Unit #1- Physical Science- Mixtures and Solutions

Content Area: **Science**
Course(s): **Grade 5**
Time Period: **First Marking Period**
Length: **12 Week**
Status: **Published**

Unit Overview

Chemistry is the study of the structure of matter and the changes or transformations that take place within those structures. Learning about the properties and behaviors of substances and systems of substances gives us knowledge about how things go together and how they can be taken apart and gives us the opportunity to use and develop models that explain phenomena too small to see directly. Learning about changes in substances can lead to the development of new materials and new ways to produce energy and resources such as clean drinking water.

This unit has five investigations that introduce students to fundamental ideas about matter and its interactions. Students come to know that matter is made of particles too small to be seen and develop the understanding that matter is conserved when it changes state-from solid to liquid to gas-when it dissolves in another substance, and when it is part of a chemical reaction. Students have experiences with mixtures, solutions of different concentrations, and reactions forming new substances. They also engage in engineering experiences with separation of materials. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and energy and matter

STAGE 1- DESIRED RESULTS

Educational Standards

2020 New Jersey Student Learning Standards- Science

Performance Expectations

Physical Sciences

SCI.5-PS1	Matter and Its Interactions
SCI.5-PS1-1	Develop a model to describe that matter is made of particles too small to be seen.
SCI.5-PS1-4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
SCI.5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
SCI.5-PS1-3	Make observations and measurements to identify materials based on their properties.
SCI.5-PS1-2	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
SCI.5-PS2	Motion and Stability: Forces and Interactions
SCI.5-PS3	Energy
SCI.5-PS3-1	Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Life Sciences

SCI.5-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.5-LS1	From Molecules to Organisms: Structures and Processes
SCI.5-LS1-1	Support an argument that plants get the materials they need for growth chiefly from air and water.
SCI.5-LS2-1	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Earth and Space Sciences

SCI.5-ESS2-1	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
SCI.5-ESS1-1	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
SCI.5-ESS2-2	Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
SCI.5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
SCI.5-ESS3-1	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
SCI.5-ESS1	Earth's Place in the Universe
SCI.5-ESS3	Earth and Human Activity
SCI.5-ESS2	Earth's Systems

Engineering Design

SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Science and Engineering Practices

- Practice 1: Asking Questions and Defining Problems
- Practice 2: Developing and Using Models
- Practice 3: Planning and Carrying Out Investigations
- Practice 4: Analyzing and Interpreting Data
- Practice 5: Using Mathematics and Computational Thinking
- Practice 6: Constructing Explanations and Designing Solutions
- Practice 7: Engaging in Argument from Evidence
- Practice 8: Obtaining, Evaluating, and Communicating Information

Cross Cutting Concepts

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity
- Systems and System Models
- Energy and Matter
- Structure and Functions
- Stability and Change

Disciplinary Core Ideas

Physical Sciences

- PS1. Matter and Its Interaction
- PS1.A: Structure and Properties of Matter
- PS1.B: Chemical Reactions

- PS1.C: Nuclear Processes
- PS2. Motion and Stability: Forces of Interaction
- PS2.A: Forces and Motion
- PS2.B: Types of Interactions
- PS2.C: Stability and Instability in Physical Systems
- PS3. Energy
- PS3.A: Definitions of Energy
- PS3.B: Conservation of Energy and Energy Transfer
- PS3.C: Relationship Between Energy and Forces
- PS3.D: Energy and Chemical Processes in Everyday Life
- PS4. Waves and Their Applications in Technologies for Information Transfer
- PS4.A: Wave Properties
- PS4.B: Electromagnetic Radiation
- PS4.C: Information Technologies and Instrumentation

