**“Overlapping” Science and Technology/Engineering Standards that May Be Assessed on the 2018 MCAS Grades 8STE Test**

Below are lists of the 2001/06 and 2016 science and technology/engineering (STE) standards that may be assessed on the **2018 MCAS STE tests for grade 8**. The focus of the questions on the 2018 tests will be on the overlapping content and skills between the two sets of standards.

**2001/06 Grade 8 STE Standards**

**Earth and Space Science**

2. Describe the layers of the earth, including the lithosphere, the hot convecting mantle, and the dense metallic core.

3. Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through the earth’s system.

4. Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.

5. Describe how the movement of the earth’s crustal plates causes both slow changes in the earth’s surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

6. Describe and give examples of ways in which the earth’s surface is built up and torn down by natural processes, including deposition of sediments, rock formation, erosion, and weathering.

7. Explain and give examples of how physical evidence, such as fossils and surface features of glaciation, supports theories that the earth has evolved over geologic time.

8. Recognize that gravity is a force that pulls all things on and near the earth toward the center of the earth. Gravity plays a major role in the formation of the planets, stars, and solar system and in determining their motions.

9. Describe lunar and solar eclipses, the observed moon phases, and tides. Relate them to the relative positions of the earth, moon, and sun.

11. Explain how the tilt of the earth and its revolution around the sun result in an uneven heating of the earth, which in turn causes the seasons.

12. Recognize that the universe contains many billions of galaxies, and that each galaxy contains many billions of stars.

**Life Science**

2. Recognize that all organisms are composed of cells, and that many organisms are single-celled (unicellular), e.g., bacteria, yeast. In these single-celled organisms, one cell must carry out all of the basic functions of life.

3. Compare and contrast plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, cytoplasm, chloroplasts, mitochondria, vacuoles).

4. Recognize that within cells, many of the basic functions of organisms (e.g., extracting energy from food and getting rid of waste) are carried out. The way in which cells function is similar in all living organisms.

5. Describe the hierarchical organization of multicellular organisms from cells to tissues to organs to systems to organisms.

6. Identify the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, excretion, protection from disease, and movement, control, and coordination) and describe ways that these systems interact with each other.

7. Recognize that every organism requires a set of instructions that specifies its traits. These instructions are stored in the organism’s chromosomes. Heredity is the passage of these instructions from one generation to another.

8. Recognize that hereditary information is contained in genes located in the chromosomes of each cell. A human cell contains about 30,000 different genes on 23 different chromosomes.

9. Compare sexual reproduction (offspring inherit half of their genes from each parent) with asexual reproduction (offspring is an identical copy of the parent’s cell).

10. Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.

11. Recognize that evidence drawn from geology, fossils, and comparative anatomy provides the basis of the theory of evolution.

12. Relate the extinction of species to a mismatch of adaptation and the environment.

13. Give examples of ways in which organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.

14. Explain the roles and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

15. Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.

16. Recognize that producers (plants that contain chlorophyll) use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms.

17. Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans. Describe how changes may be catastrophes such as volcanic eruptions or ice storms.

18. Recognize that biological evolution accounts for the diversity of species developed through gradual processes over many generations.

**Physical Science**

2. Differentiate between volume and mass. Define density.

4. Explain and give examples of how mass is conserved in a closed system.

5. Recognize that there are more than 100 elements that combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

6. Differentiate between an atom (the smallest unit of an element that maintains the characteristics of that element) and a molecule (the smallest unit of a compound that maintains the characteristics of that compound).

7. Give basic examples of elements and compounds.

8. Differentiate between mixtures and pure substances.

9. Recognize that a substance (element or compound) has a melting point and a boiling point, both of which are independent of the amount of the sample.

10. Differentiate between physical changes and chemical changes.

13. Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

14. Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system.

15. Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.

16. Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.

**Technology/Engineering**

1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., strength, hardness, and flexibility).

1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.

1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sander, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to build a prototype of an engineer design.

2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.

2.2 Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, multiview drawings.

2.3 Describe and explain the purpose of a given prototype.

2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.

2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.

2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.

