

TRUMBULL PUBLIC SCHOOLS

Trumbull, Connecticut

ADVANCED PLACEMENT / EARLY COLLEGE EXPERIENCE ENVIRONMENTAL SCIENCE

Grade 12

Science Department

2020

Curriculum Writing Team

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The Trumbull Board of Education promotes non-discrimination in all of its programs, including educational opportunities and services provided to students, student assignment to schools and classes, and educational offerings and materials.

CORE VALUES AND BELIEFS

The Trumbull School Community engages in an environment conducive to learning which believes that all students will **read** and **write effectively**, therefore communicating in an articulate and coherent manner. All students will participate in activities **that present problem-solving through critical thinking**. Students will use technology as a tool applying it to decision making. We believe that by fostering self-confidence, self-directed and student-centered activities, we will promote **independent thinkers and learners**. We believe **ethical conduct** to be paramount in sustaining the welcoming school climate that we presently enjoy.

Approved 8/26/2011

INTRODUCTION & PHILOSOPHY

Advanced Placement Environmental Science is designed to teach students how the world works in a pristine state from the inner core to atmospheric limits. This course uses concepts from physics, chemistry, biology, geology, ecology, and many other disciplines that underpin how the Earth maintained its own homeostasis prior to the evolution of Homo sapiens. This course will then explore the impact of adding 7.6 billion humans on each of the disciplines aforementioned, what may occur if our current behaviors remain unchanged, and most importantly how human kind can move forward in a sustainable direction. Students will construct, analyze, evaluate, and modify designs for sustainability using extensive data and research from sources within and outside this curriculum document.

The A.P. Environmental Science elective is offered to students who have successfully completed three years of college-preparatory science. The lab component of this class will involve field study, wet labs, and case studies to better enhance student mastery of the curriculum. This course provides students with an opportunity to extend their core science knowledge through field and classroom studies of the environment, and to integrate their knowledge of social issues and governmental processes as they explore current environmental issues and potential solutions. Students taking this course will be prepared to take the College Board's Advanced Placement Environmental Science Examination.

COURSE GOALS

Learning Objectives (LOs) derive from the 2019 College Board *AP Environmental Science Course and Exam Description*.

The following course goals derive from the 2013 Next-Generation Science Standards.

NGSS.HS-LS2-1

Use mathematical and/or computational representations to support explanation of factors that affect carrying capacity of ecosystems at different scales.

NGSS.HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
NGSS.HS-LS2-6	Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
NGSS.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
NGSS.HS-LS2-8	Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.
NGSS.HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
NGSS.HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
NGSS.HS-ESS2-2	Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
NGSS.HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
NGSS.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.
NGSS.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

NGSS.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
NGSS.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
NGSS.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
NGSS.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 cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
NGSS.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

The following course goals derive from the 2010 Connecticut Core Standards.

CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.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.
CCS.ELA-Literacy.WHST.11-12.1	Write arguments focused on discipline-specific content.

CCS.ELA-Literacy.WHST.11-12.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCS.ELA-Literacy.WHST.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
CCS.ELA-Literacy.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCS.ELA-Literacy.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CCS.ELA-Literacy.SL.11-12.4	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
CCS.ELA-Literacy.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

COURSE ENDURING UNDERSTANDINGS

Students will understand that . . .

- science is a process that is a method of learning more about the world and is constantly changing the way we understand the world.

- energy conversions underlie all ecological processes. Energy cannot be created; it must come from a source. As energy flows through systems, at each step, more of it becomes unstable.
- the Earth itself is one interconnected system in which natural systems change over time and space, and biogeochemical systems vary in ability to recover from disturbances.
- humans alter natural systems and have had an impact on the environment for millions of years. Technology and population growth have enabled humans to increase both the rate and scale of their impact.
- environmental problems and solutions have cultural, social, and economic contexts.
- human survival depends on developing practices that will achieve sustainable systems in that a suitable combination of conservation and development is required, and management of common resources is essential.

COURSE ESSENTIAL QUESTIONS

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

COURSE KNOWLEDGE & SKILLS

Students will know . . .

- the composition and major processes that occur in each layer of the Earth (inner and outer core, mantle, crust, biosphere, troposphere, stratosphere, mesosphere, thermosphere).
- the atmosphere's composition, structure, weather and climate, atmospheric circulation / Coriolis effect, atmosphere-ocean interface, and ENSO.
- the distribution of freshwater and saltwater around the globe.
- which sectors (agriculture, industry, domestic) are overdrawing freshwater at the highest rate.
- the processes of the rock cycle.
- the physical and chemical properties of soil.
- the causes of soil degradation globally.
- what defines a biological population and community.
- what a keystone species is.
- what contributes to biodiversity, places with high and low biodiversity, and biodiversity's importance to ecological health.
- the characteristics of each major biome globally (terrestrial and aquatic).

