

Environmental Science ECE

Course Description

Environmental Science Early College Experience (ECE) provides students with a comprehensive study of the fundamentals of Environmental Science. Students examine the biological and physical characteristics of the Earth and the impact of human interactions on ecosystems, climates, and natural resources. Using inquiry methods, students evaluate the complexity of these impacts and research solutions and/or methods to prevent ongoing problems. Independent work and diligence in meeting deadlines are important factors towards success in this ECE course.

The course aligns with the *Portrait of the Crusader* by encouraging students to think both critically and creatively in order to solve problems. In addition, students are encouraged to work collaboratively, demonstrate respect for others, take responsibility for individual and group work, and demonstrate integrity in all activities.

Essential Questions for the Course

- What impacts do humans and the growing human population have on the environment?
- What is the correlation between human behavior and climate change?
- What are viable solutions to climate change?
- What is biodiversity and why is it important for human survival?
- How does climate influence the levels of biodiversity in a region?
- How is energy transferred through biomes and ecosystems?
- How does geologic activity affect the chemical compositions of soil profiles?
- How does topography affect agricultural practices and crop yields?
- What steps need to be taken to protect species population and wetlands?
- What are the global impacts of air and water pollution?
- How does elevated levels of carbon in our oceans affect climate change?
- What is renewable energy and how is it being utilized today?
- What is the importance of ecotourism?

Course Curriculum

Unit I. Introduction to Environmental Science

Focus Questions:

- What does Environmental Science encompass?
- What are the ways that humans impact the environment?
- What is the impact of rising human population on the environment?
- What is the impact of urban sprawl?
- What steps can we take to limit the negative environmental impacts due to population growth?

Concepts/Skills:

- Analyze population data and determine reasons for high population in specific regions. Interpret and analyze graphs, charts, and tables.
- Analyze the varied types of environmental impact caused by the growing human population.
- Examine and discuss the concept of *Tragedy of the Commons*.
- Research and evaluate attempted and possible solutions to environmental issues caused by the growing human population.

Labs:

- Global Issues Lab
- Tragedy of the Commons Lab

Summative Assessments:

- Unit Test based on information from the textbook, other sources studied in the unit, and class notes.
- Group presentation on an environmental issue caused by overpopulation and an evaluation of attempted/proposed solutions.

Unit II. Biodiversity and Conservation

Focus Questions:

- What is biodiversity and why is it essential for human survival?
- How does biodiversity exist at different scales?
- How does geographic location affect levels of biodiversity?
- What is the difference between a biome and an ecosystem? What are the major biomes? Ecosystems?
- How do biotic and abiotic factors interact to create a healthy system?
- How is energy transferred within a biome and ecosystem?
- How are species classified as overpopulated, threatened, endangered, or extinct? What causes the extinction of a species? What causes a mass extinction?
- What steps have been taken in various regions to protect biodiversity?

Concepts/Skills:

- Explain why biodiversity is critical to the healthy functioning of biomes/ ecosystems.
- Define the different scales of biodiversity: genetic, species, habitat, ecosystem; analyze the consequences of healthy and diminished biodiversity of each scale.
- Analyze the correlation between geographic location/water and biodiversity levels.
- Compare a biome and an ecosystem. Describe the major ecosystems and biomes on Earth.
- Analyze/model how biotic and abiotic factors interact to create a healthy system.
- Analyze, explain and model the flow of energy (energy transfer) within an ecosystem.
- Explain trophic level transfer efficiency and how TLTE is determined.
- Explain trophic cascade. Examine the effects of reintroducing wolves at Yellowstone.
- Classify species based on population. Research the causes and effects of specific endangered species.

Labs:

- Food Web/Food Chain Lab/Energy Transfer

Summative Assessments:

- Unit Test based on readings from the textbook and other sources as well as class notes.
- Group presentation focused on the analysis of all aspects of a specific biome.

Unit III. Geologic Process, Soils, Minerals

Focus Questions:

- What are soil profiles?
- How does geologic activity affect the compositions of soil profile?
- What are the characteristics of fertile soil?
- What role does pH play in soil fertility?
- What are common ways that soil is negatively impacted by modern industry, agriculture, and human activities?

Concept/Skills:

- Explain soil formation and the factors that impact soil formation.
- Define soil profiles and identify the various soil profiles found on Earth.
- Explain the factors that impact soil fertility and analyze how plate tectonics affects fertility.
- Classify soil as fertile or non-fertile based on soil characteristics and pH analysis.
- Analyze why the quality and abundance of soil is important to the health of the planet and its inhabitants.
- Analyze natural and man-made causes of soil degradation, including erosion, and how this impacts the planet and its inhabitants.