Life Sciences

- LS1. From Molecules to Organisms: Structure and Processes
- LS1.A: Structure and function
- LS1.B: Growth and development of organisms
- LS1.C: Growth and development of organisms
- LS1.D: Information Processing
- LS2. Ecosystems: Interactions, Energy, and Dynamics
- LS2.A: Interdependent relationships in ecosystems
- LS2.B: Cycles of matter and energy transfer in ecosystems
- LS2.C: Ecosystem dynamics, functioning, and resilience
- LS2.D: Social interactions and group behavior
- LS3. Heredity: Inheritance and Variation of Traits
- LS3.A: Inheritance of traits
- LS3.B: Variation of traits
- LS4. Biological Evolution: Unity and Diversity
- LS4.A: Evidence of common ancestry and diversity
- LS4.B: Natural selection
- LS4.C: Adaptation
- LS4.D: Biodiversity and humans

Earth and Space Sciences

- ESS1. Earth's Place in the Universe
- ESS1.A: The universe and its stars
- ESS1.B: Earth and the solar system
- ESS1.C: The history of planet Earth
- ESS2. Earth's System
- ESS2.A: Earth materials and systems
- ESS2.B: Plate tectonics and large-scale system interactions
- ESS2.C: The roles of water in Earth's surface processes
- ESS2.D: Weather and climate
- ESS2.E: Biogeology
- ESS3. Earth and Human Activity
- ESS3.A: Natural resources
- ESS3.B: Natural hazards
- ESS3.C: Human impacts on Earth systems
- ESS3.D: Global climate change

Essential Questions

Investigation 1: Separating Mixtures

Part 1: How can a mixture be separated?

Part 2: Where does the solid material go when a solution is made?

Part 3: How can you separate a mixture of dry materials?

Part 4: Are there materials outdoors that will dissolve in water?

Investigation 2: Developing Models

Part 1: What is the process to develop a model of the black box?

Part 2: How does a drought-stopper system work?

Part 3: What is the difference between dissolving and melting?

Investigation 3: Concentration

Part 1: Are all solutions made with soft-drink powder and water the same?

Part 2: How can you determine which salt solution is more concentrated?

Part 3: How can you determine the relative concentrations of three mystery solutions?

Part 4: What is the relationship between salt-solution concentration and density?

Investigation 4: Reaching Saturation

Part 1: Is there a limit to the amount of salt that will dissolve in 50 mL of water?

Part 2: Does it always take the same amount of solid materials to saturate 50 mL of water?

Part 3: What is the identity of the mystery substance?

Part 4: What is in our water samples? What is a design to remove salt from ocean water?

Investigation 5: Fizz Quiz

Part 1: What is the effect of mixing two substances with water?

Part 2: How can we identify the products from the baking soda and calcium chloride reaction?

Part 3: What happens when you mix substances with water in a bag?

Enduring Understanding

This physical science unit develops students' understanding of how to explain the structure, properties, and interactions of matter.

Students will know...

Investigation 1: Separating Mixtures

constraint, criteria, crystal, diatomaceous earth, dissolve, engineer, evaporation, extract, filter, gravel, magnet, mass, mixture, powder, property, salt, screen, separate, solute, solution, solvent, transparent

Investigation 2: Developing Models

analyze, collaboration, condensation, consensus, construct, freezing, melting, model, phase change, revise, siphon, water vapor

Investigation 3: Concentration

concentrated, concentration, density, dilute, equal volumes, layer, less dense, more dense

Investigation 4: Reaching Saturation

citric acid, Epsom salts, insoluble, saturated solution, soluble, solubility, substance, supersaturated

Investigation 5: Fizz Quiz

baking soda, calcium carbonate, calcium chloride, carbon dioxide, chalk, chemical reaction, gas, precipitate, product, reactant

Students will be able to...

Investigation 1: Separating Mixtures

- Define a simple design problem concerning how to separate a dry mixture using a systematic and efficient process.
- Develop and use models to understand how substances dissolve in water to form solutions.
- Plan and carry out investigations dealing with making and separating mixtures and solutions; make observations to produce data to serve as evidence for the mechanism of dissolving and a design solution for separating a mixture of four materials.
- Analyze and interpret data to make sense of the phenomenon of dissolving using logical reasoning and using data to refine a separation process.
- Use mathematics and computational thinking to measure and compare the volume and mass of matter before and after mixing to form solutions.
- Design solutions by applying scientific ideas of separating mixtures to a problem.
- Engage in argument from evidence to support the explanation that a solid remains in a solution after it dissolves.
- Obtain, evaluate, and communicate information from books and media and integrate that with firsthand experiences to construct explanations about mixtures and solutions.