- the formulas for photosynthesis and cellular respiration.
- the differences among food chains, food webs, trophic levels, and ecological pyramids.
- the postulates of the theory for natural selection.
- what ecosystem services are.
- what is meant by a climate shift.
- what a disturbance is.
- the major reservoirs and fluxes of the major biogeochemical cycles (carbon, nitrogen, phosphorus, sulfur, water).
- how biotic potential, limiting factors (biotic and abiotic), and carrying capacity play a role in population ecology.
- the difference in reproductive strategies between K- and r-selected species.
- the three major survivorship curves displayed by species globally (Type I, Type II, Type III).
- what an invasive species is, what characteristics make an organism prone to becoming invasive, and the impacts invasive species may cause.
- the historical population size, and distribution of human kind.
- the characteristics (total fertility rate, birth rate, death rate) of a population in each stage of demographic transition as well as examples of countries or regions in each stage.
- various strategies for sustainability as population size continues to increase.
- examples of national policies that have been implemented for sustainability.
- how hunger, disease, resource use, and habitat destruction traditionally correlate with population growth.
- the nutritional requirements of a human being.
- the different types of agriculture.
- what led to the green revolution and the greenwashing that occurred with its name.
- the major impacts industrial agriculture has had on this planet.
- the types of pesticides used in industrial agriculture.
- the relevant laws that surround agriculture in the United States.
- what an old growth, tree plantation, primary forest, and secondary forest are.
- the benefits of fires in forest ecosystems.
- the effects that overgrazing and CAFOs have had on ecological health.
- what urbanization is and how cities traditionally grow (sprawl).
- how the federal highway system, canals and channels, and transportation systems have fragmented wildlife corridors.
- the differences among wilderness areas, national parks, national forests, wildlife refuges, and wetlands.
- the differences among preservation, remediation, mitigation, and restoration.
- how minerals form.
- various mining strategies.

- the relevant laws and treaties surrounding mineral extraction.
- the various industrial fishing techniques used in open oceans.
- the relevant laws and treaties associated with fishing and aquaculture.
- what the Tragedy of the Commons is.
- the forms of energy.
- how energy consumption changed during the Industrial Revolution.
- the major sources of energy for each sector of consumption.
- the major producers and consumers of each energy source.
- the differences between renewable and nonrenewable energy sources.
- how much energy will need to be created in the future.
- how coal, oil and natural gas are formed.
- how each fossil fuel is extracted and purified for consumption.
- the differences between fusion and fission.
- how nuclear waste is stored and the challenge behind storing it.
- the difference between run of river and storage hydropower.
- the difference between energy conservation and efficiency.
- how solar, hydrogen fuel cells, biomass, biofuel, wind, tidal, and geothermal produce energy.
- the sources of each of the major air pollutants.
- the differences between a primary and a secondary pollutant.
- the differences between industrial smog and photochemical smog.
- the environmental and human health impacts of both industrial smog and photochemical smog.
- what acid deposition is and how it occurs.
- how a temperature inversion occurs.
- the sources of indoor air pollution.
- the relevant laws and treaties associated with clean air.
- what noise pollution is.
- the types, sources, causes and effects of the major water pollutants.
- the steps that occur leading to eutrophication.
- the processes involved and the target pollutant of each step of drinking water treatment.
- the processes involved and the target pollutant of each step of wastewater treatment.
- how a septic tank and system work in residential communities.
- the relevant laws and treaties associated with clean water.
- the types of solid waste coming from industry and residential sources.
- how to evaluate the toxicity of a given substance.
- the major types of hazardous waste.
- the treatment/disposal options available for hazardous waste.

- the relevant laws and treaties associated with hazardous waste.
- how to conduct in-depth cost-benefit analysis.
- the importance of stratospheric ozone to human and ecological health.
- the goals and accomplishments of the Montreal Protocol.
- the differences between the greenhouse effect and climate change/global warming.
- the four major categories of greenhouse gases, their GWP, and their residence times.
- the relevant laws and treaties associated with climate change.
- how human presence has led to habitat loss, overuse, pollution, introduced species, endangered species, and extinct species.
- the relevant laws and treaties associated with the loss of biodiversity.

Students will be able to . . .

- create representations and models of natural or man-made phenomena and systems in the domain. (S.P. 1.1)
- describe the processes that shape each layer of the Earth (plate tectonics, earthquakes, volcanism; seasons; solar intensity and latitude).
- describe the importance of the atmosphere's composition, structure, weather and climate, atmospheric circulation / Coriolis effect, atmosphere-ocean interface, and ENSO in redistributing heat and energy all over the planet.
- describe the challenges that are faced by organisms around the world to access the resource of water.
- propose solutions for each sector to reduce consumption of freshwater.
- describe the importance of the rock cycle in the formation of soils.
- evaluate temperature, rainfall, and rock composition in order to determine the rate at which soil will form.
- determine which major soil type is present and infer what qualities for agriculture are present using various physical and chemical tests.
- propose solutions to each cause of soil degradation in order to preserve the exhaustible resource of soil.
- determine the sensitivity of a given population and community to environmental change (anthropogenic or natural).
- evaluate the effects of the removal of a keystone species on a given ecosystem (both biotic and abiotic components).
- calculate biodiversity of a given ecosystem.
- identify threats to biodiversity both locally and globally.
- identify risk factors for each biome based on human desired resources in each.
- define primary productivity and discuss the variables that influence primary productivity.
- describe the importance of both photosynthesis and cellular respiration in a food chain.

- use the rule of 10 to explain why an energy pyramid is an accurate representation of energy flow in an ecosystem.
- use food chains, food webs, trophic levels, and ecological pyramids in order to evaluate ecological relationships.
- identify selection pressures driving the evolution of a given species.
- describe how the coevolution of species has changed biotic and abiotic components of global systems.
- describe the importance of ecosystem services to human kind as well as global ecological health.
- predict how climate shifts will alter species presence and distribution in a given ecosystem.
- describe the stages of succession after a disturbance.
- identify the impact humans have had on the major biogeochemical cycles (carbon, nitrogen, phosphorus, sulfur, water).
- describe how an environmental change will influence an ecosystem's carrying capacity.
- plot a given data set to determine which reproductive strategy and survivorship curve has evolved in that species.
- understand the factors that led to U.S. populations to display all three survivorship curves in different time periods (pre-1900, 1901-1950, 1951-present).
- design ways to prevent invasive species spread, and to have control over, or eliminate, of an established invasive species.
- calculate fertility rate based on collected data.
- calculate the doubling time of a given population ($70/r$).
- construct an age-structure diagram of a given population.
- make predictions about a population's growth using information derived from the age-structure diagram.
- calculate percent change $(P_F - P_I)/P_I$ given population data.
- evaluate populations in various case studies and make recommendations to increase sustainability.
- design solutions to hunger, disease, resource use, and habitat destruction to mitigate their impact.
- calculate the caloric requirements of human being and the associated land area required to sustain this caloric intake.
- calculate the total land area required for the current and projected global human population.
- identify benefits and flaws with each type of agriculture.
- discuss the benefits of switching to aquaponics/hydroponics/permaculture.
- discuss the costs and benefits of pesticide use.
- use the knowledge of evolution to describe the pesticide treadmill.

