



Science
Course: Honors Science 8
Middle School: Grade 8

Essential Course Information

- Course Revision
- Full Year
- Please see district requirements for Honors level

Course Overview

The course increases the depth of understanding of life science, physical science, and earth and space science and prepares students for high school science. With each unit, students will use the NGSS Crosscutting Concepts to make sense of natural phenomena. Students analyze phenomena in terms of patterns, cause and effect, systems-thinking, structure and function, and stability and change. Students will further their understanding of the NGSS Disciplinary Core Ideas by engaging in the NGSS Science and Engineering Practices including but not limited to: engaging in argument from evidence, analyzing and interpreting data, designing and conducting explanations, constructing explanations, and modeling.

Unit	Estimated Class Time	Overview
Unit 1 Contact Forces	6 weeks	This unit on contact forces identifies the factors that contribute to damage occurring in some collisions and not others, to explore and examine forces, friction and how mass and speed affect the amount of kinetic energy in an object. Students plan and carry out investigations, analyze and interpret data to determine the relationship between potential and kinetic energy. This allows students to determine how mass and velocity impact the amount of kinetic energy in an object and derive the mathematical equation for kinetic energy. Students will manipulate energy equations to solve for different variables. Students will develop and use system models to support explanations for how contact forces, including friction, normal force and air resistance, cause energy to be transferred from one part of the system to another before, during, and after a collision. Students will calculate net forces in a scenario.
Unit 2 Sound	4 weeks	Students engage in model-based reasoning, argumentation, and computational and mathematical reasoning to develop models to explain how sounds are made, received and move. By investigating factors including loudness and pitch, students develop a model of vibration that captures important ideas about how changes in the frequency and amplitude of the vibrations can explain these different characteristics of sounds. Students use this model of vibration to answer their initial questions about what causes different sounds. Students will also test various types of materials to figure out how sound travels from one location to another by causing sequences of vibrations through matter. By reasoning with the models they have developed, students also figure out how sounds can be absorbed and transmitted. In particular, they figure out how the energy transferred by the sound wave depends on both frequency and amplitude of a sound wave, and is more affected by its amplitude than the frequency. Students will manipulate equations to predict outcomes. This knowledge base permits students to tackle the performance task of improving the sound quality for stakeholders in the school building. An understanding of how the human body hears and interprets sound will deepen students comprehension of sound movement. Students will also explore and debate the ethical arguments behind cochlear implants within the deaf community.
Unit 3 Forces at a Distance	4 weeks	Students will explore forces at a distance by experimenting with electromagnets, magnetic forces, and speakers. Students investigate each of the parts in a speaker system to figure out how they work together. Through manipulation of the various parts (e.g., changing the strength of the magnet, number of coils, current direction) students will identify how this technology could be modified to apply to systems in very different contexts, like MagLev trains, junkyard magnets, and electric motors. Through a series of hands-on investigations, students <ul style="list-style-type: none"> • develop and refine a model about forces (pushes and pulls) that includes magnetic forces interacting at a distance via fields that extend through space, • revise a model for explaining magnetic forces to include electromagnets that act as permanent magnets in many ways but can be manipulated by changing the electric current, • consider the transfer of energy in their model, and the connections between forces, energy and magnetic fields, • plan and carry out a series of investigations to test how changes in one part of a magnetic system (e.g., number of coils, diameter of coils, strength of magnet) affect the magnetic forces in the system, and • construct an explanation based on evidence to explain that magnetic fields extend through space and predict the strength and direction of magnetic forces. • Design an electromagnet to complete a number of specific tasks. • Identify the components and forces which impact the usefulness of such an electromagnet.
Unit 4 Genetics	6 weeks	Throughout the course of the unit students will explore how gene mutations and asexual vs sexual reproduction contributes to genetic variation. Students will understand how genetic factors determine the growth of an individual organism. They will demonstrate understanding of how heredity explains why offspring resemble, but are not identical to, their parents and is a unifying biological principle. Students will grapple with the benefits and risks of modern gene editing techniques and weigh the ethical concerns of how humans have influenced the inheritance of desired traits in organisms in the past and could do so in the future. An exploration of genetic differences will lead to a deeper understanding of gene mutation and variation. They will debate the ethics of the potential to use gene editing and decoding techniques in the present and future and examine what various bodies in science are able to monitor and control.
Unit 5 Natural Selection and Common Ancestry	6 weeks	In this unit of study, students analyze graphical displays and gather evidence from multiple sources in order to develop an understanding of how fossil records and anatomical similarities of the relationships among organisms and species describe biological evolution. Students search for patterns in the evidence to support their understanding of the fossil record and how those patterns show relationships between modern organisms and their common ancestors. Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species. The crosscutting concepts of cause and effect, patterns, and structure and function are called out as organizing concepts for these disciplinary core ideas. Students use the practices of analyzing graphical displays and gathering, reading, and communicating information to demonstrate understanding of the core ideas. Students will construct explanations for how artificial selection impacts species and the environment in which they live.
Unit 6 Natural Resources and Human Impact	8 weeks	In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth's systems. By building their understanding of how the Earth's natural resources are distributed, they can analyze how that supply may be impacted by an increasing human population. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. Students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop, test, and improve their model to reach the best solution. In this unit students are expected to demonstrate proficiency in analyzing and interpreting data and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas and how to mitigate human impact on Earth's systems. Woven throughout the unit will be an examination of how climate changes impact various communities and social economic status.

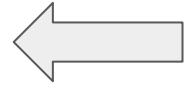
Content Continuum

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Honors Science 7

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Honors Science 8



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Honors Biology

INSTRUCTIONAL / SUPPLEMENTAL MATERIALS

1. Open Sci Ed
2. Supplemental readings and online resources to enhance understanding of course content and skills
 - Unit PPT Slides
 - WOHS LMS Databases
 - PhET
 - Concord Consortium
 - and others

All existing resources will be evaluated for alignment to new curriculum.

KEY FEATURES OF REVISION

- Science curriculum was last revised in 2016.
- Course aligns with the NJSLA-Science 8th Grade test.
- Student access to digital resources has expanded greatly.
- Integration of performance based assessments and common writing tasks.
- Incorporation of engineering and design tasks throughout the units

LEP (Limited English Proficiency) and Special Education sections are offered.

Differentiation strategies will be included.

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