Pequannock Township School District Curriculum Syllabus

General Environmental Science / Grade 11 and 12

Course Description:

Environmental Science is an introductory multi-disciplinary course including such areas as Biological Sciences, Physical Sciences, Social Sciences, Humanities, and Economics, offered as a full-year lab science course. A dominant issue of our times concerns the relationship of people to their changing environment. This course is to help students become active participants in the preservation of our natural resources, through the study of ecological relationships. Upon completion of the course, students will be able to understand the difficult decisions facing their generation and the trade-offs necessary to live in an environmentally sustainable society. Sustainability is the overarching theme throughout the course as students explore the basic concepts of ecology, resource management, the importance of biodiversity, and the impacts of human societies on the environment. Students will also develop a sense of reverence for the environment as well as what they, as students, can accomplish locally and globally through political and social, and physical action.

Course Standards:

The following is a list of NJSLS that describe what students are expected to know and be able to do as a result of successfully completing this course. The following NJSLS are the basis of the assessment of student achievement. The learner will demonstrate mastery of:

Unit1:

HS-LS2-3:Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-4:Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-6:Evaluate the 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.

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.

HS-ESS2-6:Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS2-7:Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Unit 2:

HS-LS2-4:Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

HS-LS2-5:Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

HS-ESS2-6:Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS3-3:Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

HS-LS4-6:Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Unit 3:

HS-ESS2-6:Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

HS-ESS2-7:Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

HS-LS2-8:Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce.

HS-LS4-6:Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Unit 3:

HS-LS2-1:Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.

HS-LS2-2:Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

HS-LS3-3:Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

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.

HS-LS4-6:Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Unit 4:

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.

HS-ESS3-2:Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS3-3:Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

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

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 systems.

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.

Unit 5:

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.

HS-ESS3-2:Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

HS-ESS3-3:Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

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

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 systems.

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.

Scope and Sequence

Unit of Study/Topic	NGSS/MP/Approximate time of study
Unit Plan 1: **Earth's Systems**	Marking Period 1 (25 days) HS-LS2-3 HS-LS2-4 HS-LS2-6 HS-ESS2-2 HS-ESS2-7
Unit Plan 2: **Earth's Cycles**	Marking Period 1 (20 days) HS-LS2-4 HS-LS2-5 HS-ESS2-6
Unit Plan 3: **Earth's Ecosystems** **Subtopics:** **Terrestrial Ecosystems** **Aquatic Ecosystems**	Marking Period 2 (25 days) HS-LS2-6 HS-LS2-7 HS-LS2-8 HS-LS4-6
Unit Plan 4: **Population**	Marking Periods 2 & 3 (35 days) HS-LS2-1 HS-LS2-2 HS-LS3-3 HS-LS4-5 HS-LS4-6
Unit Plan 5: **Human Population & the Environment** **Subtopics:** ● **Biodiversity** ● **Water** ● **Air** ● **Land** ● **Atmosphere & Climate** ● **Food & Agriculture** ● **Environment & Health** ● **Energy Resources** ● **Waste Production**	Marking Periods 3 (30 days) HS-ESS3-1 HS-ESS3-2 HS-ESS3-3 HS-ESS3-4 HS-ESS3-5 HS-ESS3-6

Unit Plan 6: **Sustainability** **Subtopics:** ● **Water** ● **Energy** ● **Preservation** ● **Policies** ● **Practices** ● **Activism**	Marking Period 4 (35 days) HS-ESS3-1 HS-ESS3-2 HS-ESS3-3 HS-ESS3-4 HS-ESS3-5 HS-ESS3-6

Assessments

Evaluation of student achievement in this course will be based on the following formative and summative assessments:

-Research Reports (written)
-Verbal Reports (electronic, poster, etc. presentations)
-Visual Components (posters etc., graphic organizers, and electronic presentations)
-Chapter/Unit Test & Quizzes
-Written and Electronic Lab Reports
-Constructed Responses as stand alone components
-Mathematical computations
-Graph construction and customization (use of Google SHEETS)
-Warm-ups/Do Nows/Exit Tickets

Curriculum Resources

Anchor Programs/Teacher Materials

- Google Classroom and related postings (daily and other)
- Rubrics
- Discovery Education website
- Pearson Environmental Science textbook
- The Habitable Planet, http://www.learner.org/courses/envsci/index.html
- Crash Course Videos
- In a Nutshell Videos
- Principles of Sustainability - http://www.colorado.edu/hazards/publications/informer/infrmr3/informer3c.htm and http://www.thenaturalstep.org/sustainability/the-system-conditions/