- design an integrated pest management plan for a given infestation.
- discuss the costs and benefits to forest management strategies.
- describe the costs and benefits behind fire suppression in the Western United States.
- describe how rotational grazing mitigates traditional rangeland management's impact on desertification.
- discuss the impact of urban sprawl on ecological and human health.
- propose regulations, and use smart growth principles, to mitigate the impact of sprawl.
- design solutions to habitat fragmentation from transportation systems.
- discuss the SLOSS dilemma and how it plays a role in land management.
- use components of preservation, remediation, mitigation, and restoration in a given case study involving ecological habitat change.
- identify the costs and benefits of each mining strategy.
- describe what products contain different ores and metals.
- identify the costs and benefits associated with various industrial fishing techniques used in open oceans.
- describe the costs and benefits associated with aquaculture (both aquatic and terrestrial).
- describe why aquaculture needs to move from a linear system to a circular one.
- describe a scenario in which the Tragedy of the Commons takes place in the present day.
- describe the costs and benefits of globalization on human and environmental health.
- solve energy consumption problems with the use of a graphing calculator and label with the correct units given in a problem.
- explain how the change in energy consumption during the Industrial Revolution allowed for the exponential growth of human populations.
- discuss the flaws of current sources of energy.
- describe the importance of switching to renewable energy sources to meet energy demands of the future.
- identify costs and benefits for each type of fossil fuel from cradle to grave.
- use data regarding global reserves from each fossil fuel and the projected demand to determine when each resource may be exhausted.
- identify the environmental advantages and disadvantages of each energy source.
- to discuss the costs and benefits of both fusion and fission.
- discuss the costs and benefits to humans and ecosystems of run of river and storage hydropower.
- discuss how salmon are a perfect case study for evaluating a dam's feasibility.
- propose ways to conserve energy and ways to become more energy efficient.
- discuss the costs and benefits of solar, hydrogen fuel cells, biomass, biofuel, wind, tidal, and geothermal energy.
- discuss ways to reduce the emission of each source.
- discuss the impact acid deposition has on ecological systems.

- identify ways to reduce the exposure to each indoor air pollutant.
- identify the sources, impacts, and measures to mitigate noise pollution.
- describe how bioaccumulation and biomagnification occur in food webs when pollutants are fat soluble.
- describe the human and ecological impacts of eutrophication in freshwater and saltwater ecosystems.
- design solutions to eutrophication in both freshwater and saltwater ecosystems.
- describe the flaw with combined sewage treatment and combined sewage overflow.
- understand the costs and benefits of septic systems as compared to wastewater treatment plants.
- discuss ways waste is disposed and ways to reduce the overall amount of it entering waste streams.
- identify the threshold dose, ED₅₀, and LD₅₀ on a given dose-response curve.
- identify the acute and chronic effects of a given chemical.
- build a risk analysis statement and an environmental impact statement from given case studies.
- identify Superfund sites and discuss what types of cleanup efforts are being put in place to remediate the pollution.
- identify human and environmental externalities in a given case study.
- identify threats to stratospheric ozone and the consequences to human and ecological health.
- outline the impacts of climate change globally.
- support the position of anthropogenic climate change using evidence and data against any of the opposing arguments.
- design solutions to each human impact of habitat loss, overuse, pollution, introduced species, endangered species, and extinct species.

COURSE SYLLABUS

Course Name

Advanced Placement Environmental Science

Level

Advanced Placement

Prerequisites

Grade of A- or better in Advanced College-Preparatory Biology and Advanced College-Preparatory Chemistry, or Grade of B+ or higher in Honors Biology

Materials Required

None

General Description of the Course

Advanced Placement Environmental Science is offered to students who have successfully completed three years of college-preparatory science. The lab component of this class will involve field study, wet labs, and case studies to better enhance student mastery of the curriculum. This course provides students with an opportunity to extend their core science knowledge through field and classroom studies of the environment, and to integrate their knowledge of social issues and governmental processes as they explore current environmental issues and potential solutions. Students taking this course will be prepared to take the College Board's Advanced Placement Environmental Science Examination.

