# 2022 - 2023, Fourth Grade, Science, Quarter 1

**Big Ideas/Key Concepts:**

- **Photosynthesis is the process that enables plants to convert energy from the sun to produce matter.**
- **Energy flows through an ecosystem by means of photosynthesis and food chains on both land and water.**
- **All life is interdependent and interacts with the environment.**
- **Fossils provide information, especially about types of life and their environment in the past.**

| Standards | Student Friendly "I Can" Statements |
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| **Ecosystems: Interactions, Energy, and Dynamics**<br><br>**4.LS2.1** Support an argument with evidence that plants get the materials they need for growth and reproduction chiefly through a process in which they use carbon dioxide from the air, water, and energy from the sun to produce sugars, plant materials, and waste (oxygen); and that this process is called photosynthesis.<br>*Note: Carbon dioxide and oxygen are exceptions to the general recommendation that microscopic components should be referred to as 'particles' in the 3-5 grade band.* | **Ecosystems: Interactions, Energy, and Dynamics**<br><br>I can research and explain that matter exists in invisible forms called particles, and one type of these invisible particles is a gas called carbon dioxide.<br><br>I can carry out an investigation to provide evidence that plants get most of their material for growth by taking in carbon dioxide and turning it into plant materials.<br><br>I can explain that plants get the rest of their material for growth by absorbing energy from sunlight to make sugars and by absorbing water and nutrients from the soil.<br><br>I can observe elodea plants underwater for evidence that they produce and release oxygen.<br><br>I can explain that plants use the process of photosynthesis to take in air, water, nutrients and sunlight to grow and make new plants. |

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| **4.LS2.2** Develop models of terrestrial and aquatic food chains to describe the movement of energy among producers, herbivores, carnivores, omnivores, and decomposers. | I can research and describe whether an organism gets energy by absorbing sunlight (producers), or by consuming another organism (consumers).<br><br>I can classify types of consumers (herbivores, carnivores, omnivores, decomposers) by the organisms they eat to obtain energy.<br><br>I can make models of food chains within a land ecosystem and a water ecosystem to describe the movement of energy in each one. |
| **4.LS2.3** Using information about the roles of organisms (producers, consumers, decomposers), evaluate how those roles in food chains are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web. | I can show how the living things which are part of a food chain are also part of a larger, interconnected food web. My food web includes producers, consumers, and decomposers.<br><br>I can explain how living things are able to meet their needs in a stable food web. |
| **4.LS2.4** Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem. | I can describe how a stable ecosystem can become unbalanced by an invasive species which can outcompete native species for shared energy and resources.<br><br>I can describe how a stable ecosystem can become unbalanced by the removal of a native species which was interconnected with other living things and the environment.<br><br>I can make a model of a food web to predict how adding or removing a species within an ecosystem can damage the ecosystem's balance. |
| **4.LS2.5** Analyze and interpret data about changes (land characteristics, water distribution, temperature, food, and other organisms) in the | I can gather and interpret data about changes in the environment such as land characteristics, water distribution, temperature, food, and other organisms. |

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| environment and describe what mechanisms organisms can use to affect their ability to survive and reproduce. | I can describe how some organisms continue to survive and reproduce by adapting to changes in the environment.<br><br>I can explain that some organisms may struggle in an environment after a change has occurred and may die off or move to a new location, while other organisms may have new opportunities to establish themselves. |
| **<u>Biological Change: Unity and Diversity</u>**<br><br>**4.LS4.1** Obtain information about what a fossil is and ways a fossil can provide information about the past. | **<u>Biological Change: Unity and Diversity</u>**<br><br>I can research a variety of fossils and explain how fossils are formed.<br><br>I can describe different ways that fossils give us information about the past (e.g., fossilized footprints vs a fossilized skeleton). |
| **Embedded K-8 TN Computer Science Standards:**<br>● **AIT.1** Identify and define problems and form significant questions for investigation.<br>● **AIT.6** Collect, organize, analyze, and interpret data to identify solutions and/or make informed decisions.<br>● **AIT.7** Infer and predict or propose relationships with data.<br>● **DC.1** Advocate, demonstrate, and routinely practice safe, legal, and responsible use of information and technology.<br>● **DC.2** Exhibit a positive mindset toward using technology that supports collaboration, learning, and productivity. | |

