Flemington-Raritan Regional School District
Flemington, New Jersey

Science Curriculum
Grades K-8

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District Mission Statement

The Flemington-Raritan Regional School District provides our students with an exceptional education, empowering them to become problem solvers, collaborators and critical thinkers. The district creates a culture in which students act responsibly and communicate effectively in preparing to become productive citizens in a changing, global society.

It is the expectation of the Flemington-Raritan School District that all pupils achieve the New Jersey Core Curriculum Content Standards at all grade levels.

Flemington-Raritan Regional School District

Grades K - 8

Spring 2011

It is important that children bring a certain ragamuffin, barefoot irreverence to their studies; they are not here to worship what is known but to question it.

Jacob Branowski

Scientific Learning Goals:

Students will learn the skills necessary to explain everyday phenomena, study and solve everyday practical problems using critical thinking skills, and apply their learning to make informed decisions about issues. Students need to use these skills to make a life, make a living, and make a difference.

Philosophy

The study of science begins with curiosity. Children are natural scientists. They use their senses as they eagerly explore their world and construct meaning from their experiences. The research indicates that children learn science through experiences such as hands-on activities that employ the science process skills. An effective school science program nurtures the natural curiosity of children and provides experiences for them to explore their world as their teacher guides them. In school, those experiences are structured so that the students can construct meaning from them. Hands-on / minds-on activities are a means of learning and should not be done in isolation. Students need opportunities to discuss their finds, look for patterns and draw conclusions. Thus, the science curriculum capitalizes on the student's natural inquisitiveness and emphasizes active student participation.

The nature of science and the intellectual development of the learner are closely related. Therefore, the initial emphasis is based on concrete experiences leading to activities that ultimately develop abstract thinking. The use of spiraling themes improves the integration of facts and ideas; it also shows the inter-relationship among the disciplines and helps reflect on the reality of science.

Scientific study develops an awareness of the world in which we live and gives students the necessary skills, and concepts that will enable them to become productive and knowledgeable citizens in the technological world they will enter as adults. Students will be expected to make informed decisions throughout their lives. It is the role of the school to provide experiences that will guide students toward scientific literacy as they explore the excitement of their natural world. Through their experiences, students develop a broad understanding of their world and retain their natural curiosity as they engage in opportunities for life-long learning.

K-8 Science Program Description

The goal of the Flemington-Raritan Science Program is to develop inquiry skills that will enable students to understand the world in which they live and be able to make informed decisions that will touch the future. The program is based on a process approach in which students will use observation, classification, inferences, measurement, data collection, communication, modeling, inference, prediction, experimentation and data analysis to make sense of their world.

The primary Grades K-2 focus more deeply on the science processes listed above than on science content. Students in Grades 3-4 apply the process skills as they develop their conceptual understandings.

The structure of the program includes three strands: Physical Science, Earth Science/Astronomy and Life/Environmental Science as outlined by the 2009 New Jersey Science Core Curriculum Content Standards. Topics introduced on a primary level are further developed in Grades 3-4 and are again revisited at a higher level in intermediate and middle schools. The scope of sequence chart provides a general outline for the 5-8 programs.

The study of each topic emphasizes the use of the process skills as the children explore concepts using a hands-on/minds-on approach. Each concept is referenced to the 2009 New Jersey Science Core Curriculum Content Standards.

We feel strongly that the standard devoted to the process of "doing" science be incorporated throughout the study of each topic. Students are involved with the formation of questions, developing strategies and skills for problem solving, observing, recording data and summarizing their findings. Students also use the tools and technology necessary to study each science topic.

The design of the Grade K-8 Science Curriculum is based on a four part thematic approach: Systems, Human Impact on the World, Energy and Motion, and Natural Change in conjunction with the sub themes of Interactions, Patterns of Constancy, Patterns of Change, Models and Organization. These themes evolve from that National Science Teachers Association (NSTA) Scope and Sequence guide and represent the integration of the following scientific disciplines: Earth and Space Science, Life/Environmental and Chemical and Physical Science. The objective is to end isolation of the various sciences and instead, demonstrate their relatedness.

The 5-8 curriculum is intended to be viewed as a 5/6 program and a 7/8 program, as subsets of the 5-8 curriculum. Thus we look at conceptual understandings over a 2 year and 4 year period of time.

