 school year had 34 students complete Video Game Design I & II in 2025-2026 over 55 students are enrolled in Video Game Design I and II, and growing interest in our new esports program. This additional class will complete the pathway for our video game design students and provide them with a well-rounded understanding and advantage in the field of gaming.

Grade Level:10-12
Credit Value: 0.5 (Fine Arts) with 3 credits from Post University under EGM401 – Gaming Project Management

This course provides an overview of the game development and event project management process. The course focuses on dual focus areas within gaming, specifically the Software Development Life Cycle (SDLC) and the Event Planning Life Cycle (EPLC), and project management concept considerations for each. Students will be required to complete the Post University requirements and will also select a project/game to develop during the length of this course. Examples: game creation using Unity with collaboration with music and art students in the design, support of local game creators (relationships established), and launch of our new Nonnewaug High School esports program.

Rationale for Offering this New Course: *(Please include the anticipated impact on students, how it complements existing course offerings, and the identified educational need this course would address.)*
Upon successful completion of this course, you will be able to:

a. Demonstrate an understanding of the software development lifecycle and the project management process, and the project manager's role within software development, specifically video games.
b. Demonstrate an understanding of the event planning lifecycle and the project management

process, and the project manager's role within event planning – specifically, esports competitions and events.

c. Demonstrate the ability to evaluate an organization's project management systems and structures and assess their design/controls for areas of improvement.
d. Demonstrate the ability to construct a project plan for software development and/or a gaming event.

Prerequisites: *(Please list any prerequisite knowledge, skills, or coursework that must be completed for students to be prepared for the course.)*

Prerequisite: Students need to complete Video Game Design I and Video Game Design II to be enrolled in Video Game Design III.

Long-Term Course Outcomes: *(Please list the projected long-term student outcomes as a result of students being enrolled in the course.)*

Apply Project Management Skills Across Industries

- Transfer knowledge of the **Software Development Life Cycle (SDLC)** and **Event Planning Life Cycle (EPLC)** to manage projects in gaming, technology, esports, or other fields.
- Confidently use project management tools and strategies to plan, monitor, and deliver successful outcomes in both technical and non-technical environments.

Lead Collaborative Projects with Professionalism

- Develop the ability to manage stakeholders, set goals, and align teams toward shared objectives.
- Communicate effectively across technical and creative roles, fostering collaboration in diverse, cross-functional groups.

Identify and Solve Complex Problems

- Evaluate organizational structures, project workflows, and system controls to spot inefficiencies.
- Propose **evidence-based improvements** to strengthen performance, compliance, and sustainability in project systems.

Design and Execute Comprehensive Project Plans

- Integrate project management principles into actionable plans that anticipate risks, define deliverables, and establish realistic schedules.
- Adapt project plans dynamically in response to changing requirements, stakeholder needs, or unforeseen challenges.

Cultivate Professional Readiness for the Gaming Industry

- Build a portfolio of project planning artifacts (journals, shared assignments, final project plan) that demonstrate readiness for careers in **game development, esports event planning, or project management**.
- Exhibit leadership qualities such as accountability, resilience, and decision-making that will serve them in both entrepreneurial and corporate contexts.

Practice Lifelong Learning in Digital and Event Ecosystems

- Stay adaptive to evolving technologies, software methodologies, and event planning practices.
- Carry forward a mindset of continuous improvement and reflective practice, enabling long-term growth in rapidly changing industries.

Scope and Sequence: *(Please provide a bulleted overview of the course content to include anticipated units, skills students will develop, Vision of A Learner attributes that will be practiced/demonstrated, and any resources that have already been identified for use).*

Course Outline:

Unit 1	Project Management – Stakeholders and Goals **(Take initiative)**	• Review the Course Information page. • Download/save the course syllabus. • Introduce yourself in the Introduction discussion forum. • Read chapters 1 & 2, view, and engage with Readings and Resources. • Complete and submit the Unit 1 Shared Assignment.
Unit 2	Project Management – Deliverables and Schedules **(Take initiative)**	• Read chapters 4 & 5, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 2 Shared Assignment.
Unit 3	Project Management: Identifying Risk and Obtaining Buy-In **(Think critically and creatively)**	• Read chapter 6, view, and engage with Readings • Actively participate in Unit Discussion. • Complete and submit the Unit 3 Assignment

Unit 4	Software Development Life Cycle and Project Planning – Analysis, Design, Implementation **(Collaborate and communication effectively)**	• Read, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit the Unit 4 Journal Assignment.
Unit 5	Software Development Life Cycle and Project Planning – Testing and Maintenance (Adapt and adjust)	• Read, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit Unit 5 Assignments.
Unit 6	The Event Planning Life Cycle and Project Planning – Marketing, Social Media and Venue Sourcing **(Collaborate and communication effectively)**	• Read, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit Unit 6 Assignment.
Unit 7	Event Planning Life Cycle and Project Planning – Accommodations and Onsite Considerations (Persevere)	• Read, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit Unit 7 Assignments.

Unit 8	Putting it all Together: The Project Plan Meets the Need (Persevere)	• Read chapter 7, view, and engage with Readings and Resources. • Actively participate in Unit Discussion. • Complete and submit

Required Resources and Projected Financial Needs: *(Please list any resources that would be required to teach the course and their projected cost.)*

- No cost to the district. Resources provided by Post University.

Kogen, K. (2015). *Project management for the unofficial project manager*. Franklin Covey. o This book is available through the VitalSource link provided in the course.

Additional electronic reading, listening, and viewing materials are available in each unit of the course.

- Post University credit cost for student: $150 (optional)