3.1 Identify and explain the components of a communication system, i.e., source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.

3.3 Identify and compare communication technologies and systems, i.e., audio, visual, printed, and mass communication.

4.4 Explain basic processes in manufacturing systems, e.g., cutting, shaping, assembling, joining, finishing, quality control, and safety.

5.1 Describe and explain parts of a structure, e.g., foundation, floor, deck, wall, roof systems.

5.3 Explain how the forces of tension, compression, torsion, bending, and shear affect the performance of bridges.

5.4 Describe and explain the effects of loads and structural shapes on bridges.

6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the follow: land, air, water, and space.

6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support.

**2016 Grade 8 STE Standards**

**Earth Science**

**6.MS-ESS1-1a. Develop and use a model of the Earth-Sun-Moon system to explain the causes of lunar phases and eclipses of the Sun and Moon.***Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.*

**6.MS-ESS1-4. Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over long periods of time.***Clarification Statements: Analysis includes Laws of Superposition and Crosscutting Relationships limited to minor displacement faults that offset layers. Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressure. State Assessment Boundary: Strata sequences that have been reordered or overturned, names of specific periods or epochs and events within them, or the identification and naming of minerals or rock types are not expected in state assessment.*

**6.MS-ESS1-5(MA). Use graphical displays to illustrate that Earth and its solar system are one of many in the Milky Way galaxy, which is one of billions of galaxies in the universe.***Clarification Statement: Graphical displays can include maps, charts, graphs, and data tables.*

**6.MS-ESS2-3. Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth’s plates have moved great distances, collided, and spread apart.***Clarification Statement: Maps may show similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches) similar to Wegener’s visuals. State Assessment Boundary: Mechanisms for plate motion or paleomagnetic anomalies in oceanic and continental crust are not expected in state assessment.*

**7.MS-ESS2-2. Construct an explanation based on evidence for how Earth’s surface has changed over scales that range from local to global in size.***Clarification Statements: Examples of processes occurring over large, global spatial scales include plate motion, formation of mountains and ocean basins, and ice ages. Examples of changes occurring over small, local spatial scales include earthquakes and seasonal weathering and erosion.*

**8.MS-ESS1-1b. Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth’s tilt and differential intensity of sunlight on different areas of Earth across the year.***Clarification Statement: Examples of models can be physical or graphical.*

**8.MS-ESS1-2. Explain the role of gravity in ocean tides, the orbital motions of planets, their moons, and asteroids in the solar system.***State Assessment Boundary: Kepler’s Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth are not expected in state assessment.*

**8.MS-ESS2-1. Use a model to illustrate that energy from Earth’s interior drives convection that cycles Earth’s crust leading to melting, crystallization, weathering, and deformation of large rock formations, including generation of ocean sea floor at ridges, submergence of ocean sea floor at trenches, mountain building, and active volcanic chains.***Clarification Statement: The emphasis is on large-scale cycling resulting from plate tectonics.*

**8.MS-ESS2-5. Interpret basic weather data to identify patterns in air mass interactions and the relationship of those patterns to local weather.***Clarification Statements: Data includes temperature, pressure, humidity, precipitation, and wind. Examples of patterns can include air masses flow from regions of high pressure to low pressure, and how sudden changes in weather can result when different air masses collide. Data can be provided to students (such as in weather maps, data tables, diagrams, or visualizations) or obtained through field observations or laboratory experiments. State Assessment Boundary: Specific names of cloud types or weather symbols used on weather maps are not expected in state assessment.*

**8.MS-ESS2-6. Describe how interactions involving the ocean affect weather and climate on a regional scale, including the influence of the ocean temperature as mediated by energy input from the sun and energy loss due to evaporation or redistribution via ocean currents.***Clarification Statement: A regional scale includes a state or multi-state perspective. State Assessment Boundary: Koppen Climate Classification names are not expected in state assessment.*

**Life Science**

**6.MS-LS1-1. Provide evidence that all organisms (unicellular and multicellular) are made of cells.***Clarification Statement: Evidence can be drawn from multiple types of organisms, such as plants, animals, and bacteria.*

