

2022 - 2023, Eighth Grade, Science, Quarter 1

Big Ideas/Key Concepts:

- Forces of nature affect movement of the objects in our universe in ways that can be observed, measured, described, and predicted.
- Electromagnetic force is fundamental to many engineered technologies that improve the human experience.
- Engineers develop prototypes for optimal design.

Embedded K-8 TN Computer Science Standards are found on the OER sites.

- AIT.1 Identify and define problems and form significant questions for investigation.
- AIT.2 Develop a plan to use technology to find a solution and create projects.
- AIT.6 Collect, organize, analyze, and interpret data to identify solutions and/or make informed decisions.
- AIT.7 Infer and predict or propose relationships with data.

Phenomenon Based I Can Statements (Based on SEPs & CCCs)

Suggested Use: These I Cans can be used during phenomena-based lessons as needed per quarter but are suggestions and NOT required for each quarter. These would best fit during the introduction of a phenomenon or during student-led investigations following the introduction of a phenomenon.

Asking questions

- I can formulate questions that address the phenomenon.

Develop & Use Models

- I can use models to identify relationships or connections within the phenomenon (or system).
- I can use models to describe, explain and predict results.

Plan & Carry out an Investigation

- I can plan an investigation that tests and analyzes a scientific question.
- I can analyze & interpret results.

Analyze & Interpret Data

- I can identify patterns & relationships within and between datasets.

Use Math & Computational Thinking

- I can use math and mathematical modeling or computational thinking to analyze, represent and model data.

Construct Explanations or Design Solutions

- I can construct and explain my scientific thinking.
- I can identify and explain the relationship between events in a phenomenon (or system).
- I can identify a problem and design a solution using provided criteria and constraints.

Engage in Argument with Evidence

- I can identify and construct scientific claims.
- I can provide evidence to a scientific claim.
- I can construct scientific reasoning for a claim using evidence.

Obtain, Evaluate & Communicate Info

- I can obtain, evaluate, and communicate information for a phenomenon (or investigation).

Quick Links within this Document
[TN Science Standards Reference Guide](#)
[OER](#)

Standards	Student Friendly “I Can” Statements
<u>Motion and Stability: Forces and Interactions</u>	<u>Motion and Stability: Forces and Interactions</u>

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.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.PS2.1: Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.

- A. I can plan and conduct experiments to collect data on the position, force, and direction of movement for an object in motion.
- B. I can explain the motion of a real-world object based upon a stated frame of reference.
- C. I can create and use motion maps and simple graphs (position vs time, velocity vs time) to describe the motion of an object.

- A. I can plan and conduct experiments to determine how different amounts of force affect the motion of objects with different masses.
- B. I can develop and use models to explain how the motion of an object depends on the mass of the object and the sum of forces acting on the object.

- A. I can develop and use models to explain how every force on an object has an opposite force in equal amount.
- B. I can research and communicate real world examples of opposite and equal forces.

- A. I can plan and conduct experiments to determine how electromagnetic force from one object can affect other objects even when not in contact.
- B. I can develop and use models to show how forces can cause objects in the same field to attract and repel even when not in contact.

- A. I can design and conduct experiments to identify the relationship between electricity and magnetism.

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.

- B. I can develop and use models to explain how the relationship between electricity and magnetism is used in electromagnets, generators, and electric motors.
- C. I can design and conduct experiments to identify factors that change the strength of the magnetic field from an electromagnet and the electric current from a generator.
- A. I can develop an optimal design for an electromagnet, a generator, and a motor by building, testing, and modifying prototypes.

2022 - 2023, Eighth Grade, Science, Quarter 2

Big Ideas/Key Concepts:

- Energy is transferred through waves that can be observed, measured, described, and manipulated in ways to create & improve technologies.
- Technologies are used to collect and analyze data that allow us to form conclusions about how our universe formed and has changed over time.
- Gravitational force works over long distances to cause the movement of celestial bodies in our solar system and ocean tides on Earth.

