2022 - 2023, Sixth Grade, Science, Quarter 1

Big Ideas/Key Concepts:

- Energy exists in many unique forms.
- Energy can be transformed from potential to kinetic energy.
- Kinetic energy is proportionally related to an object's mass and speed.
- Transfer or energy can move energy from one energy type to a different energy type.
- The transfer of thermal energy within a system supports the Law of Conservation of Energy.

Embedded K-8 TN Computer Science Standards

- 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

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

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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

Quarter 2 Quarter 3 Quarter 4
TN Science Standards Reference Guide
OER

Standards	Student Friendly "I Can" Statements
Energy **6. PS3.1:** Analyze the properties and compare the sources of kinetic, elastic potential, gravitational potential, electric potential, chemical, and thermal energy.	**Energy** A. I can differentiate between potential energy and kinetic energy. B. I can identify the properties and sources of kinetic, elastic potential, gravitational potential, electric potential, chemical, and thermal energy through scientific phenomena. C. I can develop a scientific explanation to identify the relationship between thermal energy, temperature, and heat. D. I can identify a transfer of energy from chemical to thermal during a scientific investigation. E. I can develop a model of kinetic energy as energy due to the motion of particles within matter. F. I can develop a model of elastic potential, gravitational potential, and electric potential as energy stored by objects due to position.

6. PS3.2: Construct a scientific explanation of the transformations between potential and kinetic energy.	A. I can construct models of phenomena that occur in everyday life involving the transfer of potential and kinetic energy (motion, light, sound, magnetism, and heat). B. I can develop a scientific explanation using models to describe how a change in position creates a transfer of energy. C. I can develop a model that demonstrates a transfer of energy that results in work being done. D. I can construct a scientific explanation of the transformation between potential and kinetic energy. E. I can explain the Law of Conservation of Energy using data from a variety of energy transformations.
6. PS3.3: Analyze and interpret data to show the relationship between kinetic energy and the mass of an object in motion and its speed.	A. I can analyze and model real-world examples of the relationship between kinetic energy and an object's mass and speed. B. I can design and complete an investigation comparing objects with different masses to study the relationship between kinetic energy, the mass of an object in motion, and its speed. C. I can create a graphical display to analyze and interpret data that explains the relationship between kinetic energy, the mass of an object, and the speed of an object. D. I can identify the relationship between kinetic energy to the mass of an object and to the speed of an object.
6. PS3.4: Conduct an investigation to demonstrate the way that heat (thermal energy) moves among objects through radiation, conduction, or convection.	A. I can design and conduct an energy transformation investigation which demonstrates that some usable energy is released as thermal energy. B. I can develop a scientific argument to support the Law of Conservation of Energy that includes the transfer of thermal energy within a system. C. I can investigate how thermal energy is transferred in radiation, conduction, and convection.

	D. I can identify and differentiate between conduction, convection, and radiation. E. I can model the transfer of energy during conduction, convection, and radiation.
6.ETS1.2: Design and test different solutions that impact energy transfer.	A. I can design and test different materials and methods that impact the amount of energy transferred between two objects.

2022 - 2023, Sixth Grade, Science, Quarter 2

Big Ideas/Key Concepts

- The transfer of energy through convection, conduction, and radiation drives Earth's systems.
- The climate and weather patterns present in a specific region can be attributed to the transfer of energy in water and wind.
- Geographic features can alter weather patterns.
- Humans can predict weather patterns using various tools.

Embedded K-8 TN Computer Science Standards

- 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.

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Quick Links within this Document

Quarter 1 Quarter 3 Quarter 4
TN Science Standards Reference Guide
OER

Standards	Student Friendly "I Can" Statements
Earth's System **6.ESS2.2:** Diagram convection patterns that flow due to uneven heating of the earth.	**Earth's Systems** A. I can explain how the process of convection relies on conduction and radiation to produce air movements in the atmosphere. B. I can diagram atmospheric convection patterns that flow due to the uneven heating of earth. C. I can use diagrams to investigate the role of temperature and density change in atmospheric convection patterns. D. I can identify and apply the following concepts as they relate to wind: Coriolis Effect (based on Earth's rotation and pressure change), Prevailing wind direction, Global winds, Local winds: Land/Sea Breezes and Mountain/valley breezes.