Investigation 2: Developing Models

- Develop and use models to understand the process of melting and dissolving and the difference between the two.
- Plan and carry out investigations dealing with how to develop physical and conceptual models to explain phenomena that are inaccessible to direct observation.
- Analyze and interpret data to make sense of phenomena that are inaccessible to direct observation.
- Construct explanations using evidence to explain what is in a black box, how a drought stopper works, and the difference between melting and dissolving.

- Engage in argument from evidence to develop models to explain phenomena and to critique the models put forth by others.
- Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations of phase change.

Investigation 3: Concentration

- Develop and use models to understand the relationship between solute and solvent particles in a solution.
- Plan and carry out investigations to produce data to serve as the basis for evidence to determine the relative concentrations of a series of salt solutions and make predictions about what would happen when equal amounts of two salt solutions are compared on a balance; represent data in tables to show relationships.
- Analyze and interpret data to order a series of salt solutions of different concentrations based on their density.
- Construct explanations using evidence, such as the intensity of color, taste (when appropriate), and mass of equal volumes to determine relative concentrations of a series of soft drinks or salt solutions.
- Engage in argument from evidence to determine the relative concentrations of a series of salt solutions and to construct an explanation of the interaction of particles in a solution.
- Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences to construct explanations about solutions of different concentrations.

Investigation 4: Reaching Saturation

- Ask questions about the nature of solutions dealing with concentration, saturation, and evaporation; define the problems involved in removing salt from ocean water.
- Develop and use models to understand how the solute and solvent interact in a solution.
- Plan and carry out investigations dealing with the property of solubility of solid materials to produce data to serve as the basis for evidence to identify a substance; make observations and measurements in a systematic way to produce reliable and representative data in tables to reveal patterns.
- Analyze and interpret data to use the properties revealed to find out more about solutions. Compare and contrast the data collected by a number of groups to better understand how the procedures used affect the outcomes.
- Use mathematics and computational thinking as a tool to develop better models of solutions.
- Construct explanations using evidence, such as the mass of the saturated solution, to determine the relative solubilities of different substances in water.

Investigation 5: Fizz Quiz

- Ask questions about the nature of chemical reactions.
- Develop and use models to understand how matter is conserved when reactants turn into new products during chemical reactions.
- Plan and carry out investigations dealing with chemical reactions; make observations and measurements in a systematic way to produce reliable results, and record data to develop evidence for explanations.
- Analyze and interpret data to make sense of chemical reactions using logical reasoning. Compare and contrast the data collected by a number of groups to better understand how the procedures used affect the outcomes and how changing a variable might affect the result.
- Construct explanations using evidence, such as the observations of change during and after a chemical reaction and the processes by which products can be separated and tested to determine their identity.

Obtain, evaluate, and communicate information from books and media and integrate that with their firsthand experiences

to construct explanations about reactants and products in chemical reactions and conservation of matter.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment Suggestions

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments Suggestions

Investigation 1: Separating Mixtures

- Science notebook entries
- Response sheet
- Performance assessment

- Survey
- Investigation 1 I-Check

Investigation 2: Developing Models

- Science notebook entries
- Response sheet
- Investigation 2 I-Check

Investigation 3: Concentration

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 3 I-Check

Investigation 4: Reaching Saturation

- Science notebook entries
- Response sheet
- Performance assessment
- Investigation 4 I-Check

Investigation 5: Fizz Quiz

- Science notebook entries
- Response sheet

Benchmark Assessments

Unit Posttest

STAGE 3- LEARNING PLAN

Instructional Map

Investigation 1: Separating Mixtures

Investigation 2: Developing Models

Investigation 3: Concentration

Investigation 4: Reaching Saturation

Investigation 5: Fizz Quiz

Investigation 1: Separating Mixtures

Investigation 1: Part 1- Making and Separating Mixtures

Students make three mixtures of solid materials (salt, gravel, and diatomaceous earth) and water. After they observe the mixtures, they attempt to separate them with screens and filters. They discover that water and salt make a special kind of mixture-a solution-that cannot be separated with a filter.