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- DC.1 Advocate, demonstrate, and routinely practice safe, legal, and responsible use of information and technology.
- DC.2 Exhibit a positive mindset toward using technology that supports collaboration, learning, and productivity.
- DC.3 Exhibit leadership for digital citizenship.
- DC.4 Recognize and describe the potential risks and dangers associated with various forms of online communications (e.g., cell phones, social media, digital photos).
- DC.5 Explain responsible uses of technology and digital information; describe possible consequences of inappropriate use such as copyright infringement and piracy.

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- I can plan an investigation that tests and analyzes a scientific question.
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Standards	Student Friendly "I Can" Statements
<p><u>Waves and Their Applications in Technologies for Information Transfer</u></p> <p>8.PS4.1: Develop and use models to represent the basic properties of waves including frequency, amplitude, wavelength, and speed.</p> <p>8.PS4.2: Compare and contrast mechanical waves and electromagnetic waves based on refraction, reflection, transmission, absorption, and their behavior through a vacuum and/or various media.</p> <p>8.PS4.3: Evaluate the role that waves play in different communication systems.</p> <p><u>Earth's Place in the Universe</u></p>	<p><u>Waves and Their Applications in Technologies for Information Transfer</u></p> <p>A. I can analyze data to determine the frequency, amplitude, wavelength, and speed of different waves.</p> <p>B. I can develop and use mathematical models to explain the relationships between frequency, amplitude, wavelength, and wave speed.</p> <p>A. I can develop and use models to explain how energy is transferred by waves.</p> <p>B. I can plan and conduct experiments to describe how mechanical and electromagnetic waves move through vacuums and different types of media.</p> <p>C. I can analyze data on how waves move through vacuums and different media to classify them as either mechanical or electromagnetic.</p> <p>D. I can design and conduct experiments to test for refraction, reflection, doppler effect, transmission, and absorption of different waves through different media.</p> <p>A. I can research and communicate how various technologies use different frequencies of the electromagnetic spectrum.</p> <p>B. I can develop and use models to explain the role waves play in communication systems. (Examples: radio, television, fiber optics, Wi-Fi devices)</p> <p><u>Earth's Place in the Universe</u></p>

<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>A. I can research and communicate how technologies are used to obtain data about our solar system, galaxy, and universe.</p> <p>B. I can explain how data are analyzed to develop conclusions about the objects in our solar system, galaxy, and universe.</p> <p>A. I can determine the sizes of stars and use the light they emit to determine their composition.</p> <p>B. I can create an argument on the motion of galaxies (using red shift/blue shift) and develop models that explain how the universe began with a period of rapid expansion.</p> <p>A. I can explain how the planets in our solar system formed under the force of gravity.</p> <p>B. I can investigate and explain how nuclear fusion was involved in the formation of stars.</p> <p>C. I can develop and use models to explain how gravity affects the motion of objects in our solar system. (Introduction of Kepler's Laws - DO NOT include mathematical computations.)</p> <p>D. I can develop and use models to explain how gravity affects Earth's ocean tides.</p> <p>A. I can plan and conduct experiments to determine how gravitational force from one object can affect other objects even when not in contact.</p>
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2022 - 2023, Eighth Grade, Science, Quarter 3

Big Ideas/Key Concepts:

- Technologies are used to collect and analyze data that allow us to form conclusions about the structure and change of Earth's geological layers.
- Forces and processes within Earth's layers cause geological changes that shape and reshape the surface of Earth.
- Changes in Earth's geological features impact the availability of natural resources and biodiversity of living organisms on a global scale.

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<p><u>Earth’s Systems</u></p> <p>8.ESS2.2: Evaluate data collected from seismographs to create a model of Earth's structure.</p>	<p><u>Earth’s Systems</u></p> <p>A. I can analyze seismograph data to develop models of the composition of Earth's structural layers. (crust, mantle, and core)</p> <p>B. I can compare methods of classifying Earth’s layers based on composition and mechanical characteristics of the layers. (crust/mantle/core vs. asthenosphere/lithosphere)</p>

