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**SUGGESTED**

**INSTRUCTIONAL PLANNING GUIDE**

*for the Mississippi College- and Career-Readiness Standards*

**q SCIENCE**

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| **GRADE 5** |

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**INTRODUCTION**

The unprecedented, nationwide school closures in the spring of 2020 due to the COVID-19 pandemic have created a shift in how districts plan for school re-entry. Instead of the traditional brick-and-mortar planning, administrators are now identifying models that will support a variety of instructional delivery scenarios as they plan for school reopening. The traditional methods of planning and delivery are nearly impossible to implement as a stand-alone model; instead, innovative educators are developing and identifying strategies and resources to support a variety of distance learning scenarios as part of their plans. When using new models of delivery, it is important to recognize that the traditional approach to remediation—providing work better suited for earlier grades—may be insufficient. Instead, the conventional approach to remediation will likely compound the problem educators are trying to correct. According to a 2018 study, ***The Opportunity Myth***[[1]](#footnote-2), the approach of “meeting students where they are”, while often well-intended, only widens the achievement gap. Instead of remediation, teachers and administrators are encouraged to look toward acceleration methods to support student growth and close the gaps.

**PURPOSE**

The purpose of the Suggested Mississippi College- and Career-Readiness Standards Instructional Planning Guide is to provide teachers with an assistive tool for planning units of instruction. This tool will provide suggested standards grouping that should facilitate a coherent and logical delivery of related science concepts. Suggested planning sources and tools are included to assist teachers with curating instructional materials, designing and implementing effective lessons and activities, and building content knowledge and pedagogical practices. This tool encourages instructors to maintain a focus on preparing students to master skills and acquire knowledge at their current grade level.

**DEVELOPMENT**

The following suggested Instructional Planning Guide was developed with a focus on the subsequent key areas, Conceptual Connections, Real-World Connections and Phenomena, Embedded Science and Engineering Practices and Crosscutting Concepts, and Core Vocabulary. The standards are grouped into suggested units based on their underlying conceptual relationships. A list of real-world connections and/or phenomena is associated with each unit group. Their purpose is to give teachers and students researchable opportunities that lead to an in-depth and authentic quest for conceptual understanding. The embedded Science and Engineering Practices (SEPs) and Crosscutting Concepts (CCCs) are extracted from the grouped performance objectives and should encourage students to act and think like scientists. The included list of SEPs and CCCs does not indicate that other SEPs and CCCs are not relevant to the respective standard and performance objectives. Core vocabulary terms are included to emphasize terminology that is essential to the conceptual understandings captured in the standards and performance objectives. It is suggested that instructors pace themselves based on student assessment performance and demonstration of skills mastery and knowledge comprehension.

**RESOURCES for CONSIDERATION**

The resources listed below may be referenced to support classroom teachers in the development of lesson plans and instruction at the local level.   This list is not meant to be exhaustive, rather it represents consultative resources that align with the Units/Themes provided in the Instructional Planning Guides.   Educators are encouraged to use these resources in addition to those curriculum materials that meet the needs of the students they serve.

