The Tech Interactive

Middle School: Grades 6-8 Standards Connections for Labs

		Physics of Roller Coasters	Chemicals of Innovation	Down the Drain	Engineering for Earthquakes	Simplicity of Electricity	Chemistry of Plastination	DNA and Genetics
Next Generation Science Standards								
Engineering Design								
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	✓		✓	✓	✓		
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	✓		✓	✓	✓		
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	✓		✓	✓	✓		
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	✓		✓	✓	✓	✓	
Physical Science: Chemical Reactions								
MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.		✓				✓	
Physical Science: Forces and Interactions								
MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.					✓		
Physical Science: Energy								
MS-PS3-2	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	✓						
MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes,energy is transferred to or from the object.	✓						
Life Science: Structure, Function, and Information Processing								
MS-LS1-1	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.							✓
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.							✓
Earth and Space Science: History of Earth								
MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.				✓			
MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.				✓			

Earth and Space Science: Human Impacts								
MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.				✓			
MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.			✓				
MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.			✓				
Science and Engineering Practices								
Practice 1	Asking questions and defining problems	✓	✓	✓	✓	✓		
Practice 2	Developing and using models	✓	✓	✓	✓	✓	✓	✓
Practice 3	Planning and carrying out investigations	✓	✓	✓	✓	✓	✓	✓
Practice 4	Analyzing and interpreting data	✓						
Practice 5	Using mathematics and computational thinking	✓						
Practice 6	Constructing explanations and designing solutions	✓	✓	✓	✓	✓		
Practice 7	Engaging in argument from evidence		✓	✓			✓	
Practice 8	Obtaining, evaluating, and communicating information		✓	✓			✓	
Disciplinary Core Ideas								
LS1.A	*Structure and Function* • All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular) • Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.							✓
LS3.A	*Inheritance of Traits* • Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. • Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.							✓
LS3.B	*Variation of Traits* • In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other.							✓
ESS1.C	*The History of Planet Earth* • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches.				✓			
ESS2.A	*Earth Materials and Systems* • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.				✓			
ESS3.C	*Human Impacts on Earth Systems* • Human activities significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. • Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.			✓				

ESS3.D	*Global Climate Change* • Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.			✓				
PS1.A	*Structure and Properties of Matter* • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms. • Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. • The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.		✓				✓	
PS1.B	*Chemical Reactions* • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. • The total number of each type of atom is conserved, and thus the mass does not change. • Some chemical reactions release energy, others store energy.		✓					
PS3.A	*Definitions of Energy* • Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. • A system of objects may also contain stored (potential) energy, depending on their relative positions.	✓						
PS3.B	*Conservation of Energy and Energy Transfer* • When the motion energy of an object changes, there is inevitably some other change in energy at the same time. • The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. • Energy is spontaneously transferred out of hotter regions or objects and into colder ones.	✓						
ETS1.A	*Defining and Delimiting an Engineering Problem* • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.	✓		✓	✓	✓		
ETS1.B	*Developing Possible Solutions* • A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. • Models of all kinds are important for testing solutions.	✓		✓	✓	✓		
ETS1.C	*Optimizing the Design Solution* • Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process - that is, some of the characteristics may be incorporated into the new design. • The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	✓		✓	✓	✓		

Crosscutting Concepts								
Energy and Matter	• Matter is conserved because atoms are conserved in physical and chemical processes. • The transfer of energy can be tracked as energy flows through a designed or natural system • Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).	✓	✓					
Structure and Function	• Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. • Structures can be designed to serve particular functions.	✓	✓	✓	✓	✓		✓
Science is a Human Endeavor	Advances in technology influence the progress of science and science has influenced advances in technology.			✓	✓		✓	
Cause and Effect	Cause and effect relationships may be used to predict phenomena in natural systems.							✓
Common Core Language Arts								
Speaking and Listening								
SL.**6**.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓	✓	✓	✓	✓	✓	✓
SL.6.1b	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	✓	✓	✓	✓	✓	✓	✓
SL.6.1c	Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.	✓	✓	✓	✓	✓	✓	✓
SL.6.1d	Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.	✓	✓	✓	✓	✓	✓	✓
SL.**7**.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓	✓	✓	✓	✓	✓	✓
SL.7.1b	Follow rules for collegial discussions, track progress toward specific goals and dead-lines, and define individual roles as needed.	✓	✓	✓	✓	✓	✓	✓
SL.7.1c	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.	✓	✓	✓	✓	✓	✓	✓
SL.7.1d	Acknowledge new information expressed by others and, when warranted, modify their own views.	✓	✓	✓	✓	✓	✓	✓
SL.**8**.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on Grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.	✓	✓	✓	✓	✓	✓	✓
SL.8.1b	Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.	✓	✓	✓	✓	✓	✓	✓
SL.8.1c	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.	✓	✓	✓	✓	✓	✓	✓
SL.8.1d	Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.	✓	✓	✓	✓	✓	✓	✓