**6.MS-LS1-2. Develop and use a model to describe how parts of cells contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of wastes, and providing energy for cellular processes.***Clarification Statement: Parts of plant and animal cells include (a) the nucleus, which contains a cell’s genetic material and regulates its activities; (b) chloroplasts, which produce necessary food (sugar) and oxygen through photosynthesis (in plants); (c) mitochondria, which release energy from food through cellular respiration; (d) vacuoles, which store materials, including water, nutrients, and waste; (e) the cell membrane, which is a selective barrier that enables nutrients to enter the cell and wastes to be expelled; and (f) the cell wall, which provides structural support (in plants). State Assessment Boundary: Specific biochemical steps or chemical processes, the role of ATP, active transport processes involving the cell membrane, or identifying or comparing different types of cells are not expected in state assessment.*

**6.MS-LS1-3. Construct an argument supported by evidence that the body systems interact to carry out essential functions of life.** *Clarification Statements: Emphasis is on the functions and interactions of the body systems, not specific body parts or organs. An argument should convey that different types of cells can join together to form specialized tissues, which in turn may form organs which work together as body systems. Body systems to be included are the circulatory, digestive, respiratory, excretory, muscular/skeletal, and nervous systems. Essential functions of life include obtaining food and other nutrients (water, oxygen, minerals); releasing energy from food; removing wastes; responding to stimuli; maintaining internal conditions; and, growing/developing. An example of interacting systems could include the respiratory system taking in oxygen from the environment which the circulatory system delivers to cells for cellular respiration, or the digestive system taking in nutrients which the circulatory system transports to cells around the body. State Assessment Boundaries: The mechanism of one body system independent of others or the biochemical processes involved in body systems are not expected in state assessment. Describing the function or comparing different types of cells, tissues, or organs are not expected in state assessment.*

**6.MS-LS4-1. Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of Earth.** *Clarification Statement: Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms. State Assessment Boundary: Names of individual species, geological eras in the fossil record, or mechanisms for extinction or speciation are not expected in state assessment.*

**6.MS-LS4-2. Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms.** *Clarification Statement: Evolutionary relationships include (a) some organisms have similar traits with similar functions because they were inherited from a common ancestor, (b) some organisms have similar traits that serve similar functions because they live in similar environments, and (c) some organisms have traits inherited from common ancestors that no longer serve their original function because their environments are different than their ancestors’ environments.*

**7.MS-LS2-1. Analyze and interpret data to provide evidence for the effects of periods of abundant and scarce resources on the growth of organisms and the size of populations in an ecosystem.**

**7.MS-LS2-2. Describe how relationships among and between organisms in an ecosystem can be competitive, predatory, parasitic, and mutually beneficial and that these interactions are found across multiple ecosystems.** *Clarification Statement: Emphasis is on describing consistent patterns of interactions in different ecosystems in terms of relationships among and between organisms.*

**7.MS-LS2-3. Develop a model to describe that matter and energy cycle among living and nonliving parts of an ecosystem and that both matter and energy are conserved through these processes.** *Clarification Statements: Cycling of matter should include the role of photosynthesis, cellular respiration, and decomposition, and transfer among producers, primary, secondary, and tertiary consumers, and decomposers. Models may include food webs and food chains. State Assessment Boundary: Cycling of specific atoms (such as carbon or oxygen), or the biochemical steps of photosynthesis, cellular respiration, and decomposition are not expected in state assessment.*

**7.MS-LS2-4. Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations.** *Clarification Statement: Focus should be on ecosystem characteristics varying over time, including disruptions such as hurricanes, floods, wildfires, oil spills, and construction.*

**7.MS-LS2-5. Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.\*** *Clarification Statements: Examples of design solutions could include water, land, and species protection, and the prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.*

**8.MS-LS1-5. Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.** *Clarification Statements: Examples of environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include the genes responsible for size differences in different breeds of dogs, such as great danes and chihuahuas. Examples of environmental factors could include drought decreasing plant growth, fertilizer increasing plant growth, and fish growing larger in large ponds than they do in small ponds. Examples of both genetic and environmental factors could include different varieties of plants growing at different rates in different conditions. State Assessment Boundary: Methods of reproduction, genetic mechanisms, gene regulation, biochemical processes, or natural selection are not expected in state assessment.*