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| **High-Quality****Instructional Material** **(HQIM)** | **Planning and Instruction Resources** | **Assessment** **Resources** | **Professional Development** **Resources** |
| * [Adopted Science Texts](https://mdek12.org/OEER/Caravan)
* [STEM Teaching Tools](http://stemteachingtools.org/)
 | * [5 E Science Instructional Model](http://nextgenerationscience.weebly.com/5-es-of-science-instruction.html)
* [The Concord Consortium](https://concord.org/ngss/)
* [PBS Learning Media](https://mpb.pbslearningmedia.org/standards/0/)
* [Teacher Tube](https://www.teachertube.com/)
* [Next Generation Science Standards](https://www.nextgenscience.org/)
* [Phenomena for Next Generation Science](https://www.ngssphenomena.com/)
* [Khan Academy](https://www.khanacademy.org/)
* [OpenSciEd](https://www.openscied.org/)
* [Science Buddies](https://www.sciencebuddies.org/)
* [PhET Interactive Simulations](https://phet.colorado.edu/)
* [Phenomenal GRC Lessons](https://sites.google.com/3d-grcscience.org/going3d/home?authuser=0)
 | * [MS MAAP Program](https://mdek12.org/OSA/MAAP)
* [MS MAAP-A Program](https://mdek12.org/OSA/SP/MAAP-A)
* [Access for All Guidance](https://mdek12.org/sites/default/files/documents/OAE/OAE/2019-access-for-all-guide.pdf)
* [Problem-Attic](https://www.problem-attic.com/)
* [EDInformatics](https://www.edinformatics.com/testing/testing.htm)
* [STEM Teaching Tools for Assessments](http://stemteachingtools.org/tgs/Assessment)
* [Next Generation Science Assessment](http://nextgenscienceassessment.org/) (Middle Focus)
 | * [MDE Professional Development](https://www.mdek12.org/OPD/home)
* [The Teaching Channel](https://www.teachingchannel.com/)
* [California Academy of Sciences](https://www.calacademy.org/)
* [Teacher Tube](https://www.teachertube.com/)
* [Knowles Teacher Short Courses](https://knowlesteachers.org/knowles-academy/short-courses)
* [STEM Teaching Tools OER PD](http://stemteachingtools.org/pd)
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| **GRADE 5 SCIENCE****THEME: Interdependence of System** |
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| **UNIT OF STUDY**(REAL-WORLD CONNECTIONS and PHENOMENA)**q** | **SCIENCE FOUNDATION STANDARDSq** | **SCIENCE AND ENGINEERING PRACTICES SCIENCE CROSSCUTTING CONCEPTS** **q** | **VOCABULARY TERMS**CORE ACADEMIC **q** |
| **COURSE INTRODUCTION**In Grade 5, students will model processes, provide evidence to support arguments, and obtain and display data about relationships among a variety of systems. The crosscutting concept can be seen in life science through the transfer of energy from the sun into all parts of a food web and ecosystem. In physical science, the concept is developed through a study of matter and an examination of forces and motion through the lens of gravity’s effect on an object. The study of Earth and space science in fifth grade investigates the Earth in the universe, relationships between the bodies of our solar system, and human interaction with theEarth. Students are expected to engage in the engineering design process and conduct research to communicate their understanding of each standard in a variety of ways, including ELA connections to speaking and writing and mathematics connections to measurements using the metric system. Because of this yearlong study, students will gain content knowledge and tools to provide evidence and support arguments about the ways systems across content areas are interconnected and interdependent. | **FOUNDATION STATNDARDS*** Identify and select appropriate science and engineering tools to collect, analyze, and communicate science and engineering data and information.
* Demonstrate effective questioning and observation skills
* Communicate science and engineering data using appropriate SI units of measurement
* Identify and discuss science and engineering practices
* Identify and discuss Crosscutting Concepts
 | **SCIENCE and ENGINEERING PRACTICES*** Ask Question and Define Problems
* Develop and Use Models
* Analyze and Interpret Data
* Plan and Conduct Investigations
* Use Mathematical and Computational Thinking
* Engage in Scientific Argument from Evidence
* Construct Explanations and Design Solutions
* Obtain, Evaluate, and Communicate Information

**SCIENCE CROSSCUTTING CONCEPTS*** Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Scale, Proportion, and Quantity
* Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Structure and Function
* Stability and Change
 | Argument ChangeConcepts DataDependent Variable Engineering Evaluate Evidence Gram Independent Variable InterpretInvestigationLiter Meter Observation Patterns QuantityScience  SI Units of Measurement Stability  |