This program builds on previous work and connects to other curriculum topics. The 2009 New Jersey Science Core Curriculum Content Standards, the New Jersey Test Specifications, and the program philosophy influenced the development of this curriculum.

Materials are chosen from a variety of vendors based on their grade level appropriateness, concept development and commitment to the process skills. Supplemental resources are continually being identified and teachers continually attend workshops as life-long learners to develop deeper understandings of science concepts, classroom management techniques and methods for supporting the district philosophy.

School Setting

All students are taught in a heterogeneous group setting in a collaborative learning environment. Standard science equipment, reading materials and technology support the program.

Reading-Fleming Intermediate School

Grade 5
Fifth grade teachers share fully outfitted science labs. Instruction in science takes place for approximately 45 minute periods every other day. Follow-up instruction takes place in the regular classroom setting with the science teacher.

Grade 6
Teams of teachers specialize in their given content areas. Thus, students receive instruction every other day for the full year from a highly qualified science teacher for 1 hour periods of time. All science experiences occur in a lab setting.

J.P. Case Middle School

Grade 7/8
Seventh and eighth grade science courses are taught by highly qualified science teachers. Science instruction is taught in an A/B block schedule format, consisting of 78 minute periods of instruction. The curriculum is intended for use in a laboratory setting.

The 2009 New Jersey Core Curriculum Content Standards, National Standards for Science Standards, American Association for the Advancement of Science – Benchmarks, NSTA Scope and Sequence Guide, and articulation with Hunterdon Central High School guide curricular content choices.

What do we want students to know how to do?
Observe, predict, hypothesize, collect, organize, analyze and explain data, communicate both verbally and in written format, read for information, use technology to gather and communicate data and information.

What life long habits do we want students to practice?
Become skeptical thinkers, rely on data, accept ambiguity, be willing to modify explanations, cooperate in answering questions and solving problems, respect reason, be honest, practice safety, monitor their own meaning and become reflective thinkers (metacognition).

What do we want students to understand?

Scientific investigation usually involve the collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, and explanations to make sense of collected quantitative and qualitative evidence.
(AAAS Project 2061 Framework/Benchmarks)

Investigations are conducted for various reasons: to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare theories.
(AAAS Project 2061 Framework/Benchmarks)

LARGE OVER-REACHING ESSENTIAL QUESTIONS-' DISTRICT

HABITS OF MIND
PROCESSESS
EARTH - PHYSICS –CHEMISTRY- SPACE –LIFE- MATH- TECHNOLOGY

Patterns Interactions Systems Models Organization

GRADE LEVEL QUESTIONS

WHAT SHOULD STUDENTS:
UNDERSTAND?
KNOW?
KNOW HOW TO DO?
HAVE AS HABITS OF MIND?

HOW WILL WE KNOW?

WHAT WILL STUDENTS DO?

Are the experiences safe and developmentally appropriate?
How do students learn?
What misconceptions do students hold about scientific phenomena?
What will students read?