6.ESS2.6: Explain how relationships between the movement and interactions of air masses, high- and low-pressure systems, and frontal boundaries result in weather conditions and severe storms.	A. I can analyze how relationships between the movement and interactions of air masses, high- and low-pressure systems, and frontal boundaries result in weather conditions and severe storms. B. I can identify and describe the following in terms of air mass interactions: severe weather (tornado, hurricane), cold and warm air masses, weather fronts, water cycle, and high- and low-pressure systems.
6.ESS2.5: Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.	A. I can analyze tools and technologies (barometer, anemometer, spectrometer, thermometer, and radar mapping) designed to record weather factors. B. I can analyze tools and technologies (barometer, anemometer, spectrometer, thermometer, and radar mapping) to predict and minimize the effects of severe weather and other natural disasters. C. I can analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
6.ESS2.1: Gather evidence to justify that oceanic convection currents are caused by the sun's transfer of heat energy and differences in salt concentration leading to global water movement.	A. I can develop a model to describe how radiation from the sun impacts ocean water movement by convection. B. I can gather information and model how variations in salt concentration impact water density and ocean water movement. C. I can conclude and communicate how the curvature of the Earth creates uneven heating of Earth's oceans. D. I can diagram convection patterns and explain that flow due to the uneven heating of water, energy transfer, and density changes. E. I can develop and communicate a scientific explanation for how density and temperature are the major drivers of global water movement. F. I can analyze and interpret characteristics of the Global Conveyor Belt (thermohaline circulation) in terms of temperature, density, and water movement.

6.ESS2.3: Construct an explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.	A. I can research and discuss how mountain ranges, bodies of water, and other geographical features cause climate variations. B. I can investigate and develop models demonstrating how geographic features can impact atmospheric flow. (orographic lifting, rain shadow effect, landform breezes, and wind funnels) C. I can explain how wind and ocean currents (surface and deep) affect weather and climate along coastal regions. D. I can identify and apply the following concepts as they relate to wind: Coriolis Effect (based on Earth's rotation and pressure change), Prevailing wind direction, Global winds, and Local winds: Land/Sea Breezes and Mountain/valley breezes. E. I can investigate the California Current and North Atlantic Current/Gulf Stream and model the impact these currents have on coastal weather patterns.
6.ESS2.4: Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle.	A. I can investigate human environmental impacts on the local and global hydrologic cycle, specifically with regard to water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and water pollution. B. I can develop and design a feasible solution based on evidence that could reduce human impact on water usage or pollution.

2022 - 2023, Sixth Grade, Science, Quarter 3

Big Ideas/Key Concepts:

- Energy is transferred through abiotic and biotic factors of an ecosystem.
- Environmental variables impact population sizes within an ecosystem.
- The transfer of energy through biotic factors in an ecosystem can be mapped in a food pyramid.
- Ecosystems change over time by both natural occurrences and human activity.
- Engineering problems have clear design constraints that incorporate scientific understanding.

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

- 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.

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Quick Links within this Document

Quarter 1 Quarter 2 Quarter 4
TN Science Standards Reference Guide
OER

Standards	Student Friendly "I Can" Statements
Ecosystems: Interactions, Energy, and Dynamics	**Ecosystems: Interactions, Energy, and Dynamics**
6.LS2.1: Evaluate and communicate the impact of environmental variables on population size.	A. I can model and explain levels of ecological organization: (Organism, Population, Community, Ecosystem, Biome, and Biosphere). B. I can investigate the relationship between population size, population density, and population dispersion. C. I can formulate a hypothesis based on historical data, addressing the impact of environmental variables on population size.
6.LS2.2: Determine the impact of competitive, symbiotic, and predatory interactions in an ecosystem.	A. I can differentiate between mutualism, commensalism, and parasitism in symbiotic relationships and give examples of each within an ecosystem. B. I can analyze how scarce resources can create competitive relationships between populations in an ecosystem.

6.LS2.7: Compare and contrast auditory and visual methods of communication among organisms in relation to survival strategies of a population.	A. I can research and communicate a logical argument detailing the importance of visual and auditory communication as a survival strategy of a population. B. I can investigate ways in which members of a population may communicate with one another. (i.e. bioluminescence, feather coloring/displays, and whale auditory communication) C. I can model a scenario in which common auditory and/or visual communication would aid in the immediate survival of members of a population.
6.LS2.3: Draw conclusions about the transfer of energy through a food web and energy pyramid in an ecosystem.	A. I can investigate the role and impact of predators in a food web/ecosystem. B. I can investigate limiting factors, carrying capacity, and exponential growth to a population and represent these terms graphically. C. I can develop a model of the energy pyramid using research of the 10% rule of a food chain. D. I can investigate and justify how species migration over multiple ecosystems can alter an ecosystem's food pyramid. E. I can analyze and interpret data to identify and determine the cause and effect relationships between resources and the numbers of organisms in ecosystems during periods of abundant and scarce resources. F. I can evaluate the impact of an increase or loss of a species on a food web and within an ecosystem. G. I can diagram and describe the flow of matter and energy through the biotic and abiotic components of an ecosystem, using the terms producers, consumers (primary, secondary, tertiary), and decomposers.
6.LS2.4: Using evidence from climate data, draw conclusions about the patterns of abiotic and biotic factors in different biomes, specifically the tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater ecosystems.	A. I can develop a graphic representation of climate data on abiotic factors in an ecosystem as well as a biome. B. I can investigate and analyze patterns of abiotic and biotic factors to identify the world's biomes. (tundra, taiga, deciduous forest, desert, grasslands, rainforest, marine, and freshwater ecosystems)