# 2021 - 2022, Fourth Grade, Science, Quarter 2

**Big Ideas/Key Concepts:**

- **The surface of Earth changes due to weathering, tectonic plate movement, organisms, and other natural phenomena.**
- **Erosion and deposition naturally occur over long periods of time and have changed landscapes and landforms.**
- **The Earth has four distinctive layers: crust, mantle, outer core, and inner core.**
- **There are renewable and nonrenewable resources found in nature that provide energy and/or fuel for human activities. ● Humans impact the environment in both positive and negative ways.**

| Standards | Student Friendly "I Can" Statements |
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| **Earth's Systems**<br><br>**4.ESS2.4** Analyze and interpret data on the four layers of the Earth, including thickness, composition, and physical states of these layers. | **Earth's Systems**<br><br>I can use research to compare and contrast the four layers of Earth: crust, mantle, outer core, and inner core.<br><br>I can analyze and interpret data on the four layers of Earth, including thickness, composition, and physical states of these layers. |
| **4.ESS2.2** Interpret maps to determine that the location of mountain ranges, deep ocean trenches, volcanoes, and earthquakes occur in patterns. | I can analyze and interpret maps to describe patterns in the locations of Earth's mountain ranges, deep ocean trenches, volcanoes, and earthquakes.<br><br>I can explain that the presence of igneous rock in a location provides evidence that a volcano was active in the past.<br><br>I can analyze data from maps to determine a pattern in the locations of Earth's landforms and compare those to the region known as the "Ring of Fire". |

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| **4.ESS2.3** Provide examples to support the claim that organisms affect the physical characteristics of their regions. | I can defend the claim that some organisms affect the physical characteristics of their regions to suit their needs by providing examples from research.<br><br>I can explain how deposits of fossil fuels in certain areas are the result of the remains of organisms which used to live there in the distant past. |
| **4.ESS2.1** Collect and analyze data from observations to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering (frost wedging, abrasion, tree root wedging) and are transported by water, ice, wind, gravity, and vegetation.<br>*Note: 4.ESS2.1 focuses on processes of interacting systems whereas 4.ESS1.1 focuses on the landforms affected/created by these processes and the information they hold about Earth's history.* | I can collect and analyze evidence that rocks, soils, and sediments are broken into smaller pieces by mechanical weathering (frost wedging, abrasion, tree root wedging).<br><br>I can use evidence from photos or real-life examples to compare and contrast 3 types of mechanical weathering (frost wedging, abrasion, tree root wedging).<br><br>I can describe how smaller pieces of rocks, soils, and sediments are transported by water, ice, wind, gravity, and vegetation. |
| **4.ESS1.1** Generate and support a claim with evidence that over long periods of time, erosion (weathering and transportation) and deposition have changed landscapes and created new landforms.<br>*See note for 4.ESS2.1.* | I can model the effects of weathering and erosion to create small scale landforms.<br><br>I can argue from evidence that erosion & deposition naturally occur over long periods of time, and that they can significantly impact landscapes and landforms. |
| **<u>Earth and Human Activity</u>**<br><br>**4.ESS3.1** Obtain and combine information to describe that energy and fuels are derived from natural resources and that some energy and fuel sources are renewable (sunlight, wind, water) and some are not (fossil fuels, minerals). | **<u>Earth and Human Activity</u>**<br><br>I can gather information to describe that energy and fuels are derived from natural resources. |

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| *Note: A full discussion relating the time to renew resources to human lifetimes will occur in 6th grade (6.ESS3.1).* | I can differentiate between renewable (sunlight, wind, water) and nonrenewable (fossil fuels, minerals) resources. |
| **4.ESS3.2** Create an argument, using evidence from research, that human activity (farming, mining, building) can affect the land and ocean in positive and/or negative ways. | I can create an argument, using evidence from research, that human activity (farming, mining, and building) can affect the land and ocean in both positive and negative ways. |

**Embedded K-8 TN Computer Science Standards:**

- **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.
- **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.5** Explain responsible uses of technology and digital information; describe possible consequences of inappropriate use such as copyright infringement and piracy.