| **TERM 1** |
| --- |
| **UNIT OF STUDY**(REAL-WORLD CONNECTIONS and PHENOMENA)**q** | **MS CCR STANDARDSq** | **SCIENCE AND ENGINEERING PRACTICES SCIENCE CROSSCUTTING CONCEPTS** **q** | **VOCABULARY TERMS**CORE ACADEMIC **q** |
| **EARTH and the UNIVERSE:****Astronomy and the Solar System****REAL-WORLD CONNECTIONS and PHENOMENA*** Explore how to use and read star maps and use constellations to locate major stars or star systems in the sky.
* Discuss, with evidence, the possibility of life on other planets.
* View images of bodies and objects in space gathered from various space probes and satellites throughout history and the present.
 | **E.5.8A Students will demonstrate an understanding of the locations of objects in the universe.****E.5.8A.1** Develop and use scaled models of Earth’s solar system to demonstrate the size, composition (i.e., rock or gas), location, and order of the planets as they orbit the Sun.**E.5.8A.2** Use evidence to argue why the sun appears brighter than other stars**.****E.5.8A.3** Describe how constellations appear to move from Earth’s perspective throughout the seasons (e.g., Ursa Major, Ursa Minor, and Orion).**E.5.8A.4** Construct scientific arguments to support claims about the importance of astronomy in navigation and exploration, including the use of telescopes, compasses, and star charts.**E.5.8B.4** Obtain information and analyze how our understanding of the solar system has evolved over time (e.g., Earth-centered model of Aristotle and Ptolemy compared to the Sun-centered model of Copernicus and Galileo). | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Develop and Use Models
* Analyze and Interpret Data
* Engage in Scientific Argument from Evidence
* Construct Explanations and Design Solutions
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Scale, Proportion, and Quantity
* Systems and System Models
* Stability and Change
 | Apparent BrightnessAsteroidAsteroid BeltAstronomyConstellationOrbitPlanetRevolutionSolar SystemStarSun |
| **EARTH and the UNIVERSE:****Earth-Sun-Moon System****REAL-WORLD CONNECTIONS and PHENOMENA*** Observe and explore the phases of the moon and be able to explain observations scientifically.
* Research lunar and solar eclipses from a science perspective and possibly predict future occurrences.
 | **E.5.8B Students will demonstrate an understanding of the principles that govern moon phases, day and night, appearance of objects in the sky, and seasonal changes.****E.5.8B.1** Analyze and interpret data from observations and research (e.g., from NASA, NOAA, or the USGS) to explain patterns in the location, movement, and appearance of the moon throughouta month and over the course of a year.**E.5.8B.2** Develop and use a model of the Earth-Sun-Moon system to analyze the cyclic patterns of lunar phases, solar and lunar eclipses, and seasons.**E.5.8B.3** Develop and use models to explain the factors (e.g., tilt, revolution, and angle of sunlight) that result in Earth’s seasonal changes. | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Develop and Use Models
* Analyze and Interpret Data
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Structure and Function
* Stability and Change
 | AxisConstellationEarthEclipseLunar Cycle ModelMoonRotateSeasonSolsticeSunTilt |
| **EARTH and the UNIVERSE:****Earth and Human Interactions****REAL-WORLD CONNECTIONS and PHENOMENA*** Research and explore the consequences of building dams and altering natural water flow.
* Discuss how communities prepare for and rebuild after natural or manmade disasters paying attention to conserving natural resources, revamping building codes, etc.
 | **E.5.10 Students will demonstrate an understanding of the effects of human interaction with Earth and how Earth’s natural resources can be protected and conserved.****E.5.10.1** Collect and organize scientific ideas that individuals and communities can use to conserve Earth’s natural resources and systems (e.g., implementing watershed management practices toconserve water resources, utilizing no-till farming to improve soil fertility, reducing emissions to abate air pollution, or recycling to reduce landfill waste).**E.5.10.2** Design a process for better preparing communities to withstand manmade or natural disasters (e.g., removing oil from water or soil, systems that reduce the impact of floods, structures that resist hurricane forces). Use an engineering design process to define the problem, design, construct, evaluate, and improve the disaster plan. \* **All SEPs and CCCs are applicable.** | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Analyze and Interpret Data
* Plan and Conduct Investigations
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Stability and Change
 | RecycleResourceConserveConservation StrategiesEnvironmentCarrying CapacityNatural DisasterPollutionEmissionsSoil Fertility |