Content:

- A mixture is two or more materials intermingled.
- An aqueous solution is a mixture in which a substance disappears (dissolves) in water to make a clear liquid.

Investigation 1: Part 2- Separating a Salt Solution

Students add a measured amount of salt to a measured amount of water to make a solution. They compare the total mass of a mixture to the mass of its parts to infer that the invisible salt is still present. Students evaporate the salt solution to reclaim the salt as crystals.

Content:

- Mixtures can be separated into their constituents.
- The mass of a mixture is equal to the mass of its constituents.

Investigation 1: Part 3- Separating a Dry Mixture

Students are given a dry mixture (gravel, powder, and salt) to separate. The mixture includes a new mystery material, magnetite. Students separate the mixture by using magnets, screens, filters, and evaporation. Students review the elements of engineering design as they design an efficient system to separate a dry mixture. They discuss their efforts in terms of science and engineering practices.

Content:

- Mixtures can be separated into their constituents.
- Mixtures and solutions can be separated, using screens, filters, and evaporation.
- Possible solutions to a problem are limited by available materials and resources (constraints).
- The success of a designed solution is determined by considering the desired features of a solution (criteria).

Investigation 1: Part 4- Outdoor Solutions

Students are challenged to discover if natural materials in the schoolyard will make solutions when mixed with water. When students observe that organic material changes the color of the water, they are introduced to the concept of an extract.

Content:

- A mixture is two or more materials intermingled.
- An aqueous solution is a mixture in which a substance disappears (dissolves) in water to make a clear liquid.

Investigation 2: Developing Models

Investigation 2: Part 1- Black Boxes

Students make multisensory observations of sealed black boxes in an effort to determine what is inside. They develop models and try to reach consensus with other students who investigated the same boxes. Students construct physical models of black boxes in an effort to replicate the behaviors of the original black boxes.

Content:

- Models are explanations of objects, events, or systems that cannot be observed directly.
- Models are representations used for communicating and testing.
- Developing a model is an iterative process, which may involve observing, constructing, analyzing, and revising.

Investigation 2: Part 2- Drought Stopper

Students observe a device that delivers 600-700 mL of water when only 100 mL of water is put in. They develop conceptual models to explain how they think the device works.

Content:

- Models are explanations of objects, events, or systems that cannot be observed directly.
- Models are representations used for communicating and testing..

Investigation 2: Part 3- Models for Change in Properties

Students use hot water to heat four common solid materials and observe that one melts, two soften, and one is unchanged. With this review of phase change and melting, students are asked to develop models of dissolving and melting and tell how they are different.

Content:

- Dissolving is an interaction between two (or more) substances: a solute which dissolves, and a solvent, which does the dissolving and into which the solute disappears.
- Melting is a change in a single substance from solid to liquid caused by heat (energy transfer).
- The amount of matter is conserved when it changes form.

Investigation 3: Concentration

Investigation 3: Part 1- Soft-Drink Recipes

Students observe and compare soft-drink solutions that differ in the amount of powder (water held constant) and in the amount of water (powder held constant) to develop the concept of concentration.

Content:

- Concentration is the amount of dissolved solid material per unit volume of water.
- Solutions with a lot of solid dissolved in a volume of water are concentrated; solutions with little solid dissolved in a volume of water are dilute.

Investigation 3: Part 2- Salt Concentration

Students make salt solutions and compare their concentrations. Taste is no longer a viable indicator, so students use a balance to determine the relative concentration of the salt solutions.