# 2020 - 2021, Fourth Grade, Science, Quarter 3

**Big Ideas/Key Concepts:**

- **The interaction between Earth and the Sun causes a pattern of day and night as well as predictable changes in shadow length.**
- **Waves have properties, such as amplitude, wavelength, and direction.**
- **Light waves travel in straight lines, which in turn affects what is visible to our eyes.**
- **Light waves bend when they encounter a lens, and this principle can be used to develop technology to help humans see more clearly.**

| Standards | Student Friendly "I Can" Statements |
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| **Earth's Place in the Universe**<br><br>**4.ESS1.2** Use a model to explain how the orbit of the Earth and sun cause observable patterns: a. day and night; b. changes in length and direction of shadows over a day. | **Earth's Place in the Universe**<br><br>I can use a model to explain how the orbit and rotation of the Earth causes a pattern such as day & night.<br><br>I can investigate how my shadow changes in its length & direction over a day.<br><br>I can describe how and why my shadow changes in its length & direction over a day. |
| **Waves and their Application in Technologies for Information Transfer**<br><br>**4.PS4.1** Use a model of a simple wave to explain regular patterns of amplitude, wavelength, and direction.<br>*Note: 4th grade students are NOT responsible for learning how waves behave when they reach the end of a medium (e.g., when waves reach the end of a string) or when they encounter a change in the medium (e.g., if there are two strings tied together and the wave moves from one string to the other).* | **Waves and their Application in Technologies for Information Transfer**<br><br>I can use models to identify the properties (amplitude, wavelength, direction) of two types of simple waves (transverse, longitudinal).<br><br>I can investigate making different waves to describe how a change in properties affects the resulting wave's size, wavelength, or direction. |

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| | I can describe how a wave's amplitude may increase (constructive interference) or decrease (destructive interference) when it interacts with another wave.<br><br>I can investigate what happens to the direction of a wave when it intersects another wave while traveling. |
| **4.PS4.2** Describe how the colors of available light sources and the bending of light waves determine what we see. | I can describe how light is reflected from the surface of objects and is detected by light receptors in our eyes.<br><br>I can investigate the effects of different colored light sources on the appearance of objects and describe how they change.<br><br>I can explain how a prism can be used to separate white light into its component colors of the rainbow.<br><br>I can model how light waves that travel in straight lines bend when they travel through a lens. |
| **4.PS4.3** Investigate how lenses and digital devices like computers or cell phones use waves to enhance human senses. | I can investigate how devices such as binoculars, telescopes, microscopes, or magnifying glasses use lenses to allow us to see things we would not have been able to see otherwise.<br><br>I can research and describe how digital devices like computers or cell phones store digital information and use waves to transfer it over distances. |
| **Embedded K-8 TN Computer Science Standards:**<br>● **AIT.1** Identify and define problems and form significant questions for investigation.<br>● **AIT.6** Collect, organize, analyze, and interpret data to identify solutions and/or make informed decisions.<br>● **AIT.7** Infer and predict or propose relationships with data. | |

- **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.

