CRM 3 Force, Motion and Energy	**Pacing** • **20 days** • **Oct. 15-Nov. 9** • **Week 8-11**

DESIRED RESULTS

Making Meaning

The study of force, motion, and energy leads students to discovering how objects interact with each other in the real world. Students are very familiar with force, motion, and energy if they play sports, push strollers, pull wagons, and ride bikes or skateboards. These concepts build a foundation for the secondary science in the study of Physics, Astronomy, and Engineering. The following make meaning valuable for learners and are investigated in this unit:

- Energy can cause a variety of effects as it moves from place to place including: motion, light, sound, electricity, magnetic fields, and heat.
- Energy is always conserved within a system and remains constant until it is transferred into or out of the system.
- The faster an object moves the more energy it possesses.
- When objects interact each one exerts a force on the other; these forces can transfer energy between the objects.
- The strengths of forces can be measured and compared.
- What happens when a force is applied to an object depends on the strength of the fore itself, and the strength of the other forces acting upon it.
- If an object is at rest the forces acting on it are most likely equivalent.
- Forces that are imbalanced can cause changes in the speed or direction of an object.
- Gravity is a force that acts on matter.

Transfer: Students use critical thinking and problem solving to construct their own scientific understanding of forces and motion and develop their scientific process skills by asking scientific questions, designing and conducting investigations, constructing explanations from their observations, and discussing their explanations with others as they investigate energy, and forces and motion.

Enduring Understandings:	**Essential Questions:**
• Energy in its many forms is useful in our everyday lives. • Energy causes change. • Forces change an object's position (location) or motion and show work being done.	• What is energy, and how do we use it in our everyday life? • How do forces change an object's position and/or motion?

Essential Vocabulary		**Supporting Vocabulary Link**
• absorb/ absorber • boiling point/punto de ebullición • condensation/condensación • conductor/conductor • constant/constante • current/ corriente • dissolve/disolución • echolocation/ ecolocación • effort/ esfuerzo • electrical energy/ energyía eléctrica • focus/ enfocar	• freezing point/punto de congelación • frequency/ frecuencia • kinetic energy/ energía cinética • lens/lente • magnetism/magnetism • mechanism/ mecanismo • physical change/cambio físico • potential energy/ energía potencial • power/ fuerza • reflect/ reflejar • refract/ refractar • thermal energy/energíca termica	• Elementary School Supporting Vocabulary

Student Prerequisite Knowledge

Students should know:

- energy occurs in many forms.
- energy can be observed in cycles, patterns, and systems.
- conductors easily transmit electricity.
- insulators do not easily transmit electricity.
- circuits must have a complete path in order for electricity to flow.
- an electromagnet is created when electricity flows through a wire therefore producing a magnetic field.
- the effect of a force on an object can be tested in an experiment.

Resources: AISD Module Kit, Model Lesson Portfolio, STEMscopes, eBooks: Envisions Science Leveled Readers, Scott Foresman Text, Science Notebook Resources, BrainPop Jr., Discovery Education, Differentiation Strategies & Resources

ELPS: Mandated by Texas Administrative Code (19 TAC §74.4), click on the link for English Language Proficiency Standards (ELPS) to support English Language Learners.

TEKS Knowledge & Skills	**Acquisition**	
STAAR: RC = Reporting Category; DC = Dual Coded Skills; **Readiness Standard**; ***Supporting Standard*** ~~Concepts~~ are addressed in another unit.	**Students Will Know**	**Students Will Be Able To**
5.6: Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to:		
5.6A: explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy.	• There are five main forms of energy: mechanical, light, thermal, electrical, and sound. • Mechanical energy is the energy of motion; it can be kinetic (motion) or potential (stored). • Thermal energy is heat energy. • Heat energy is used to change properties of matter so they are more useful. • Sound energy is the production of vibrations through a medium such as air.	• Work in teams to discuss, categorize, and sort picture cards of different forms of energy and the uses of these forms of energy. • Contribute to a class concept map on Forms of Energy. • Review how heat changes matter. • Relate experiences and explain the ways thermal energy moves from a fireplace. • Investigate sound and how it is created. • Contribute to a class concept map showing uses of sound at different frequencies.
5.6B: demonstrate that the flow of electricity in circuits requires a complete path through which an electric current can pass and can produce light, heat, and sound.	• Electric circuits only work if the path is complete. • A working electric circuit can produce light. • An electric circuit is a system: All the parts work together. • Electric circuits can produce thermal energy, especially if the circuit includes a conductor with high resistance. • When circuits are complete, they can produce a sound.	• Light a light bulb using simple materials to design and test a circuit. • Work in stations to explore electrical concepts. • Observe examples of circuits with resistance and how electricity can produce heat. • Explore objects that vibrate in an electric circuit.