Content:

- Concentration is the amount of dissolved solid material per unit volume of water.
- A concentrated solution can be diluted with water.
- When equal volumes of two salt solutions are weighed, the heavier one is the more concentrated solution.

Investigation 3: Part 3- Mystery Solutions

Students determine the relative concentrations of three mystery salt solutions (the most concentrated and the most dilute) by comparing equal volumes on a balance. More concentrated solutions have a greater mass.

Content:

- Concentration is the amount of dissolved solid material per unit volume of water.
- When equal volumes of two salt solutions are weighed, the heavier one is the more concentrated solution.

Investigation 3: Part 4- Liquid Layers

Students observe that a mass piece sinks in one liquid and floats in another, because the liquids are different densities. Armed with the knowledge that less dense objects float on more dense liquids, students investigate four salt solutions to discover which is more concentrated based on how they layer.

Content:

- Density is mass per unit volume.
- The greater the concentration of a salt solution, the greater is its density.

- Less dense liquids and solid objects float on more dense solutions.

Investigation 4: Reaching Saturation

Investigation 4: Part 1- Salt Saturation

Students make a saturated solution by adding salt to water until no more salt will dissolve. After separating the undissolved solid salt, students use a balance to determine the mass of salt needed to saturate 50 mL of water. The two components of a solution are identified as the solvent and solute.

Content:

- A solution is saturated when as much solid material as possible has dissolved in the liquid.
- Solutions are composed of a solvent (liquid) and a solute (solid); the solute is dissolved in the solvent.

Investigation 4: Part 2- Epsom Salts Saturation

Students add Epsom salts to 50 mL of water to make a saturated solution. They use a balance to determine the mass of Epsom salts in the saturated solution in order to compare the solubility of salt and Epsom salts.

Content:

- A solution is saturated when as much solid material as possible has dissolved in the liquid.
- Solubility is the property that indicates how readily a solute dissolves in a solvent.
- Solubility varies from substance to substance and is affected by kind of solvent, temperature, and other factors.

Investigation 4: Part 3- The Saturation Puzzle

Students are given an unknown substance (citric acid) to identify based on its properties. They determine the unknown's solubility and compare their results to a table of known solubilities for five substances. Students evaporate the unknown solution and compare the crystals to photographic images to confirm their identification.

Content:

- Solubility is the property that indicates how readily a solute dissolves in a solvent.

- A substance is a single, pure material.
- Substances form predictable, identifiable crystals when solutions evaporate.

Investigation 4: Part 4- What's in Your Water?

Students collect water samples from the school and use observation and evaporation to determine what's in each sample. Students find out about the source of their local water, where it is stored, and how it is treated. They apply their knowledge of solution chemistry to design a process to make ocean water suitable for drinking.

Content:

- Apply techniques used to separate mixtures and solutions.

Investigation 5: Fizz Quiz

Investigation 5: Part 1- Chemical Reactions

Students use three substances (calcium chloride, baking soda, and citric acid) to make three different combinations of two substances. They add water and observe the changes that occur. The new products that form (a gas and a white precipitate) are identified as evidence of a chemical reaction.

Content:

- Some mixtures of substances result in a chemical reaction.
- During reactions, starting substances (reactants) change into new substances (products).
- Formation of a gas or precipitate is evidence of a chemical reaction.

Investigation 5: Part 2- Reaction Products

Students use techniques from earlier investigations (filtering and evaporation) to separate the products of the reactions. They identify the products by testing the precipitate with vinegar to see if it is chalk, and by evaporating the liquid to discover the typical square crystals of salt.

Content:

- Formation of a precipitate occurs in some chemical reactions.
- Some products of a reaction are soluble and can be observed only after evaporating the solution.
- Calcium carbonate reacts with acid.

Investigation 5: Part 3- Reaction in a Zip Bag

Using combinations of the substances used in Parts 1 and 2, students produce chemical reactions in zip bags. The closed systems allow students to effectively observe the volume of gas and discover a new precipitate when all three substances are mixed in a bag.