# 2020 - 2021, Fourth Grade, Science, Quarter 4

**Big Ideas/Key Concepts:**

- **There is a cause and effect relationship between the speed of an object and the energy of an object.**
- **Two types of energy of motion are kinetic and potential, and they have an inverse relationship.**
- **Differences among these two types of energy can be predicted, measured, and described through an investigation.**
- **The Engineering Design Process is used to generate multiple solutions to a defined problem with criteria and constraints.**
- **Different engineering solutions are categorized according to their effectiveness in meeting a problem's criteria and constraints.**
- **Tools and measurements, when used appropriately, can develop an accurate model of a solution to a problem.**
- **Engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands.**
- **Identify the parts and functions of the human skeletal and muscular systems to better understand human health. (WCS Standard)**

| Standards | Student Friendly "I Can" Statements |
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| **Energy**<br><br>**4.PS3.1** Use evidence to explain the cause and effect relationship between the speed of an object and the energy of an object. | **Energy**<br><br>I can investigate what happens to the shapes of colliding objects when they interact at different speeds.<br><br>I can use the results of my investigation as evidence to explain that more energy is present when objects move faster.<br><br>I can investigate how changing the shape of an elastic object like a spring or rubber band can be used to transfer energy to a different object.<br><br>I can explain by using evidence the cause and effect relationship between the speed of an object and the energy of an object. |

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| **4.PS3.2** Observe and explain the relationship between potential energy and kinetic energy. | I can explain that an object which begins to move does not produce energy out of nothing, but uses stored energy which already existed.<br><br>I can explain that potential energy is stored and transferred to kinetic energy as the object moves.<br><br>I can observe and explain the relationship between potential and kinetic energy. ***Apply the Engineering Standards found below***<br><br>I can carry out an investigation to demonstrate the difference between potential and kinetic energy.<br>***Apply the Engineering Standards found below*** |
| **4.PS3.3** Describe how stored energy can be converted into another form for practical use. | I can describe how stored energy can be converted into another form for practical use. ***Apply the Engineering Standards found below*** |
| **Engineering Design**<br><br>**4.ETS1.1** Categorize the effectiveness of design solutions by comparing them to specified criteria for constraints. | **Engineering Design**<br><br>I can categorize how effective design solutions are by comparing them to specified criteria for constraints.<br>***Embed within the Energy Standards found above*** |
| **Links Among Engineering, Technology, Science, and Society**<br><br>**4.ETS2.1** Use appropriate tools and measurements to build a model. | **Links Among Engineering, Technology, Science, and Society**<br><br>I can build a model to solve a problem using appropriate tools and measurements. ***Embed within the Energy Standards found above*** |
| **4.ETS2.2** Determine the effectiveness of multiple solutions to a design problem given the criteria and the constraints. | I can determine the effectiveness of multiple solutions to a design problem given the criteria and constraints. ***Embed within the Energy Standards found above*** |

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| **4.ETS2.3** Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands (artificial limbs, seatbelts, cell phones). | I can explain how engineers have improved existing technologies to increase their benefits (i.e., artificial limbs).<br><br>I can explain how engineers have improved existing technologies to decrease known risks (i.e., seatbelts).<br><br>I can explain how engineers have improved existing technologies to meet societal demands (i.e., cell phones). |
| **Human Body Systems**<br><br>**4.WCE.SC.1** Identify the parts of the skeletal system and their functions.<br>*Introduced after TCAP – this standard is not assessed.* | **Human Body Systems**<br><br>I can identify and investigate the parts of the skeletal system and their functions.<br><br>I can correctly label a diagram of the skeletal system including the following: skull, mandible, vertebrae, sternum, ribs, vertebral column, carpal, phalanges, tarsal, metatarsals, fibula, tibia, knee, femur, wrist, ulna, radius, elbow, humerus, scapula, and maxilla. |
| **4.WCE.SC.2** Identify the parts of the muscular system and their functions.<br>*Introduced after TCAP – this standard is not assessed.* | I can identify and investigate the parts of the muscular system and their functions, including skeletal, smooth, and cardiac muscles.<br><br>I can correctly label a diagram of the muscular system, including skeletal, smooth, and cardiac muscles. |

**Embedded K-8 TN Computer Science Standards:**

- **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.5** Evaluate the accuracy, relevance, appropriateness, and bias of electronic information sources.
- **AIT.6** Collect, organize, analyze, and interpret data to identify solutions and/or make informed decisions.
- **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.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.