**8.MS-LS3-2. Construct an argument based on evidence for how asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. Compare and contrast advantages and disadvantages of asexual and sexual reproduction.** *Clarification Statements: Examples of an advantage of sexual reproduction can include genetic variation when the environment changes or a disease is introduced, while examples of an advantage of asexual reproduction can include not using energy to find a mate and fast reproduction rates. Examples of a disadvantage of sexual reproduction can include using resources to find a mate, while a disadvantage in asexual reproduction can be the lack of genetic variation when the environment changes or a disease is introduced.*

**8.MS-LS3-3(MA). Communicate through writing and in diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of an individual.** *State Assessment Boundary: Specific changes at the molecular level or mechanisms for protein synthesis are not expected in state assessment.*

**8.MS-LS3-4(MA). Develop and use a model to show that sexually reproducing organisms have two of each chromosome in their nucleus, and hence two variants (alleles) of each gene that can be the same or different from each other, with one random assortment of each chromosome passed down to offspring from both parents.** *Clarification Statement: Examples of models can include Punnett squares, diagrams (e.g., simple pedigrees), and simulations. State Assessment Boundary: State assessment will limit inheritance patterns to dominant-recessive alleles only.*

**8.MS-LS4-4. Use a model to describe the process of natural selection, in which genetic variations of some traits in a population increase some individuals’ likelihood of surviving and reproducing in a changing environment. Provide evidence that natural selection occurs over many generations.** *Clarification Statements: The model should include simple probability statements and proportional reasoning. Examples of evidence can include Darwin’s finches, necks of giraffes, and peppered moths. State Assessment Boundary: Specific conditions that lead to natural selection are not expected in state assessment.*

**Physical Science**

**6.MS-PS1-7(MA). Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials.**

**6.MS-PS1-8(MA). Conduct an experiment to show that many materials are mixtures of pure substances that can be separated by physical means into their component pure substances.** *Clarification Statement: Examples of common mixtures include salt water, oil and vinegar, milk, and air.*

**7.MS-PS3-2. Develop a model to describe the relationship between the relative position of objects interacting at a distance and their relative potential energy in the system.** *Clarification Statements: Examples of objects within systems interacting at varying distances could include the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves; changing the direction/orientation of a magnet; and, a balloon with static electrical charge being brought closer to a stream of water. Examples of models could include representations, diagrams, pictures, and written descriptions of systems. State Assessment Boundaries: State assessment will be limited to electric, magnetic, and gravitational interactions and to interactions of two objects at a time. Calculations of potential energy are not expected in state assessment.*

**7.MS-PS3-3. Apply scientific principles of energy and heat transfer to design, construct, and test a device to minimize or maximize thermal energy transfer.\*** *Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a vacuum flask. State Assessment Boundary: Accounting for specific heat or calculations of the total amount of thermal energy transferred are not expected in state assessment.*

**7.MS-PS3-4. Conduct an investigation to determine the relationships among the energy transferred, how well the type of matter retains or radiates heat, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.** *State Assessment Boundary: Calculations of specific heat or the total amount of thermal energy transferred are not expected in state assessment.*

**7.MS-PS3-5. Present evidence to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.** *Clarification Statement: Examples of empirical evidence could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object. State Assessment Boundary: Calculations of energy are not expected in state assessment.*

**7.MS-PS3-6(MA). Use a model to explain how thermal energy is transferred out of hotter regions or objects and into colder ones by convection, conduction, and radiation.**

**7.MS-PS3-7(MA). Use informational text to describe the relationship between kinetic and potential energy and illustrate conversions from one form to another.** *Clarification Statement: Types of kinetic energy include motion, sound, thermal and light; types of potential energy include gravitational, elastic, and chemical.*