Content:

- Some mixtures of substances result in a chemical reaction.
- Formation of a gas or precipitate is evidence of a chemical reaction.

Modifications/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means

- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate

- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in "chunks"
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn

- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-Direct
- Repeated Drill / Practice
- Shortened Assignments
- Teacher Notes
- Tutorials
- Use of Additional Reference Material
- Use of Audio Resources

High Preparation Differentiation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Menu Assignments
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation Differentiation

- Choice of Book / Activity
- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Extend Skills
- Mini Workshops to Re-teach
- Open-ended Activities
- Think-Pair-Share by Interest
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Learning Style
- Think-Pair-Share by Readiness
- Use of Collaboration
- Use of Reading Buddies

- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Integration- Interdisciplinary Connections

New Jersey Student Learning Standards for Mathematics

N-Q.A.Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; chose and interpret the scale and the origin in graphs and data displays
2. Define appropriate quantities for the purpose of descriptive modeling.
3. Choose the level of accuracy appropriate to limitations on measurement when reporting quantities.

N-CN.A. Perform arithmetic operations with complex numbers.

1. Know there is a complex number.
2. Use the commutative, associative, and distributive properties.

A-SSE.A. Interpret the structure of expressions

1. Interpret expressions that represent a quantity in terms of its context.

A-SSE.B. Write expressions in equivalent forms to solve problems.

1. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

F-IF.A. Understand the concept of a function and use functional notation.

1. Understand that a function from one set to another set.

F-IF.B Interpret functions that arise in applications in terms of the context.

F-IF.C. Analyze functions using different representations

S-ID.A. Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on a real number line.

S-ID.B. Summarize, represent, and interpret data on two categorical and quantitative variables.

S-ID.C. Interpret linear models.

S-IC.A. Understand and evaluate random processes underlying statistical experiments.

S-IC.B. Make inferences and justify conclusions from surveys, experiments, and observational studies.

English Language Arts Standards – Grade 5

RF 4: Read text with purpose and understanding.

RI 1: Ask and answer questions about key details.

RI 2: Identify main topic and retell key details.

RI 3: Describe the connection between two ideas.

RI 4: Ask and answer questions about unknown words.

RI 5: Identify the front cover, back cover, and title page of a book.

RI 6: Distinguish their own point of view from that of the author of the text.

RI 7: Describe the relationship between illustrations and the text.

RI 8: Identify the reasons an author gives to support points.

RI 9: Identify similarities in and differences between text on the same topic.

RI 10: Actively engage in group reading activities with purpose and understanding.

W 2: Write informative /explanatory text.

W 4: Produce clear and coherent writing.

W 5: Strengthen writing by revising and editing.

W 7: Conduct short research projects.

W 8: Gather information to answer a question.

W 9: Draw evidence from informational text to support reflection.

2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design

CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

8.2 Design Thinking

8.2.5.ED.1: Explain the functions of a system and its subsystems. 8.2.5.ED.2: Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models. 8.2.5.ED.3: Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task. 8.2.5.ED.4: Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints). 8.2.5.ED.5: Describe how specifications and limitations impact the engineering design process. 8.2.5.ED.6: Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
8.2.5.ITH.1: Explain how societal needs and wants influence the development and function of a product and a system. 8.2.5.ITH.2: Evaluate how well a new tool has met its intended purpose and identify any shortcomings it might have. 8.2.5.ITH.3: Analyze the effectiveness of a new product or system and identify the positive and/or negative consequences resulting from its use. 8.2.5.ITH.4: Describe a technology/tool that has made the way people live easier or has led to a new business or career.
8.2.5.NT.1: Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem. 8.2.5.NT.2: Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies. 8.2.5.NT.3: Redesign an existing product for a different purpose in a collaborative team. 8.2.5.NT.4: Identify how improvement in the understanding of materials science impacts technologies.
8.2.5.ETW.1: Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems. 8.2.5.ETW.2: Describe ways that various technologies are used to reduce improper use of resources. 8.2.5.ETW.3: Explain why human-designed systems, products, and environments need to be

constantly monitored, maintained, and improved. 8.2.5.ETW.4: Explain the impact that resources, such as energy and materials used to develop technology, have on the environment. 8.2.5.ETW.5: Identify the impact of a specific technology on the environment and determine what can be done to increase positive effects and to reduce any negative effects, such as climate change.
8.2.5.EC.1: Analyze how technology has contributed to or reduced inequities in local and global communities and determine its short- and long-term effects.