Labs:

- Chemistry of Soils Lab
- Physical Properties of Soil Lab

Summative Assessments:

- Midterm Exam based on the information studied in semester one.

Unit IV: Agriculture and Land Resources

Focus Questions:

- What is the link between location and farming techniques used?
- How does climate play a role in agricultural techniques and crop yields?
- How has agriculture evolved since the Agricultural Revolution?
- How is poor soil amended for food production?
- What effects has agriculture had on the natural resources found on Earth?
- What techniques should farmers use to retain soil health and mitigate pollution?
- What impacts do genetically modified crops and herbicide resistant weeds have on the environment?
- What impact does large-scale livestock farming have on the Earth?

Concepts and Skills:

- Examine and explain appropriate farming techniques for certain locations, including aeroponics.
- Sequence the highlights of how agriculture has evolved since the Agricultural Revolution.
- Evaluate methods to improve farming to lessen harmful effects on the environment.
- Explain how crops are genetically modified and examine the pros and cons of this process in 2023 and beyond.
- Analyze the impacts of livestock farming on the Earth and examine the impacts of reduced meat consumption on the environment.

Labs:

- Journal of a farmer during the Hunter/Gatherer, Agricultural Revolution, Industrial Revolution, and Present Day time periods.

Summative Assessments:

- Unit Test based on textbook readings, class notes, and other sources.

Unit V. Water and Air Pollution and Links to Human Health

Focus Questions:

- Why is the ocean our greatest ally in preventing rapid climate change?
- What is the difference between point source and non-point source pollution?
- How are we polluting our waters? What is the Great Pacific Garbage Patch?
- How are we polluting our air?
- How does acid rain form and what impacts does it have on the environment?
- How does air and water pollution affect human health?
- What should we learn from Flint Michigan?
- What should we learn from the East Palestine, Ohio train derailment?

Concepts/Skills:

- Classify sources of pollution as point source or non-point source.
- Examine the pollution of oceans, including the greatest sources of plastic in the ocean.
- Explore the magnitude of the Great Pacific Garbage Patch. Research new strategies and organizations working to mitigate the plastic in the ocean.
- Explain/model how acid rain impacts the soils, agriculture, and economics of a region.
- Analyze how elevated levels of carbon in our oceans affects climate change.
- Research the impacts of air and water quality on human health, including recent polluting events in the United States. Examine pollution-related diseases in humans and domestic animals.

Labs:

- pH of Soil Lab

Summative Assessments:

- Unit Test based on textbook readings, class notes, and other sources.
- Presentation focused on one aspect of water or air pollution.

Unit VI: Renewable and Nonrenewable Resources/Global Climate Change/Solar Geoengineering**Focus Questions:**

- What is the difference between renewable and nonrenewable resources?
- What are the varied viewpoints of climatologists concerning global climate change?
- How has human behavior affected global climate change?
- What contributions have been made to combat global climate change using solar engineering?

Concepts/Skills:

- Analyze the future impacts of continued reliance on non-renewable resources.
- Examine the feasibility of specific renewable resources, including the issue of energy storage.
- Recognize the climatic changes brought on by El Nino and La Nina and the impacts on the weather across the United States.
- Evaluate past, present, and future steps to combat global climate change.
- Explore how solar geoengineering and human population could play a major role in the fight against global climate change.

Labs:

- Case Studies from past El Nino and La Nina events
- Research-based Position Paper on the future of global climate change

Summative Assessments:

- Unit Test based on textbook readings, class notes, and other sources.

Unit VII: Environmental Economics

Focus Questions:

- What is ecotourism and why is it important in our understanding of the environment?
- What role does education play in the understanding of the environment?
- What programs are available for alternative energy and what is their cost?
- What are the benefits, pitfalls, and challenges to alternative energy programs?

Concepts/Skills:

- Examine successful approaches to ecotourism and what society can do to promote ecotourism.
- Analyze and evaluate the efficiency, effectiveness, and realistic capabilities of specific alternative energy programs.
- Examine current legislation to protect the environment.
- Discuss the Essential Questions for the course using appropriate terminology and accurate facts. (This is a review process for the final exam.)

Labs:

- Cost/Benefit Analysis of Alternative Energy Programs in the United States

Summative Assessments:

- Cumulative Final Exam

Resources for the Course:

Environmental Science for the AP Course - 4th Edition 2023 - Friedland and Relyea

Grading Policy:

- Grading will be based on a points system.