| **TERM 2** |
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| **UNIT OF STUDY**(REAL-WORLD CONNECTIONS and PHENOMENA)**q** | **MS CCR STANDARDSq** | **SCIENCE AND ENGINEERING PRACTICES SCIENCE CROSSCUTTING CONCEPTS** **q** | **VOCABULARY TERMS**CORE ACADEMIC **q** |
| **MOTIONS FORCES and ENERGY:****Newton’s Laws of Motion****REAL-WORLD CONNECTIONS and PHENOMENA*** Examine the sport of baseball from the standpoint of forces and motion. Examine the movement of the ball in various scenarios or plays and discuss all forces that affect the motion of the ball.
* Explore various types of forces and journal daily occurrences of those forces detailing how the force(s) was/were experienced.
 | **P.5.6 Students will demonstrate an understanding of the factors that affect the motion of an object through a study of Newton's Laws of Motion.****P.5.6.1** Obtain and communicate information describing gravity's effect on an object.**P.5.6.2** Predict the future motion of various objects based on past observation and measurement of position, direction, and speed.**P.5.6.3** Develop and use models to explain how the amount or type of force, both contact and non-contact, affects the motion of an object.**P.5.6.4** Plan and conduct scientific investigations to test the effects of balanced and unbalanced forces on the speed and/or direction of objects in motion.**P.5.6.5** Predict how a change of force, mass, and/or friction affects the motion of an object to convert potential energy into kinetic energy.**P.5.6.6** Design a system to increase the effects of friction on the motion of an object (e.g., non-slip surfaces or vehicle braking systems or flaps on aircraft wings). Use an engineering design process to define the problem, design, construct, evaluate, and improve the system. \* **Al SEPs and CCCs are applicable.** | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Develop and Use Models
* Analyze and Interpret Data
* Plan and Conduct Investigations
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Stability and Change
 | Balanced ForcesDirectionForceFrictionMotionMovementPositionPullPushSpeedUnbalanced Force |
| **ORGANIZATION of MATTER and CHEMICAL REACTIONS:****Physical Properties of Matter****REAL-WORLD CONNECTIONS and PHENOMENA*** Research and explore the properties of characteristics of aerogels. Explore how these properties can be used to improve human life and living.
* Research the advances in the types of materials used in modern manufacturing projects (homes, cars, buildings, etc.) keeping a focus on the properties of materials that make them a better use for products and services.
 | **P.5.5A Students will demonstrate an understanding of the physical properties of matter.****P.5.5A.1** Obtain and evaluate scientific information to describe basic physical properties of atoms and molecules.**P.5.5A.2** Collect, analyze, and interpret data from measurements of the physical properties of solids, liquids, and gases (e.g., volume, shape, movement, and spacing of particles)**P.5.5A.3** Analyze matter through observations and measurements to classify materials (e.g., powders, metals, minerals, or liquids) based on their properties.**P.5.5A.4** Plan and conduct investigations about how the density of an object affects whether the object sinks or floats when placed in a liquid.**P.5.5A.5** Design a vessel that can safely transport a dense substance (e.g., syrup, coins, marbles) through water at variousdistances andunder variable conditions. Use an engineering design process to define the problem, design, construct, evaluate, and improve the vessel. \* **All SEPs and CCCs are applicable.** | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Develop and Use Models
* Analyze and Interpret Data
* Plan and Conduct Investigations
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Stability and Change
 | HardnessPhysical ChangePhysical PropertiesReflectionRelative DensitySolubilityMagnetic ForceDensityElectrical ConductivityThermal ConductivityVolumePowder |
| **ORGANIZATION of MATTER and CHEMICAL REACTIONS:****Chemical and Physical Changes in Matter****REAL-WORLD CONNECTIONS and PHENOMENA*** Examine the changes in substances due to reacting with oxygen (rusting, patina, browning fruit, etc.)
* Examine physical changes in nature such as evaporation, condensation, boiling water, etc. and discuss these changes with respect to changes in energy.
 | **P.5.5C Students will demonstrate an understanding of the difference between physical and chemical changes.****P.5.5C.2** Analyze and communicate the results of physical changes to a substance that results in a reversible change (e.g., changes in states of matter with the addition or removal of energy, changes in size or shape or combining/separating mixtures or solutions).**P.5.5C.1** Analyze and communicate the results of chemical changes that result in the formation of new materials (e.g., decaying, burning, rusting, or cooking).**P.5.5C.3** Analyze and interpret data to support claims that when two substances are mixed, the total weight of matter is conserved. | **EMBEDDED SCIENCE and ENGINEERING PRACTICES**  * Develop and Use Models
* Analyze and Interpret Data
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Cause and Effect *(Mechanism and Explanation)*
* Energy and Matter *(Flows, Cycles, Conservation)*
* Stability and Change
 | Physical ChangePhysical PropertyChemical ChangeChemical PropertyPrecipitate |