	C. I can research climate change data and justify how biomes have changed, are vulnerable to future changes, and how these changes impact organisms.
6.LS2.5: Analyze existing evidence about the effect of a specific invasive species on native populations in Tennessee and design a solution to mitigate its impact.	A. I can analyze existing evidence about the effect of a specific invasive species to Tennessee on native populations and design a possible solution to eradicate the invasive population in Tennessee. (Examples: Kudzu, Asian Carp)
6.LS2.6: Research the ways in which an ecosystem has changed over time in response to changes in physical conditions, population balances, human interactions, and natural catastrophes.	A. I can research and communicate the major factors responsible for environmental changes in a particular ecosystem using historical data. B. I can analyze and interpret graphs representing the impact population balances and/or natural catastrophes have had on a particular ecosystem.

2022 - 2023, Sixth Grade, Science, Quarter 4

Big Ideas/Key Concepts:

- Biodiversity is a component of ecosystem stability.
- A variety of Earth's natural resources are available in biodiverse regions.
- Human activity has both negatively and positively impacted ecosystem and biome biodiversity.

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.
- 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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Quick Links within this Document

Quarter 1 Quarter 2 Quarter 3
TN Science Standards Reference Guide
OER

Standards	Student Friendly "I Can" Statements
Biological Change: Unity and Diversity **6.LS4.1:** Explain how changes in biodiversity would impact ecosystem stability and natural resources.	**Biological Change: Unity and Diversity** A. I can create models and graphs to represent the level of biodiversity present in various ecosystems and biomes. B. I can compare and contrast the biodiversity of different biomes or ecosystems and determine what factors contribute to the level of diversity. C. I can investigate natural resources that are produced from biodiverse ecosystems.

6.LS4.2: Design a possible solution for maintaining biodiversity of ecosystems while still providing necessary human resources without disrupting environmental equilibrium.	A. I can research and communicate the major factors responsible for reducing the amount of global biodiversity, both through natural causes and human activity. B. I can research and construct an argument supporting the protection of biodiverse regions which are a source of global natural resources and the global economy. C. I can investigate and explain the relationship between biodiversity and ecosystem stability. D. I can investigate ways in which biodiversity has been protected without disrupting environmental equilibrium.
6.ETS1.1: Evaluate design constraints on solutions for maintaining ecosystems and biodiversity.	A. I can develop possible solutions for local or regional ecosystems that are currently unstable and/or losing natural resources. B. I can evaluate design constraints on solutions that have protected biodiversity as well as solutions resulting in a negative impact on biodiversity.
Earth and Human Activity	**Earth and Human Activity**
6.ESS3.1: Differentiate between renewable and nonrenewable resources by asking questions about their availability and sustainability.	A. I can classify examples of natural resources in categories of renewable (wind, hydroelectric, biomass, geothermal, and solar) and nonrenewable (oil, coal, gas, and nuclear), by asking questions about their availability and sustainability.
6.ESS3.2: Investigate and compare existing and developing technologies that utilize renewable and alternative energy resources.	A. I can investigate existing and developing technologies that utilize renewable and alternative energy resources. B. I can analyze the energy output of alternative and renewable energy resources when compared to traditional nonrenewable energy sources. C. I can design and construct a solution to address common disadvantages of switching to renewable resources as an energy source.

6.ESS3.3: Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction.	D. I can research the impact of man's use of renewable and nonrenewable resources on future energy supplies. A. I can research and evaluate how human activities affect the condition of Earth's land, water, and atmosphere. (water pollution, air pollution, global warming, pesticides, resource consumption, habitat destruction, deforestation) B. I can construct an argument supported by evidence that human activities and technologies can be engineered to reduce the role of human impact on natural habitats and ecosystems. C. I can investigate and analyze the role of human activities and natural disasters in causing the decline of a species towards endangerment or extinction. D. I can construct and communicate an argument based on historical data and current scientific evidence supporting the need for protective measures to ensure the survival of an ecosystem or species.