Assured Assessments

Formative Assessments:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth (Units 1, 2, 3, 4, 5, 6, 7, 8)
- Informal topic proposal (Unit 9)
- Thesis-style document outlining research and findings (Unit 9)

Summative Assessments:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit (Units 1, 2, 3, 4, 5, 6, 7, 8)
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination (Units 1, 2, 3, 4, 5, 6, 7, 8)
- Presentation of research findings and process, evaluated by teacher and peers (Unit 9)

Core Text

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

UNIT 1

Foundations of Environmental Science

Unit Goals

At the completion of this unit, students will:

LO ERT-4.A	Describe the geological changes and events that occur at convergent, divergent, and transform plate boundaries.
LO ERT-2.B	Describe ecosystem services.
LO ERT-2.C	Describe the results of human disruptions to ecosystem services.
LO EIN-2.A	Explain the concept of the tragedy of the commons.
LO EIN-2.N	Explain the variables measured in an ecological footprint.
LO STB-1.A	Explain the concept of sustainability.
NGSS.HS-LS2-1	Use mathematical and/or computational representations to support explanation of factors that affect carrying capacity of ecosystems at different scales.
NGSS.HS-LS2-7	Use a computer simulation to understand the factors contributing to their ecological footprint, then design solutions that work to reduce these impacts.
NGSS.HS-ESS2-2	Use volcanic and seismic data to infer plate boundaries and movement globally.
NGSS.HS-ETS1-3	Conduct a case study on the Three Gorges Dam in order to make an argument using economic, ecological, and human impact data for support.
CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.3	Conduct a tragedy of the commons lab to understand what happens when resources are public.

CCS.ELA-Literacy.RST.11-12.7	Use multiple sources of media to answer the question <i>What happened on Rapa Nui?</i>
CCS.ELA-Literacy.WHST.11-12.1	Write an argument on the implementation of the Pebble Mine based on multiple sources of contextual evidence.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Students will hear a reading of *The Lorax* by Dr. Seuss before conducting a case study on the island of Rapa Nui.
- Students will conduct an ecological footprint activity to evaluate their own impact before designing real-world solutions that reduce their footprint.
- Students will conduct a case study on the Three Gorges Dam in order to evaluate infrastructure projects based on economic, environmental health, and human health parameters.
- Students will draw plate tectonic boundaries and indicate direction of movement of each plate based on analyzing volcanic and seismic data around the world.
- Students will make models of each type of plate boundary in order to demonstrate the underlying reason for geologic activity at each boundary.

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 15 days

UNIT 2

Ecosystem Structure and Function

Unit Goals

At the completion of this unit, students will:

LO ERT-1.A	Explain how the availability of resources influences species interactions.
LO ERT-1.C	Describe the global distribution and principal environmental aspects of terrestrial biomes.
LO ERT-1.D	Explain the steps and reservoir interactions in the carbon cycle.
LO ERT-1.E	Explain the steps and reservoir interactions in the nitrogen cycle.
LO ERT-1.F	Explain the steps and reservoir interactions in the phosphorus cycle.
LO ERT-1.G	Explain the steps and reservoir interactions in the hydrologic cycle.
LO ENG-1.A	Explain how solar energy is acquired and transferred by living organisms.
LO ENG-1.B	Explain how energy flows and matter cycles through trophic levels.
LO ENG-1.C	Determine how the energy decreases as it flows through ecosystems.
LO ENG-1.D	Describe food chains and food webs, and their constituent members by trophic level.
LO ERT-2.A	Explain levels of biodiversity and their importance to ecosystems.
LO ERT-2.D	Describe island biogeography.
LO ERT-2.E	Describe the role of island biogeography in evolution.
LO ERT-2.F	Describe ecological tolerance.

LO ERT-2.G	Explain how natural disruptions, both short- and long-term, impact an ecosystem.
LO ERT-2.H	Describe how organisms adapt to their environment.
LO ERT-2.I	Describe ecological succession.
LO ERT-2.J	Describe the effect of ecological succession on ecosystems.
LO ERT-3.A	Identify differences between generalist and specialist species.
LO ERT-3.B	Identify differences between K- and r- selected species.
LO ERT-3.C	Explain survivorship curves.
LO ERT-3.D	Describe carrying capacity.
LO ERT-3.E	Describe the impact of carrying capacity on ecosystems.
LO ERT-3.F	Explain how resource availability affects population growth.
LO EIN-4.A	Explain the environmental problems associated with invasive species and strategies to control them.
LO EIN-4.B	Explain how species become endangered and strategies to combat the problem.
LO EIN-4.C	Explain how human activities affect biodiversity and strategies to combat the problem.
NGSS.HS-LS2-1	Use mathematical and/or computational representations to support explanation of factors that affect carrying capacity of ecosystems at different scales.
NGSS.HS-LS2-4	Develop models to demonstrate the flow of energy, nitrogen, carbon, phosphorus, and water.
NGSS.HS-LS2-6	Analyze populations of lynx and hares in order to understand the balance that exists between predator and prey and biomass.

NGSS.HS-LS2-7	Conduct data collection in the school parking lot to estimate biodiversity, understand the factors that influence biodiversity, and then identify strategies to reduce human impact on biodiversity globally.
NGSS.HS-LS4-4	Use a computer simulation to understand the process of natural selection, using peppered moths as the organism of study.
NGSS.HS-LS4-5	Use the case of California salamanders to understand speciation and how genetic isolation may lead to the emergence of new traits.
NGSS.HS-ESS2-4	Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
NGSS.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
NGSS.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
NGSS.HS.ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Parking Lot Biodiversity Lab
- Biome Book Project
- Nitrogen Cycle Modelling
- Carbon Cycle Modelling
- Hydrologic Cycle Modelling

- Phosphorus Cycle Modelling
- Owl Pellet Inquiry Lab
- Invasive Species Research Project and Wanted Poster

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 20 days

UNIT 3

Human Populations and the Need to Feed

Unit Goals

At the completion of this unit, students will:

LO ERT-3.C	Explain survivorship curves.
LO ERT-3.D	Describe carrying capacity.
LO ERT-3.E	Describe the impact of carrying capacity on ecosystems.
LO ERT-3.F	Explain how resource availability affects population growth.
LO EIN-1.A	Explain age structure diagrams.
LO EIN-1.B	Explain factors that affect total fertility rate in human populations.
LO EIN-1.C.1	Explain how human populations experience growth and decline.
LO EIN-1.D.	Define the demographic transition.
LO ERT-4.B	Describe the characteristics and formation of soil.
LO ERT-4.C	Describe similarities and differences between properties of different soil types.
LO EIN-2.C	Describe changes in agricultural practices.
LO EIN-2.D	Describe agricultural practices that cause environmental damage.
LO EIN-2.E	Describe different methods of irrigation.
LO EIN-2.F	Describe the benefits and drawbacks of different methods of irrigation.
LO EIN-2.G	Describe the benefits and drawbacks of different methods of pest control.
LO EIN-2.H	Identify different methods of meat production.