5.6C: demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another and demonstrate that light can be reflected such as the use of mirrors or other shiny surfaces and refracted such as the appearance of an object when observed through water	• Light energy has a large range of properties based on its frequency. • We use both low- and high-frequency light waves for everyday applications. • When light strikes an object it can be absorbed, refracted, or reflected. • Light travels in a straight line through a medium such as air. • Light is reflected off of shiny surfaces. • Light energy travels in a straight line until it passes from one medium to another and is refracted, or bent. • Using lenses, we can refract light to make objects appear larger or smaller.	• Label different types of light energy and examples on a class concept map of the electromagnetic spectrum. • Investigate properties of light through walls, glass, around corners, etc. • Measure the angles of light coming into a mirror and reflecting off. • Explore and analyze the effects of light passing through water of a variety of types and shapes. • Classify materials that reflect light. • Classify materials that refract light. • Identify situations where light is refracted or reflected from diagrams, pictures, and real world situations.
5.6D: design an experiment that tests the effect of force on an object	• Force is a push or pull. • Weight is a force created by the pull of gravity. • An unbalanced force causes an object to move. • We can experiment to find out the ways different forces create motion in different objects.	• Make, calibrate, and use a spring scale. • Graph amount of stretch caused by different weights. • Predict and compare actions that result from force on different objects. • Compare forces needed to lift weights using single pulleys and systems of pulleys. • Design an experiment that tests the effect of force on an object. • Look for patterns of trial data and select best experiment plan.
3.6B demonstrate and observe how position and motion can be changed by pushing and pulling objects to show work being done such as swings, balls, pulleys, and wagons.	• Forces change the position and motion of an object. • Work is done on an object when a force causes it to move position.	• Observe how position and motion can be changed by a push or a pull. • Demonstrate how position and motion can be changed by a push or pull by experimentation.
The study of science is taught through the lens of Scientific Processes (TEKS 5.1-5.4); therefore, these TEKS should be taught in conjunction with content throughout the year. Suggestions for TEKS to embed in each unit are provided in the Yearly Itinerary; however, the TEKS that can be addressed within a unit depends greatly on the learning activities in which students are engaged. Therefore, teachers must be deliberate in their choice of learning activities to ensure that all Scientific Processes TEKS are appropriately embedded within the course. In 5th grade, districts are encouraged to facilitate laboratory and field investigations for at least 50% of instructional time.		

ASSESSMENT EVIDENCE	
Student Work Products/Assessment Evidence	
Performance Tasks	**Other Evidence (i.e. unit tests, open ended exams, quiz, essay, student work samples, observations, etc.)**
• Students work in teams on pre-assessment probe. • Students contribute to class displays and concept maps. • Students examine and analyze objects to apply concepts. • Energy labs • Students label illustrations to show understanding of how heat travels. • Students demonstrate a working electrical circuit. • Students demonstrate how certain components in a circuit can create sound, light, or heat. • Full Inquiry- Forces Experiment	**Short Cycle Assessment** • *SCA Testing Window: November 9-16, 2012* *TEKS: 5.6A, 5.6B, 5.6C, 5.6D, 3.6B* **Additional Suggestions for Assessment** • science notebook reflections, questions, claims and evidence • notes and illustrations in lab notebook; • effective teamwork; • examples selected to apply concepts; • class, lab, and discussion participation • Teacher observations: Use of safety rules and equipment • Teacher observations: management and use of tools • Tools foldable/web in Interactive Notebook • Students' use of evidence to support explanations and claim.
LESSON PLANNING TOOLS	
In the course of lesson planning, it is the expectation that teachers will include whole child considerations when planning such as differentiation, special education, English language learning, dual language, gifted and talented, social emotional learning, physical activity, and wellness.	
Model Lesson- *Energy* • Forms of Energy • Mechanical Energy • Thermal Energy • Sound Energy Suggested Pacing: (5 days) TEKS: 5.6A	
Model Lesson- *Electrical Energy* • Light the Bulb • Electrical Resistance Produces Heat • Sound from Electricity Suggested Pacing: (5 days) TEKS: 5.6B	
Model Lesson- *Light Energy* • Uses of Light Energy • Reflection • Refraction • The Power of Refraction Suggested Pacing: (5 days) TEKS: 5.6A, 5.6C	

Model Lesson- *Force and Motion*

- Measuring Forces
- Forces and Motion
- Pulleys Make Work Easier
- Balloon Rocket Experiments
- Force and Motion Experiments

Suggested Pacing (5 days)
TEKS: 5.6D, 3.6B