2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

9.2 Career Awareness and Planning

9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

9.2.5.CAP.2: Identify how you might like to earn an income. 9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations. 9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.

9.4 Life Literacies and Key Skills

9.4.5.CI.1: Use appropriate communication technologies to collaborate with individuals with diverse perspectives about a local and/or global climate change issue and deliberate about possible solutions (e.g., W.4.6, 3.MD.B.3,7.1.NM.IPERS.6). 9.4.5.CI.2: Investigate a persistent local or global issue, such as climate change, and collaborate with individuals with diverse perspectives to improve upon current actions designed to address the issue (e.g., 6.3.5.CivicsPD.3, W.5.7). 9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity (e.g., 8.2.5.ED.2, 1.5.5.CR1a). 9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process (e.g., W.4.7, 8.2.5.ED.6).
9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2). 9.4.5.CT.2: Identify a problem and list the types of individuals and resources (e.g., school, community agencies, governmental, online) that can aid in solving the problem (e.g., 2.1.5.CHSS.1, 4-ESS3-1). 9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems. 9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.DC.1: Explain the need for and use of copyrights. 9.4.5.DC.2: Provide attribution according to intellectual property rights guidelines using public domain or creative commons media. 9.4.5.DC.3: Distinguish between digital images that can be reused freely and those that have copyright restrictions. 9.4.5.DC.4: Model safe, legal, and ethical behavior when using online or offline technology (e.g., 8.1.5.NI.2). 9.4.5.DC.5: Identify the characteristics of a positive and negative online identity and the lasting implications of online activity. 9.4.5.DC.6: Compare and contrast how digital tools have changed social interactions (e.g., 8.1.5.IC.1). 9.4.5.DC.7: Explain how posting and commenting in social spaces can have positive or negative consequences. 9.4.5.DC.8: Propose ways local and global communities can engage digitally to participate in and promote climate action (e.g., 6.3.5.GeoHE.1).
9.4.5.IML.1: Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., *Social Studies Practice* - Gathering and Evaluating Sources).

9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3). 9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data. 9.4.5.IML.4: Determine the impact of implicit and explicit media messages on individuals, groups, and society as a whole. 9.4.5.IML.5: Distinguish how media are used by individuals, groups, and organizations for varying purposes. (e.g., 1.3A.5.R1a). 9.4.5.IML.6: Use appropriate sources of information from diverse sources, contexts, disciplines, and cultures to answer questions (e.g., RI.5.7, 6.1.5.HistoryCC.7, 7.1.NM. IPRET.5). 9.4.5.IML.7: Evaluate the degree to which information meets a need including social emotional learning, academic, and social (e.g., 2.2.5. PF.5).
9.4.5.TL.1: Compare the common uses of at least two different digital tools and identify the advantages and disadvantages of using each. 9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings. 9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images graphics, or symbols. 9.4.5.TL.4: Compare and contrast artifacts produced individually to those developed collaboratively (e.g., 1.5.5.CR3a). 9.4.5.TL.5: Collaborate digitally to produce an artifact (e.g., 1.2.5CR1d).

Vertical Integration- Discipline Mapping

PS1- Kindergarten: Materials and Motion

Grade 2: Solids and Liquids; Pebbles, Sand, and Silt

Grade 3: Motion and Matter; Water and Climate

Grade 6: Weather and Water

Grade 8: Chemical Interactions; Earth's History

Additional Materials

Visit Fossweb.com for list of websites and additional readings.