LO EIN-2.I	Describe the benefits and drawbacks of different methods of meat production.
LO STB-1.C	Describe integrated pest management.
LO STB-1.D	Describe the benefits and drawbacks of integrated pest management (IPM).
LO STB-1.E	Describe sustainable agricultural and food production practices.
NGSS.HS-LS2-7	Given a template for a farm, design buffers and barriers in order to reduce runoff and decrease the footprint while maximizing production.
CCS.ELA-Literacy.RST.11-12.3	Perform two separate experiments to evaluate the fertility of soil samples provided, including color, porosity, permeability, texture, pH, cation exchange, water holding capacity, and available nutrients (N, P, K).
CCS.ELA-Literacy.RST.11-12.7	Collect data from cemeteries and online databases on human survivorship in order to derive patterns.
CCS.ELA-Literacy.WHST.11-12.1	Construct an argument for or against providing aid for developing countries in order to control population growth in the future.
CCS.ELA-Literacy.SL.11-12.1	Participate in a variety of small discussion regarding the pros and cons of various practices in agriculture and conclude which practices should be labeled the most sustainable for feeding the growing population.
CCS.ELA-Literacy.SL.11-12.2	Research and then present arguments for eating at a lower trophic level to improve human footprint and sustainability.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Cemetery Data Lab
- Population Pyramid Activity
- Eco-Column Construction and Data Collection
- Demographic Transition Activity
- Soils Lab #1: Physical and Chemical Characteristics
- Soils Lab #2: Student Experimental Design
- *The Biggest Little Farm* Documentary Viewing
- Genetically Modified Organism Debate

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- *The Biggest Little Farm*. Dir. John Chester, FarmLore, 2019. Film.
- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 15 days

UNIT 4

Forestry and Biodiversity

Unit Goals

At the completion of this unit, students will:

LO EIN-2.B	Describe the effect of clearcutting on forests.
LO STB-1.G	Describe methods for mitigating human impact on forests.
NGSS.HS-LS2-7	Evaluate the environmental impacts of various forestry management practices, then design their own solutions to mitigate issues.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Tree Ring Cross-Section Lab
- Smokey Bear Case Study
- Carbon Sequestration Lab

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 15 days

UNIT 5

Urbanization, Waste, and Environmental Health

Unit Goals

At the completion of this unit, students will:

LO EIN-2.M	Describe the effects of urbanization on the environment.
LO STB-1.B	Describe methods for mitigating problems related to urban runoff.
LO STB-2.J	Describe human activities that result in noise pollution and its effects.
LO STB-3.H	Describe the effect of persistent organic pollutants (POPs) on ecosystems.
LO STB-3.I	Describe bioaccumulation and biomagnification.
LO STB-3.J	Describe the effects of bioaccumulation and biomagnification.
LO STB-3.K	Describe solid waste disposal methods.
LO STB-3.L	Describe the effects of solid waste disposal methods.
LO STB-3.M	Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks.
LO EIN-3.A	Define lethal dose 50% (LD ₅₀)
LO EIN-3.B	Evaluate dose response curves.
LO EIN-3.C	Identify sources of human health issues that are linked to pollution.
LO EIN-3.D	Explain human pathogens and their cycling through the environment.
NGSS.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the ecosystem and biodiversity.

CCS.ELA-Literacy.RST.11-12.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
CCS.ELA-Literacy.SL.11-12.2	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
CCS.ELA-Literacy.SL.11-12.5	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Urban Sprawl Case Study and Presentations
- Symbiocity Web-Simulation and Sustainable Cities Report Card
- Smart Growth Principles Research and Presentations
- Toxicity Webquest
- Lemna Minor LD₅₀ Lab
- Paper Clip Biomagnification and Bioaccumulation Lab

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 20 days

UNIT 6

Threats to Aquatic Systems

Unit Goals

At the completion of this unit, students will:

LO ERT-1.B	Describe the global distribution and principal environmental aspects of aquatic biomes.
LO ERT-4.F	Describe the characteristics of a watershed.
LO EIN-2.J	Describe causes of and problems related to overfishing.
LO EIN-2.K	Describe natural resource extraction through mining.
LO EIN-2.L	Describe ecological and economic impacts of natural resource extraction through mining.
LO STB-1.F	Describe the benefits and drawbacks of aquaculture.
LO ENG-3.L	Describe the use of hydroelectricity in power generation.
LO ENG-3.M	Describe the effects of the use of hydroelectricity in power generation on the environment.
LO STB-3.A	Identify differences between point and nonpoint sources of pollution.
LO STB-3.B	Describe the impacts of human activities on aquatic ecosystems.
LO STB-3.C	Describe endocrine disruptors.
LO STB-3.D	Describe the effects of endocrine disruptors on ecosystems.
LO STB-3.E	Describe the impacts of human activity on wetlands and mangroves.
LO STB-3.F	Explain the environmental effects of excessive use of fertilizers and detergents on aquatic ecosystems.
LO STB-3.G	Describe the effects of thermal pollution on aquatic

