

Upper School Science Course Description

Hands-on, Inquiry-Based Learning

The Upper School science program at Adda Clevenger develops lifelong learners who continually expand their understanding of the world around them. The nature of science seeks to provide explanations for natural phenomena and is focused around scientific literacy, scientific inquiry, and scientific knowledge. Through inquiry-based learning, curiosity is triggered and students are able to become the experts of their own questions.

At Adda Clevenger, students take an active lead in this endeavor through guided labs, engineering design projects, scientific research, hands-on activities, interactive demonstrations, and scientific debates based on logical thinking. Students are encouraged to think beyond the application of vocabulary terms and apply systemic knowledge to answer questions, predict outcomes, and deepen discussion. Through the exercise of the scientific method and engineering design, content outlined by the Next Generation Science Standards comes alive in the students' daily experience.

One of the highlights of the year is the culmination of student research, experimentation, and analysis in the science fair. All Upper School students take part in the yearly Adda Clevenger Science Fair (grades 5-8th), with top students moving on to the San Francisco Science Fair (grades 6-8th).

5th Grade Science

Fifth grade science builds on a solid foundation of scientific inquiry and exploration provided in fourth grade. The course includes the fundamental concepts of life, physical, chemical, earth, and space sciences. Inquiry focuses on systemic design, energy flow, and matter transformations. Students will begin engaging in scientific debates, engineering models, experimental design, and scientific communication.

Unit 1: Energy and Matter in Ecosystems

- Energy in animals' food was once energy from the sun.
- Movement of matter among plants, animals, decomposers, and the environment.
- Plants get the materials they need for growth chiefly from air and water.

Unit 2: Space Systems

- The gravitational force exerted by earth on objects is directed down.
- The apparent brightness of the sun and stars is due to their relative distances from earth.
- Patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of stars.

Unit 3: Physical and Chemical Changes in Matter

- Matter is made of particles too small to be seen.
- Total weight of matter is conserved regardless of change.
- Measure and identify materials based on physical and chemical properties.
- Determine whether the mixing of two or more substances results in new substances.

Unit 4: Earth Systems

- Model ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- The distribution of water on earth is stored in various salt and freshwater reservoirs.
- Communities use science ideas to protect the Earth's resources and environment.

6th Grade Science

Sixth grade science examines the concepts of change through the study of energy and material transformations throughout earth systems. Students will examine the structure of earth, the forces responsible for its changing surface, interactions between its various systems, and effects of large-scale phenomena. Students will gain exposure through research papers, quantitative hands-on labs, model engineering, and inquiry-driven activities.

Unit 1: Earth Systems

- The cycling of earth's materials and the flow of energy driving the process.
- The distribution of fossils and rocks, continental shapes, and seafloor structures provide evidence of the past plate tectonics.
- Natural hazards and forecasting of future catastrophic events inform the development of technologies to mitigate their effects.

Unit 2: Cyclic Patterns of Space

- The earth-sun-moon system provides explanations for the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- Model the role of gravity in the motions within galaxies and the solar system.
- Scale properties of objects in the solar system.

Unit 3: Geologic History

- Evidence from rock strata for how the geologic time scale is used to organize earth's 4.6 billion year old history.
- Geoscience processes have changed earth's surface at varying temporal and spatial scales.

Unit 4: Weather, Climate, and Ocean Systems

- The motions and complex interactions of air masses result in changes in weather conditions.
- The unequal heating and rotation of the earth causes patterns of atmospheric and oceanic circulation that determine regional climates.
- Evidence-based identification of the causes of rise in global temperatures over the past century.

Unit 5: Human Impacts

- Scientific principles are used to design a method for monitoring and minimizing human impact on the environment.
- Construct arguments supported by evidence for how increases in human population and per-capita consumption of natural resources impact earth's systems.

7th Grade Science

Seventh grade science emphasizes a more complex understanding of change, patterns, and design in the living world. Students explore cellular organization and complex functioning, changes resulting from transmission of genetic information, ecosystem interactions, and the dynamics of evolution. Students expand their inquiry skills through formal lab reports, design creation, variable manipulation, experimental error, and evidence-based discussion.

Unit 1: Structure, Function, and Information Processing

- Living things are made of cells, either one cell or many different numbers and types of cells.
- Model the function of a cell as a whole or ways parts of cells contribute to the function.
- The body is a system of interacting subsystems composed of groups of cells.

Unit 2: Growth, Development, and Reproduction

- Environmental and genetic factors influence the growth of organisms.
- Structural changes to genes located on chromosomes may affect proteins and result in effects to the structure and function of the organism.
- Asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Unit 3: Interdependent Ecosystem Relationships

- The effects of resource availability on organisms and populations of organisms in an ecosystem.
- Prediction of patterns of interactions among organisms across multiple ecosystems.
- Design solutions for maintaining biodiversity and ecosystem services.

Unit 4: Natural Selection and Adaptations

- Patterns in the fossil record document the existence, diversity, extinction, and change of life forms throughout the history of life on earth under the assumption that natural laws operate today as in the past.
- Natural selection may lead to increases and decreases of specific traits in populations over time.

Unit 5: Human Systems

- A body is a system of interacting subsystems composed of groups of cells.
- Sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- Functional systems of the human organs.

8th Grade Science

Eighth graders take a deep dive into understanding the natural world's complexities through the lens of matter's structure and energy characteristics. Complex material interactions, trends and reactivity in the Periodic Table, energy transformations, force, and wave behavior are cornerstones of the eighth grade curriculum. Students expand their scientific skill set through organization and mathematical analysis of data, hands-on labs and demonstrations, manipulation of variables and repeat trials, literature review, and technical engineering.

Unit 1: Structure and Matter

- Atomic composition of simple molecules and extended structures.
- Changes in particle motion, temperature, and state of a pure substance is altered when thermal energy is added or removed.
- Atomic and molecular interactions can explain the properties of matter that we see and feel.

Unit 2: Chemical Reactions

- Analyze properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- The total number of atoms does not change in a chemical reaction and thus matter is conserved.

Unit 3: Energy

- Kinetic energy and its relation to the mass and speed of an object.
- The arrangement of objects interacting at a distance changes, and different amounts of potential energy are stored in the system.
- Test similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution.

Unit 4: Forces and Interactions

- Newton's Third Law can be used to design a solution to a problem involving the motion of two colliding objects.
- The change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- Gravitational interactions are attractive and depend on the masses of interacting objects.

Unit 5: Electromagnetics and Waves

- Mathematical representations describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- Waves are reflected, absorbed, or transmitted through various materials.