**8th Grade Theme and Sequence**

The theme for 8th grade science is forces. Each standard selected and written for 8th grade is tied together by this unifying theme. Students should recognize how forces play a role in physical science, life science, and earth and space science.

This document outlines the sequence of the standards as they should be taught, and the explanation for putting the standards in the order they are found. It also makes explicit how forces are the unifying theme for all the units. The standards should be taught in order according to this document in order to preserve the flow from one concept to the other and for collecting accurate data in the district’s common formative assessments.

What this document does not cover is the scope and depth at which the standards should be taught. That information is found in the curriculum guide. It also does not dictate how the standards should be taught or how 3D learning outcomes should be included in the classroom. Indeed, the 3D learning outcome may vary widely between teachers on the same standard depending on the way in which they wish to address the content. What is important is that teachers engage their students in 3D learning to better prepare them for future science courses and careers. Furthermore, the new TNReady science test will not only include the core content of each standard but will also include cross cutting concepts and science and engineering practices.

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| 1st Quarter | Electromagnetism, Newton’s Laws, and Waves | 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electric motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.  8.ETS1.1 Develop a model to generate data for ongoing testing and modification of an electromagnet, a generator, and a motor such that an optimal design can be achieved.  8.PS2.2 Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.  8.PS2.3 Create a demonstration of an object in motion and describe the position, force, and direction of the object.  8.PS2.4 Plan and conduct an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.  8.PS2.5 Evaluate and interpret that for every force exerted on an object there is an equal force exerted in the opposite direction.  8.PS4.1 Develop and use models to represent basic properties of waves including frequency, amplitude, wavelength and speed. |
| Starting the school year, 8th grade teachers will begin with content they are most familiar with: electromagnetism. After electromagnetism the curriculum moves into Newton’s Laws of Motion. The relationship between electromagnetism and Newton’s Laws is how contact and non-contact forces are evident in both, and the standard regarding these forces should be embedded throughout the study of both. In fact, the 8th grade theme for all the standards revolves around “Forces” and their evidence and effect in all the sciences (physical, life, earth and space). Newton’s Laws and electromagnetism provide the greatest opportunity for students to engage and experiment with forces before moving on to less manipulative studies of forces in life and earth sciences. After Newton’s Laws begins the study of waves. | |
| 2nd Quarter | Waves, Earth’s structure, Rock Cycle, Plate Tectonics, Extinction Events | 8.PS4.2 Compare and contrast mechanical waves and electromagnetic waves based on refraction, reflection, transmission, and absorption and their behavior through a vacuum and/or various media.  8.PS4.3 Evaluate the role that waves play in different communication systems.  8.ESS2.2 Evaluate data collected from a seismograph to create a model of Earth’s structure.  8.ESS2.3 Describe the relationship between the processes and forces that create igneous, sedimentary, and metamorphic rocks.  8.ESS2.4 Gather and evaluate evidence that energy form the earth’s interior drives convection cycles within the asthenosphere which create change in the lithosphere including plate movements, plate boundaries, and sea-floor spreading.  8.ESS2.5 Construct a scientific explanation using data that explains the gradual processes of plate tectonics accounting for A) the distribution of fossils on different continents, B) the occurrence of earthquakes, and C) continental and ocean floor features (including mountains, volcanoes, faults, and trenches).  8.ESS3.1 Interpret data to explain that Earth’s mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of tectonic processes.  8.ESS3.2 Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots.  8.ESS2.1 Analyze and interpret data to support the assertion that rapid or gradual geographic changes lead to drastic population changes and extinction events. |
| The 2nd nine weeks picks up with waves from the 1st nine weeks. Waves leads directly into the structure of the Earth. It is waves from earthquakes that has helped scientist come up with theories about Earth’s structure, so this is a seamless blend from one discipline (physical science) to another (earth science). Continuing with earth science the curriculum moves onto the rock cycle and into plate tectonics. Once again it is important to note that forces, namely convection currents, drive the processes in the rock cycle and plate tectonics. The nine weeks ends with how geographic changes caused both by plate movements and sudden events like meteor impacts can drastically change populations and cause extinction events, providing a transition into the life sciences found in the 3rd nine weeks. | |

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| 3rd Quarter | Fossil Record, Common Ancestry, Adaptation, Natural & Artificial Selection, Big Bang Theory, Solar System & Tides | 8.LS4.1 Analyze and interpret data for the patterns of fossil record that document the existence, diversity, extinction, and change in life forms throughout Earth’s history.  8.LS4.2 Construct an explanation addressing the similarities and differences of the anatomical structures and genetic information between extinct and extant organisms using evidence of common ancestry and patterns between taxa.  8.LS4.3 Analyze evidence from geology, paleontology, and comparative anatomy to support that specific phenotypes within a population can increase the probability of survival of species that lead to adaptation.  8.LS4.4 Develop a scientific explanation of how natural selection plays a role in determining the survival of a species in a changing environment.  8.LS4.5 Obtain, evaluate, and communicate information about the technologies that have changed the way humans use artificial selection to influence the inheritance of desired traits in other organisms.  8.ESS1.1 Research, analyze, and communicate that the universe began with a period of rapid expansion using evidence from the motion of galaxies and composition of stars.  8.ETS1.2 Research and communicate information to describe how data from technologies (telescopes, spectroscopes, satellites, and space probes) provide information about objects in the solar system and universe.  8.ESS1.2 Explain the role of gravity in the formation of our sun and planets. Extend this explanation to address gravity’s effect on the motion of celestial objects in our solar system and Earth’s ocean tides. |
| The 3rd nine weeks starts the life science content, which connects with the last standard of the 2nd nine weeks. Students will look at the fossil record to show how organisms have changed over time, and that organisms share common ancestry. Then, the discussion moves onto how those changes occurred through natural selection and adaptations. Remember that it is forces within the Earth that cause plate movement that leads to changing environments that result in the changes of organisms. Artificial selection is also taught as humans learn to amplify or modify the process of change in organisms. Finally, the curriculum ends with a culmination of waves, forces, and energy as found in the universe. This final study ties all the overarching concepts into how the universe was formed, the behavior of celestial bodies, and tides. | |
| 4th Quarter | Review, Family Life, Maker Faire | No Specified Standards |
| The 4th nine weeks is meant to review the concepts taught, complete the family life curriculum, and allow students to participate in Maker Faire. It also allows for the chaos of the closing weeks of school. Also, as these are new standards and 3D learning outcomes are expected to be taught, this nine weeks gives teachers the leeway in pacing. Most likely, the curriculum guide and pacing will need to be modified after teachers have had the chance to interact with content. | |