	ecosystems.
LO STB-3.N	Describe best practices in sewage treatment.
LO STB-4.G	Explain the causes and effects of ocean warming.
LO STB-4.H	Explain the causes and effects of ocean acidification.
NGSS.HS-LS2-7	Model an oil spill, then use various practices currently in place to clean up the spill, as well as design their own strategies to mitigate impact on biodiversity in the marine system.
NGSS.HS-ESS3-2	Using a model of a mineral resource, work to extract as much ore as possible while limiting environmental degradation.
CCS.ELA-Literacy.RST.11-12.3	Collect data related to, and evaluate, the quality of a local waterbody and make recommendations for how to improve and preserve its health.
CCS.ELA-Literacy.RST.11-12.7	Evaluate the use of hydroelectric power using a documentary, web-based research, and text, and design a solution to mitigate the impacts of hydroelectric power.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Research Project and Case Study based on *American Catch*
- Defining a Watershed Lab
- Viewing of *DamNation* and Debate on Hydroelectric Power
- Water Quality Index Lab
- Calculating Ecological Footprint: Water Use
- Mangrove Forests Case Study, & Viewing of *Raising Shrimp*
- Coral Bleaching Research Project
- Viewing of *The End of the Line*
- Oil Spill Lab

- Cookie Mining Lab
- Virtual Tour of a Coal Mine

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week’s content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- *DamNation*. Dir. Travis Rummel and Ben Knight, 2014. Film.
- *The End of the Line*. Dir. Rupert Murray, 2009. Film.
- Greenberg, Paul. *American Catch: The Fight for Our Local Seafood*. London: Penguin, 2014. Print.
- *Raising Shrimp: The Future of America’s Favorite Seafood*. Dir. Joe Cunningham, Fish Navy, 2013. Film.
- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 20 days

UNIT 7

The Atmosphere and a Changing Planet

Unit Goals

At the completion of this unit, students will:

LO ERT-4.D	Describe the structure and composition of the Earth's atmosphere.
LO ERT-4.E	Explain how environmental factors can result in atmospheric circulation.
LO ENG-2.A	Explain how the sun's energy affects the Earth's surface.
LO ENG-2.B	Describe how the Earth's geography affects weather and climate.
LO ENG-2.C	Describe the environmental changes and effects that result from El Niño and La Niña events (El Niño-Southern Oscillation).
LO STB-2.A	Identify the sources and effects of air pollutants.
LO STB-2.B	Explain the causes and effects of photochemical smog and methods to reduce it.
LO STB-2.C	Describe thermal inversion and its relationship with pollution.
LO STB-2.D	Describe natural sources of CO ₂ and particulates.
LO STB-2.E	Identify indoor air pollutants.
LO STB-2.F	Describe the effects of indoor air pollutants.
LO STB-2.G	Explain how air pollutants can be reduced at the source.
LO STB-2.H	Describe acid deposition.
LO STB-2.I	Describe the effects of acid deposition on the environment.
LO STB-4.A	Explain the importance of stratospheric ozone to

	life on Earth.
LO STB-4.B	Describe chemicals used to substitute for chloroflourocarbons (CFCs)
LO STB-4.C	Identify the greenhouse gases.
LO STB-4.D	Identify the sources and potency of the greenhouse gases.
LO STB-4.E	Identify the threats to human health and the environment posed by an increase in greenhouse gases.
LO STB-4.F	Explain how changes in climate, both short- and long-term, impact ecosystems.
LO STB-4.G	Explain the causes and effects of ocean warming.
LO STB-4.J	Explain the causes and effects of ocean acidification.
NGSS.HS-LS2-7	Identify sources of air pollution in developing nations and design strategies to reduce them.
NGSS.HS-ESS2-4	Create a model of Earth, then identify how changes in the composition of the atmosphere can lead to a cascade of changes around the planet.
NGSS.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.
NGSS.HS-ESS3-6	Use a web-based simulation to identify how changes in human activity have impacted the flow of energy and the biogeochemical cycles around the planet.
CCS.ELA-Literacy.RST.11-12.3	Conduct an investigation to see how acid deposition forms, the impact it has on aquatic and terrestrial systems, as well as some mitigation strategies.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?

- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Interpreting Graphs and Data: Clean Air Act
- Particulate Air Pollution Lab
- Acid Deposition Lab
- Coriolis Effect Lab
- Viewing of *Chasing Ice*
- Modeling Convection Currents
- Modeling El Niño and La Niña: Interpreting impacts on global weather patterns
- Identifying sources of indoor air pollutants and designing strategies to reduce or eliminate them

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week’s content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- *Chasing Ice*. Dir. Jeff Orlowski, Submarine Deluxe, 2012. Film.
- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 15 days

UNIT 8

Energy Resources

Unit Goals

At the completion of this unit, students will:

LO ENG-3.A	Identify differences between nonrenewable and renewable energy sources.
LO ENG-3.B	Describe trends in energy consumption.
LO ENG-3.C	Identify types of fuel and their uses.
LO ENG-3.D	Identify where natural energy resources occur.
LO ENG-3.E	Describe the use and methods of fossil fuels in power generation.
LO ENG-3.F	Describe the effects of fossil fuels on the environment.
LO ENG-3.G	Describe the use of nuclear energy in power generation.
LO ENG-3.H	Describe the effects of the use of nuclear energy on the environment.
LO ENG-3.I	Describe the effects of the use of biomass in power generation on the environment.
LO ENG-3.J	Describe the use of solar energy in power generation.
LO ENG-3.K	Describe the effects of the use of solar energy in power generation on the environment.
LO ENG-3.L	Describe the use of hydroelectricity in power generation.
LO ENG-3.M	Describe the effects of the use of hydroelectricity in power generation on the environment.
LO ENG-3.N	Describe the use of geothermal energy in power generation.
LO ENG-3.O	Describe the effects of the use of geothermal energy

	in power generation on the environment.
LO ENG-3.P	Describe the use of hydrogen fuel cells in power generation.
LO ENG-3.Q	Describe the effects of the use of hydrogen fuel cells in power generation on the environment.
LO ENG-3.R	Describe the use of wind energy in power generation
LO ENG-3.S	Describe the effects of the use of wind energy in power generation on the environment.
LO ENG-3.T	Describe methods for conserving energy.
LO STB-3.K	Describe solid waste disposal methods.
LO STB-3.L	Describe the effects of solid waste disposal methods.
LO STB-3.M	Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks.
CCS.ELA-Literacy.RST.11-12.3	Work collaboratively to build a windmill and test out various blade designs for efficiency.
NGSS.HS-ESS3-2	Evaluate peers' windmill designs in order to ultimately create one blade design for maximum energy production.
CCS.ELA-Literacy.RST.11-12.7	Research the pros and cons of each source of renewable and nonrenewable energy.
CCS.ELA-Literacy.SL.11-12.1	Collaborate and discuss their research into renewable and nonrenewable energy sources.
CCS.ELA-Literacy.SL.11-12.4	Present their findings on renewable and nonrenewable energy sources in a concise and effective manner including proper accounting for each source of renewable and nonrenewable energy.
CCS.ELA-Literacy.SL.11-12.5	Peer-review each image and figure in peers' energy presentations in order to maximize the effectiveness of each presentation.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Seeking Solutions: Drilling in the Arctic National Wildlife Refuge
- Carbon Dioxide Emissions from Fossil-Fuel Burning Investigations
- Personal Energy Use Audit Investigation
- Energy Resource Comparison Project
- Windmill Blade Design Lab

Assured Assessments

Formative Assessment:

- Weekly free-response questions based on each week's content, with scoring rubrics provided for self-reflection and growth

Summative Assessment:

- Collaborative writing of one formal lab report based on one of the labs conducted during the unit
- Two assessments consisting of multiple-choice and free-response questions similar to the format of the College Board Advanced Placement Environmental Science Examination

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 20 days

UNIT 9

Independent Study

Unit Goals

At the completion of this unit, students will:

CCS.ELA-Literacy.RST.11-12.2	Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
CCS.ELA-Literacy.RST.11-12.7	Research and develop a problem they wish to solve related to the essential questions of the course.
CCS.ELA-Literacy.WHST.11-12.1	Present their problem in an informal topic proposal supporting why the problem must be answered.
CCS.ELA-Literacy.WHST.11-12.4	Create a thesis-style document outlining their research and findings.
CCS.ELA-Literacy.WHST.11-12.8	Conduct extensive research using multiple resource platforms in order to further their background and understanding of the problem.
CCS.ELA-Literacy.SL.11-12.1	Utilize many forms of imagery and graphics to present their findings to the class.
CCS.ELA-Literacy.SL.11-12.4	Present their findings and process to the class in an effective manner.

Unit Essential Questions

- What processes allow for Earth to maintain its overarching equilibrium and homeostasis?
- How have living organisms added to or subtracted from Earth's ability to maintain homeostasis?
- How has human presence altered these processes, and what impact will it have?
- How can humans alter behavior and practices to mitigate these impacts?

Scope and Sequence

- Independent research project and presentations

Assured Assessments

Formative Assessment:

- Informal topic proposal supporting why the research problem must be answered
- Thesis-style document outlining research and findings

Summative Assessment:

- Presentation of research findings and process, evaluated by teacher and peers

Resources

Core

- Withgott, Jay, and Matthew Laposata. *Environment: The Science behind the Stories*. 6th ed. New York: Pearson, 2018. Print.

Time Allotment

- Approximately 25 days

COURSE CREDIT

1.25 credits in science
One class period daily, plus laboratory, for a full year

PREREQUISITES

Grade of A- or better in Advanced College-Preparatory Biology and Advanced College-Preparatory Chemistry, or Grade of B+ or higher in Honors Biology.

CURRENT REFERENCE

AP Central. "AP Environmental Science." <https://apcentral.collegeboard.org/courses/ap-environmental-science/course>. Web.

ASSURED STUDENT PERFORMANCE RUBRICS

- Trumbull High School School-Wide Writing Rubric (attached)
- Trumbull High School School-Wide Problem-Solving Rubric (attached)
- Trumbull High School School-Wide Independent Learning and Thinking Rubric (attached)