| **TERM 3** |
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| **UNIT OF STUDY**(REAL-WORLD CONNECTIONS and PHENOMENA)**q** | **MS CCR STANDARDSq** | **SCIENCE AND ENGINEERING PRACTICES SCIENCE CROSSCUTTING CONCEPTS** **q** | **VOCABULARY TERMS**CORE ACADEMIC **q** |
| **ORGANIZATION of MATTER and CHEMICAL REACTIONS:****Mixtures and Solutions****REAL-WORLD CONNECTIONS and PHENOMENA*** Demonstrate various types of chemical reactions taking place (i.e. an oscillating reaction to show color change, elephant toothpaste to demonstrate gas production).
* Demonstrate how sugar will dissolve faster in hot water than in cold water indicating that temperature influences how fast or slow something will dissolve.
* Use a magnet to remove traces of metals from cereal, thus indicating the iron is a part of a mixture and not a solution.
 | **P.5.5B Students will demonstrate an understanding of mixtures and solutions.****P.5.5B.1** Obtain and evaluate scientific information to describe what happens to the properties of substances in mixtures and solutions.**P.5.5B.2** Analyze and interpret data to communicate that the concentration of a solution is determined by the relative amount of solute versus solvent in various mixtures.**P.5.5B.3** Investigate how different variables (e.g., temperature change, stirring, particle size, or surface area) affect the rate at which a solute will dissolve.**P.5.5B.4** Design an effective system (e.g., sifting, filtration, evaporation, magnetic attraction, or floatation) for separating various mixtures. Use an engineering design process to define theproblem, design, construct, evaluate, and improve the system. \***All SEPs and CCCs are applicable.** | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Analyze and Interpret Data
* Plan and Conduct Investigations
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Stability and Change
 | DissolveEvaporationFilterMagneticMixturePropertiesSolutionSubstanceSubstancesPrecipitateSoluteSolvent |
| **ECOLOGY and INTERDEPENDENCE****Photosynthesis****REAL-WORLD CONNECTIONS and PHENOMENA*** Research and discuss the possibility of animals having the capacity to undergo the process of photosynthesis to produce their own food.
* Research plants that do not use photosynthesis but survive off other plants.
 | **L.5.3A Students will demonstrate an understanding of photosynthesis and the transfer of energy from the sun into chemical energy necessary for plant growth and survival.****L.5.3A.1** Research and communicate the basic process of photosynthesis that is used by plants to convert light energy into chemical energy that can be stored and released to fuel an organism’s activities.**L.5.3A.2** Analyze environments that do not receive direct sunlight and devise explanations as to how photosynthesis occurs, either naturally or artificially. | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Ask Question and Define Problems
* Develop and Use Models
* Engage in Scientific Argument from Evidence
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Structure and Function
* Stability and Change
 | Carbon DioxideLeafNutrient TransportOxygenPhotosynthesisRadiant EnergyRootStem |

| **TERM 4** |
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| **UNIT OF STUDY**(REAL-WORLD CONNECTIONS and PHENOMENA)**q** | **MS CCR STANDARDSq** | **SCIENCE AND ENGINEERING PRACTICES SCIENCE CROSSCUTTING CONCEPTS** **q** | **VOCABULARY TERMS**CORE ACADEMIC **q** |
| **ECOLOGY and INTERDEPENDENCE****Food Webs****REAL-WORLD CONNECTIONS and PHENOMENA*** Explore the impact of non-native plants and animals on local food-webs. How has the increased number of “wild” pythons in the US impacted local ecosystems?
* Research and discuss the importance of the mushroom in an ecosystem.
 | **L.5.3B Students will demonstrate an understanding of a healthy ecosystem with a stable web of life and the roles of living things within a food chain and/or food web, including producers, primary and secondary consumers, and decomposers.****L.5.3B.1** Obtain and evaluate scientific information regarding the characteristics of different ecosystems and the organisms they support (e.g., salt, and fresh water, deserts, grasslands, forests, rainforests, or polar tundra lands).**L.5.3B.2** Develop and use a food chain model to classify organisms as producers, consumers, or decomposers. Trace the energy flow to explain how each group of organisms obtains energy.**L.5.3B.3** Design and interpret models of food webs to justify what effects the removal or the addition of a species (i.e., introduced or invasive) would have on a specific population and/or the ecosystem as a whole.**L.5.3B.4** Communicate scientific or technical information that explains human positions in food webs and our potential impacts on these systems. | **EMBEDDED SCIENCE and ENGINEERING PRACTICES** * Develop and Use Models
* Plan and Conduct Investigations
* Engage in Scientific Argument from Evidence
* Obtain, Evaluate, and Communicate Information

**EMBEDDED CROSSCUTTING CONCEPTS**  * Patterns
* Cause and Effect *(Mechanism and Explanation)*
* Systems and System Models
* Energy and Matter *(Flows, Cycles, Conservation)*
* Structure and Function
* Stability and Change
 | ConsumerDecomposerEcosystemEnergy TransferEnvironmentFoodFood ChainFood WebFungiNichePopulationProducer |

1. https://tntp.org/assets/documents/TNTP\_The-Opportunity-Myth\_Web.pdf [↑](#footnote-ref-2)