- Earth's Spheres, http://hendersonearthspacescience.weebly.com/earth-spheres.html ,http://www.kidsgeo.com/geography-for-kids/0024-b-earth-spheres-atmoshpere-lithosphere-hydrosphere.php
- Connect the Spheres, http://pmm.nasa.gov/education/lesson-plans/connect-spheres-earth-systems-interactions
- Biogeochemical Cycle, http://www.britannica.com/science/biogeochemical-cycle
- The Global Carbon Cycle, https://www.youtube.com/watch?v=aLuSi_6Ol8M
- The Living Environment: Flow of Matter in Ecosystems: http://strandmaps.nsdl.org/?id=SMS-MAP-9001
- Food Chain vs. Food Web, https://sciencebob.com/what-is-the-difference-between-food-chain-and-a-food-web/
- Food Web

http://education.nationalgeographic.com/encyclopedia/food-web/
http://teacher.scholastic.com/activities/explorer/ecosystems/be_an_explorer/map/foodweb_play.htm
http://www.nature.com/scitable/knowledge/library/food-web-concept-and-applications-84077181

- World Population video, https://www.populationeducation.org/content/all-new-interactive-experience-worldpopulationhistoryorg
- World of 7 Billion, https://www.worldof7billion.org/teacher-resources/high-school-activities/
- Livestock's Threat to the Environment - http://www.fao.org/newsroom/en/news/2006/1000448/index.html
- History of American Farming Machinery & Techniques - http://inventors.about.com/library/inventors/blfarm1.htm
- A History of American Agriculture http://www.agclassroom.org/gan/timeline/index.htm
- Genetically Engineered Crops - http://www.ers.usda.gov/publications/eib-economic-information-bulletin/eib11.aspx;
- http://www.centerforfoodsafety.org/issues/311/ge-foods/about-ge-foods
- Aquaculture vs. Capture Fishing - http://www7.taosnet.com/platinum/data/environment/environment.html
- Aquaculture Environmental Impact -

http://www.nmfs.noaa.gov/aquaculture/faqs/faq_aq_environment.html;
http://www.fao.org/fishery/topic/14894/en

- How Gas Prices Work http://www.howstuffworks.com/gas-price.htm
- Country Energy Profiles http://tonto.eia.doe.gov/country/index.cfm
- Fossil Fuel Formation -

http://science.kqed.org/quest/video/how-were-fossil-fuels-formed-part-1-of-5/
http://www.fossil.energy.gov/education/energylessons/coal/gen_howformed.html
http://www.energyquest.ca.gov/story/chapter08.html

- Drinking water game, http://water.epa.gov/learn/kids/drinkingwater/gamesandactivies.cfm
- Climate change lessons, https://www.facingthefuture.org/CurriculaFreeUnits/CurriculaCatalog/CurriculaS

earch/tabid/550/CategoryID/8/List/1/catpagesize/0/Level/a/ProductID/15/Default.aspx

- Tox Town, http://toxtown.nlm.nih.gov/
- Air Pollution http://mypages.iit.edu/~smile/bi8713.html

- Landfill -

http://www.epamact.tennessee.edu/landfill/landfillTourDefault.shtml
http://www.gobroomecounty.com/solidwaste/landfill
http://www.youtube.com/watch?v=188cWf3fClw
http://www.youtube.com/watch?v=lmtOuAed5nM

- Alternative Energy Pros & Cons http://ezinearticles.com/?Some-Pros-And-Cons-Of-The-Most-Popular-Forms-Of-Alternative-Energy&id=422952
- Recycling Paper, http://tryengineering.org/lesson-plans/classroom-paper-recycling
- Water Filtration, http://tryengineering.org/lesson-plans/filtration-investigation
- E-waste disposal, http://www.sciencebuddies.org/science-fair-projects/project_ideas/EnvSci_p056.shtml#summary
- Oil Spill Solutions, http://tryengineering.org/lesson-plans/oil-spill-solutions
- Sustainable Practices, http://www2.epa.gov/science-and-technology/sustainable-practices-science

Home and School Connection

The following are suggestions and/or resources that will help parents support their children:

- **http://www.bozemanscience.com/ap-environmental-science**
- **https://www.nsf.gov/news/classroom/earth-environ.jsp**
- **https://ed.ted.com/lessons?category=environmental-science**
- **Google Classroom established for each class/section**
- **Real Time Grade Portal**