Trumbull High School School-Wide Writing Rubric

Category/ Weight	Exemplary 4 Student work:	Goal 3 Student work:	Working Toward Goal 2 Student work:	Needs Support 1-0 Student work:
Purpose X_____	<ul style="list-style-type: none"> • Establishes and maintains a clear purpose • Demonstrates an insightful understanding of audience and task 	<ul style="list-style-type: none"> • Establishes and maintains a purpose • Demonstrates an accurate awareness of audience and task 	<ul style="list-style-type: none"> • Establishes a purpose • Demonstrates an awareness of audience and task 	<ul style="list-style-type: none"> • Does not establish a clear purpose • Demonstrates limited/no awareness of audience and task
Organization X_____	<ul style="list-style-type: none"> • Reflects sophisticated organization throughout • Demonstrates logical progression of ideas • Maintains a clear focus • Utilizes effective transitions 	<ul style="list-style-type: none"> • Reflects organization throughout • Demonstrates logical progression of ideas • Maintains a focus • Utilizes transitions 	<ul style="list-style-type: none"> • Reflects some organization throughout • Demonstrates logical progression of ideas at times • Maintains a vague focus • May utilize some ineffective transitions 	<ul style="list-style-type: none"> • Reflects little/no organization • Lacks logical progression of ideas • Maintains little/no focus • Utilizes ineffective or no transitions
Content X_____	<ul style="list-style-type: none"> • Is accurate, explicit, and vivid • Exhibits ideas that are highly developed and enhanced by specific details and examples 	<ul style="list-style-type: none"> • Is accurate and relevant • Exhibits ideas that are developed and supported by details and examples 	<ul style="list-style-type: none"> • May contain some inaccuracies • Exhibits ideas that are partially supported by details and examples 	<ul style="list-style-type: none"> • Is inaccurate and unclear • Exhibits limited/no ideas supported by specific details and examples
Use of Language X_____	<ul style="list-style-type: none"> • Demonstrates excellent use of language • Demonstrates a highly effective use of standard writing that enhances communication • Contains few or no errors. Errors do not detract from meaning 	<ul style="list-style-type: none"> • Demonstrates competent use of language • Demonstrates effective use of standard writing conventions • Contains few errors. Most errors do not detract from meaning 	<ul style="list-style-type: none"> • Demonstrates use of language • Demonstrates use of standard writing conventions • Contains errors that detract from meaning 	<ul style="list-style-type: none"> • Demonstrates limited competency in use of language • Demonstrates limited use of standard writing conventions • Contains errors that make it difficult to determine meaning

Trumbull High School School-Wide Problem-Solving Rubric

Category/ Weight	Exemplary 4	Goal 3	Working Toward Goal 2	Needs Support 1-0
Understanding X_____	<ul style="list-style-type: none"> • Student demonstrates clear understanding of the problem and the complexities of the task 	<ul style="list-style-type: none"> • Student demonstrates sufficient understanding of the problem and most of the complexities of the task 	<ul style="list-style-type: none"> • Student demonstrates some understanding of the problem but requires assistance to complete the task 	<ul style="list-style-type: none"> • Student demonstrates limited or no understanding of the fundamental problem after assistance with the task
Research X_____	<ul style="list-style-type: none"> • Student gathers compelling information from multiple sources including digital, print, and interpersonal 	<ul style="list-style-type: none"> • Student gathers sufficient information from multiple sources including digital, print, and interpersonal 	<ul style="list-style-type: none"> • Student gathers some information from few sources including digital, print, and interpersonal 	<ul style="list-style-type: none"> • Student gathers limited or no information
Reasoning and Strategies X_____	<ul style="list-style-type: none"> • Student demonstrates strong critical thinking skills to develop a comprehensive plan integrating multiple strategies 	<ul style="list-style-type: none"> • Student demonstrates sufficient critical thinking skills to develop a cohesive plan integrating strategies 	<ul style="list-style-type: none"> • Student demonstrates some critical thinking skills to develop a plan integrating some strategies 	<ul style="list-style-type: none"> • Student demonstrates limited or no critical thinking skills and no plan
Final Product and/or Presentation X_____	<ul style="list-style-type: none"> • Solution shows deep understanding of the problem and its components • Solution shows extensive use of 21st-century technology skills 	<ul style="list-style-type: none"> • Solution shows sufficient understanding of the problem and its components • Solution shows sufficient use of 21st-century technology skills 	<ul style="list-style-type: none"> • Solution shows some understanding of the problem and its components • Solution shows some use of 21st-century technology skills 	<ul style="list-style-type: none"> • Solution shows limited or no understanding of the problem and its components • Solution shows limited or no use of 21st-century technology skills

Trumbull High School School-Wide Independent Learning and Thinking Rubric

Category/ Weight	Exemplary 4	Goal 3	Working Toward Goal 2	Needs Support 1-0
Proposal X_____	<ul style="list-style-type: none"> • Student demonstrates a strong sense of initiative by generating compelling questions, creating uniquely original projects/work 	<ul style="list-style-type: none"> • Student demonstrates initiative by generating appropriate questions, creating original projects/work 	<ul style="list-style-type: none"> • Student demonstrates some initiative by generating questions, creating appropriate projects/work 	<ul style="list-style-type: none"> • Student demonstrates limited or no initiative by generating few questions and creating projects/work
Independent Research & Development X_____	<ul style="list-style-type: none"> • Student is analytical, insightful, and works independently to reach a solution 	<ul style="list-style-type: none"> • Student is analytical, and works productively to reach a solution 	<ul style="list-style-type: none"> • Student reaches a solution with direction 	<ul style="list-style-type: none"> • Student is unable to reach a solution without consistent assistance
Presentation of Final Product X_____	<ul style="list-style-type: none"> • Presentation shows compelling evidence of an independent learner and thinker • Solution shows deep understanding of the problem and its components • Solution shows extensive and appropriate application of 21st-century skills 	<ul style="list-style-type: none"> • Presentation shows clear evidence of an independent learner and thinker • Solution shows adequate understanding of the problem and its components • Solution shows adequate application of 21st-century skills 	<ul style="list-style-type: none"> • Presentation shows some evidence of an independent learner and thinker • Solution shows some understanding of the problem and its components • Solution shows some application of 21st-century skills 	<ul style="list-style-type: none"> • Presentation shows limited or no evidence of an independent learner and thinker • Solution shows limited or no understanding of the problem and its components • Solution shows limited or no application of 21st-century skills