

Advanced Explorations in Science

Course Description

Science involves the study of the organic and inorganic matter of the earth and the universe. There are three main branches of science: physical science, earth science and life science, and within these three branches are several specialized areas. This course provides students with the opportunity to explore several areas of specialization to help them plan for future studies and career. These areas include: environmental science, physics, forensics, epidemiology, nutrition, anatomy, and physiology. Students learn the important concepts associated with each area, the process of scientific research, and how scientific knowledge translates into real-world applications.

The Advanced Explorations course aligns with the **Portrait of the Crusader** by teaching students to collaborate and solve problems through innovation, effective communication, and productive relationships during laboratory investigations. Class activities focus on critical thinking and the sharing of ideas, all while demonstrating respectful discourse.

Essential Questions for the Course

- What do all branches of science have in common?
- How do researchers ensure that their findings are valid?
- How do scientific findings translate into innovation? How do they improve everyday life?

Unit I. Environmental Science

Focus Questions:

- How do scientists study the environment?
- What are the significant issues surrounding fossil fuels?
- What are the six main types of renewable energy? What is the future of fossil fuel usage in the United States?
- What impact does the human population have on renewable and nonrenewable energy resources?
- What significant events led to environmental awareness in the United States?

Concepts/Skills:

- Examine the scientific method as it relates to Environmental Science.
- Identify and classify energy as renewable or nonrenewable.
- Explore the issues surrounding the continued use of fossil fuels and the viability of large-scale renewable energy options.
- Determine how human activity affects renewable and nonrenewable resource availability.
- Debate the effectiveness and impacts on the environment of fossil fuel usage in the United States.
- Discuss the environmental impacts and implemented solutions of the Love Canal Tragedy; explore how this event changed environmental awareness in America.

Labs:

- Renewable Energy Project
- Human Population Lab
- Fossil Fuels vs Renewable Energy Debate

Summative Assessments:

- Unit Test

Unit II. Physics

Focus Questions:

- How did Aristotle and Galileo contribute to the study of Physics?
- What were the contributions of Newton? What are his laws?
- What is the relationship between slope, acceleration, and velocity?
- How does physics play a role in bridge making?
- How can the principles of physics help us understand events in everyday life?

Concepts/Skills:

- Identify the main contributions set forth by Aristotle and Galileo.
- Summarize Newton's Laws.
- Calculate accelerations, velocities, and forces in labs and word problems.
- Calculate force using Newton's Second Law.
- Design and construct a bridge that is physically sound. Explain structural design.
- Explore a real-world event and analyze the applicable laws of physics.

Labs:

- Acceleration Lab
- Bridge Project

Summative Assessments:

- Formal Lab Report on Acceleration
- Unit Test

Unit III. Forensics

Focus Questions:

- What is the study of forensics? How is forensics connected to biology, chemistry and physics?
- How has technology improved forensic science?
- What role does forensic science have in the criminal investigation process and the courts?
- What are some court cases that have used forensics to deliver a verdict?

Concept/Skills:

- Explain how forensic scientists work to collect, analyze, and interpret evidence.
- Analyze how forensic science is connected to biology, chemistry, and physics.
- Discuss how forensics has evolved as a crucial avenue for solving complex court cases.
- Apply forensic skills: calculate the approximate height of an individual based on skeletal remains.
- Explore high profile court cases that have relied heavily on forensics.
- Explain some of the challenges that forensic scientists face when collecting and analyzing evidence.

Labs:

- Skeletal Remains Lab
- Evidence Lab

Summative Assessments:

- Unit Test
- Case Study Paper

Unit IV. Epidemiology and Nutrition

Focus Questions:

- What are the differences between infectious, non-infectious, and water-borne diseases?
- What role does the environment play in the transmission of infectious diseases?
- How were vaccines developed and what is the efficiency of vaccines?
- How did the COVID-19 pandemic change the infrastructure of the CDC and society?
- What constitutes a balanced and nutritious diet?
- What role does proper nutrition play in the health of an individual?
- How can a balanced nutritional lifestyle change the health of an individual?

Concepts/Skills:

- Distinguish between infectious, non-infectious, and water-borne diseases; provide examples.
- Examine how the environment can promote/inhibit the transmission of infectious diseases.
- Examine the function and efficacy of vaccines. Debate whether people should be mandated to have vaccines to enter certain public domains.
- Explain the importance of having a balanced diet and proper nutrition.
- Recognize examples of balanced, nutritious diets. Explain the term *empty calories*.
- Participate and produce a food journal complete with caloric intakes for a consecutive five-day period. Evaluate and determine specific healthy changes that can be implemented.

Labs:

- Food Journal Lab
- Macromolecule Webquest Lab

Summative Assessments:

- “QUEST” on Epidemiology
- Disease Analysis Project
- Unit Test

Unit V. Anatomy and Physiology

Focus Questions:

- What is the relationship between anatomy and physiology?
- What are body systems? Which organs make up each body system?
- How do the body systems work together to sustain life?
- How does disease affect organs and specific body systems? How does disease spread beyond one body system to impact other systems?
- Which medical specialists concentrate on each body system?
- How can proper nutrition help all body systems?

Concepts/Skills:

- Identify the function and location of each organ and the system to which each organ belongs.
- Explain the function of each body system.
- Analyze the relationships between the body systems. Explain the concept of homeostasis.
- Examine how a specific disease can impact an organ, a body system, and then other body systems.
- Identify the specialist that treats medical problems with each body system.
- Participate in a fetal pig dissection, identifying organs and body systems.

Labs:

- Fetal Pig Dissection Lab

Summative Assessments:

- Unit Test

Resources

- Hewitt, Lyons, Suchocki, and Yeh - Conceptual Integrated Science 2nd Edition - 2013

Grading

- Grading is done on a point system basis.