**8.MS-PS1-1. Develop a model to describe that (a) atoms combine in a multitude of ways to produce pure substances which make up all of the living and nonliving things that we encounter, (b) atoms form molecules and compounds that range in size from two to thousands of atoms, and (c) mixtures are composed of different proportions of pure substances.**  *Clarification Statement: Examples of molecular-level models could include drawings, 3D ball and stick structures, and computer representations showing different molecules with different types of atoms. State Assessment Boundary: Valence electrons and bonding energy, the ionic nature of subunits of complex structures, complete depictions of all individual atoms in a complex molecule or extended structure, or calculations of proportions in mixtures are not expected in state assessment.*

**8.MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.***Clarification Statements: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl. Properties of substances include density, melting point, boiling point, solubility, flammability, and odor.*

**8.MS-PS1-4. Develop a model that describes and predicts changes in particle motion, relative spatial arrangement, temperature, and state of a pure substance when thermal energy is added or removed.***Clarification Statements: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of pure substances could include water, carbon dioxide, and helium.*

**8.MS-PS1-5. Use a model to explain that atoms are rearranged during a chemical reaction to form new substances with new properties. Explain that the atoms present in the reactants are all present in the products and thus the total number of atoms is conserved.***Clarification Statement: Examples of models can include physical models or drawings, including digital forms, that represent atoms. State Assessment Boundary: Use of atomic masses, molecular weights, balancing symbolic equations, or intermolecular forces are not expected in state assessment.*

**Technology/Engineering**

**6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.\***

**6.MS-ETS1-5(MA). Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations.\*** *Clarification Statements: Examples of visual representations can include sketches, scaled drawings, and orthographic projections. Examples of scale can include ¼’’ = 1’0’’ and 1cm=1 m.*

**6.MS-ETS2-1(MA). Analyze and compare properties of metals, plastics, wood, and ceramics, including flexibility, ductility, hardness, thermal conductivity, electrical conductivity, and melting point.**

**6.MS-ETS2-2(MA). Given a design task, select appropriate materials based on specific properties needed in the construction of a solution.** *Clarification Statement: Examples of materials can include metals, plastics, wood, and ceramics.*

**6.MS-ETS2-3(MA). Choose and safely use appropriate measuring tools, hand tools, fasteners, and common hand-held power tools used to construct a prototype.\****Clarification Statements: Examples of measuring tools include a tape measure, a meter stick, and a ruler. Examples of hand tools include a hammer, a screwdriver, a wrench, and pliers. Examples of fasteners include nails, screws, nuts and bolts, staples, glue, and tape. Examples of common power tools include jigsaw, drill, and sander.*

**7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.\***

**7.MS-ETS1-4. Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.\***

**7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.\***

**7.MS-ETS3-1(MA). Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage.**

**7.MS-ETS3-2(MA). Compare the benefits and drawbacks of different communication systems**. *Clarification Statements: Examples of communications systems can include radio, television, print, and internet. Examples of benefits and drawbacks can include speed of communication, distance or range, number of people reached, audio only vs. audio and visual, and one-way vs. two-way communication.*

**7.MS-ETS3-3(MA). Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices. Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems.***Clarification Statements: Examples of design elements include vehicle shape to maximize cargo or passenger capacity, terminals, travel lanes, and communications/controls. Examples of vehicles can include a car, sailboat, and small airplane.*

**7.MS-ETS3-4(MA). Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use.***Clarification Statements: Examples of components of a structural system could include foundation, decking, wall, and roofing. Explanations of function should include identification of live vs. dead loads and forces of tension, torsion, compression, and shear. Examples of uses include carrying loads and forces across a span (such as a bridge), providing livable space (such as a house or office building), and providing specific environmental conditions (such as a greenhouse or cold storage). State Assessment Boundary: Calculations of magnitude or direction of loads or forces are not expected in state assessment.*

**7.MS-ETS3-5(MA). Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system.**

**8.MS-ETS2-5(MA). Present information that illustrates how a product can be created using basic processes in manufacturing systems, including forming, separating, conditioning, assembling, finishing, quality control, and safety. Compare the advantages and disadvantages of human vs. computer control of these processes.**