<p>8.ESS2.4: Gather and evaluate evidence that energy from the earth's interior drives convection cycles within the asthenosphere which creates changes within the lithosphere including plate movements, plate boundaries, and seafloor spreading.</p> <p>8.ESS2.3: Describe the relationship between the processes and forces that create igneous, sedimentary, and metamorphic rocks.</p> <p>8.ESS2.5: Construct a scientific explanation using data that explains the gradual process 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).</p> <p>8.ESS3.2: Collect data, map, and describe patterns in the locations of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hotspots.</p>	<p>A. I can develop and use models to explain how energy from Earth's interior drives convection cycles in the asthenosphere.</p> <p>B. I can develop and use models that explain how convection cycles in the asthenosphere cause changes in the lithosphere. (Examples: plate movements, formation of plate boundaries, and sea-floor spreading)</p> <p>A. I can develop and use models to explain how plate movements and processes in the Earth cause metamorphic rock formation. (Process examples: metamorphism, deformation)</p> <p>B. I can develop and use models to explain how plate movements and processes in the Earth cause igneous rock formation. (Process examples: melting, cooling, extrusion, intrusion, solidification).</p> <p>C. I can develop and use models to explain how plate movements and processes in the Earth cause sedimentary rock formation. (Process examples: weathering, erosion, sediment formation, deposition, compaction/cementation).</p> <p>A. I can develop and use models to explain how plate tectonics result in the formation of mountains, faults, and trenches.</p> <p>B. I can analyze data to develop maps that show patterns in the locations of earthquakes, volcanoes, tectonic plate movement.</p> <p>A. I can develop and use models to explain how the location and movement of tectonic plates cause earthquakes and volcanic hotspots.</p>
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8.ESS3.1: Interpret data to explain that earth's mineral, fossil fuel, and groundwater resources are unevenly distributed as a result of geologic processes.

B. I can analyze data to develop an argument of how the major geological formations of Earth have formed, changed, and continue to change over time.

A. I can analyze data to develop an argument that geological processes have caused uneven distribution of Earth's fossils, fossil fuels, minerals, and groundwater.

2022 - 2023, Eighth Grade, Science, Quarter 4

Big Ideas/Key Concepts:

- Changes in Earth's geological features impact the availability of natural resources and biodiversity of living organisms on a global scale.
- Analysis of the fossil and biological records allows us to form conclusions about the geological and biological history of Earth.
- Genetic variation allows for natural adaptations that increase the chance of survival in a changing environment and artificial selection for traits desired by humans.

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<p><u>Earth's Systems</u></p> <p>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.</p> <p><u>Biological Change: Unity and Diversity</u></p> <p>8.LS4.1: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change in life forms throughout Earth's history.</p> <p>8.LS4.2: Construct an explanation addressing similarities and differences of the anatomical structures and genetic information between extinct and extant organisms using evidence of common ancestry and patterns between taxa.</p> <p>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 that species and lead to adaptation.</p>	<p><u>Earth's Systems</u></p> <p>A. I can analyze data to develop an explanation of how rapid and gradual geographic changes have affected populations and caused extinction.</p> <p><u>Biological Change: Unity and Diversity</u></p> <p>A. I can analyze charts, graphs, and images of Earth's fossil record to identify patterns in Earth's living history. (Examples: existence, diversity, extinction, changes in living organisms)</p> <p>B. I can develop and use models to explain the relationships between major geological events and major changes in the fossil record.</p> <p>A. I can compare and contrast anatomical structures and genetic makeups of extinct and extant organisms.</p> <p>B. I can analyze cladograms to identify patterns between taxa in terms of anatomical structures and genetic makeups.</p> <p>C. I can analyze data of anatomical structures and genetic makeups to identify common ancestries.</p> <p>A. I can analyze data to determine which phenotypes within a population will increase the chances of survival in a given environment.</p> <p>B. I can develop and use models to explain how survival of certain phenotypes can lead to adaptations and survival of the species.</p> <p>C. I can analyze data from geology, paleontology, and comparative anatomy to communicate examples of</p>

<p>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.</p> <p>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.</p>	<p>phenotypes that have led to adaptations and survival of a species.</p> <ul style="list-style-type: none">A. I can develop an argument for how natural selection determines the survival of a species in a given environment.B. I can analyze data to predict the fate of a population in a changing environment. <ul style="list-style-type: none">A. I can compare and contrast artificial selection with natural selection.B. I can research and communicate scientifically how humans use technology in artificial selection to obtain desired traits in other organisms.
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