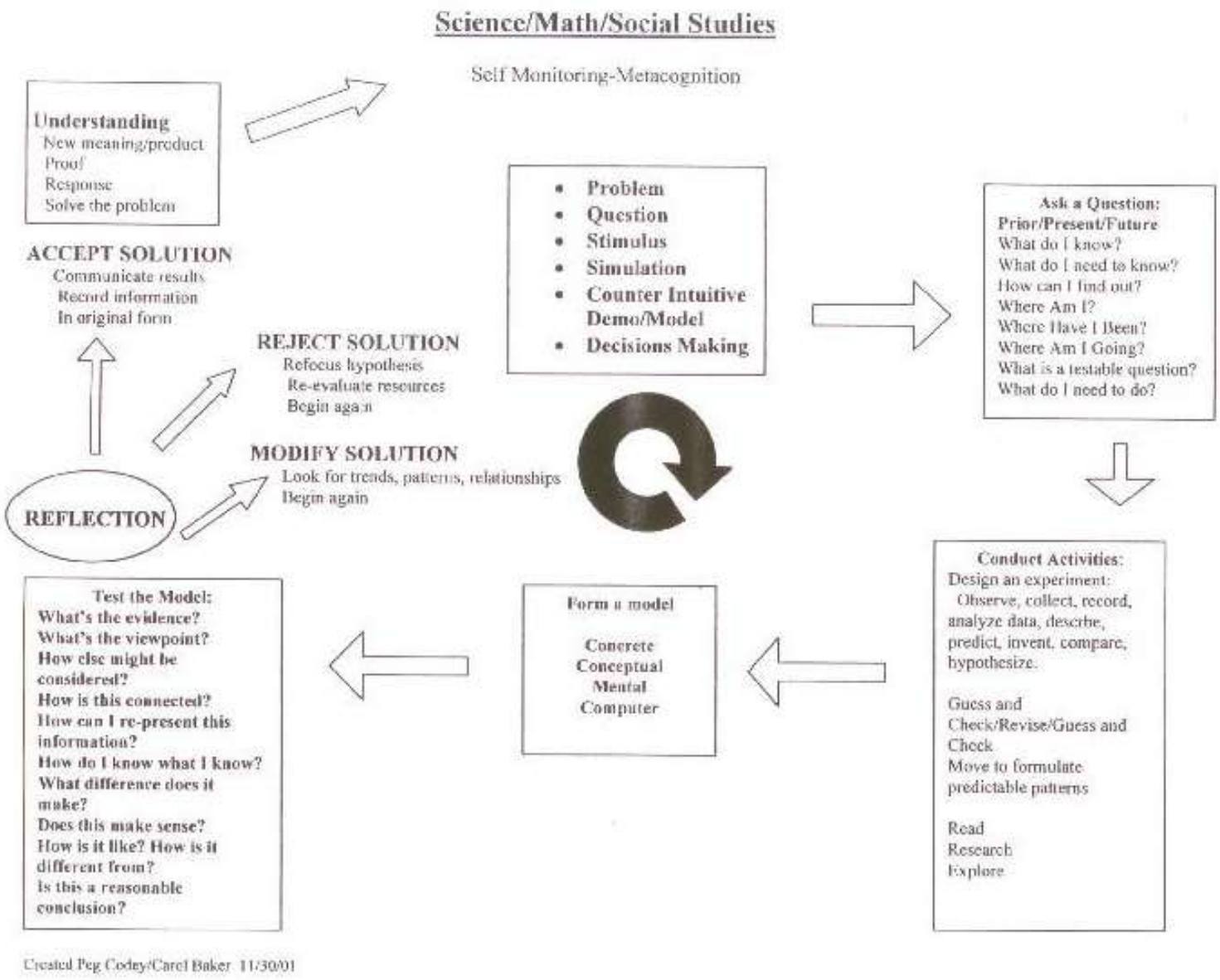
Examples of Over-Reaching

District Questions

- How do we know?
- How do we find out?
- What is the evidence?
- What difference does it make?
- How sure are you?
- What is a fair experiment?
- What can we understand by observing?
- How does quantitative data influence how I interpret what I observe?
- How can using my imagination help me understand the world?
- Is the application of a rule always the same?
- Is the micro world the key to understanding?
- Is the macro world the key to understanding?
- How can I become more clear in communicating how I reason and solve problems?
- What can I do to be a reflective thinker?
- Can I create a valid experiment to test my ideas fairly?
- How can technology help me understand?
- Do my perspectives affect how I understand and interpret observations?
- Is data always true?
- How can I influence / impact the world around me?

Science Processes:

- Observe
- Classify
- Identify
- Hypothesize
- Communicate
- Graph
- Measure
- Design
- Control Variables
- Define Operationally
- Collect Data
- Use, Interpret, Compare Data
- Predict
- Analyze quantitative and qualitative data
- Look for Patterns
- Conclude
- Evaluate


Science/Math/Social Studies
Self Monitoring-Metacognition
Understanding
New meaning/product
Proof
Response
Solve the problem
ACCEPT SOLUTION
Communicate results
Record information
In original form
REJECT SOLUTION
Refocus hypothesis
Re-evaluate resources
Begin again
MODIFY SOLUTION
Look for trends, patterns, relationships
Begin again
REFLECTION
Problem
Question
Stimulus
Simulation
Counter Intuitive Demo/Model
Decisions Making
Ask a Question:
Prior/Present/Future
What do I know?
What do I need to know?
How can I find out?
Where Am I?
Where Have I Been?
Where Am I Going?
What is a testable question?
What do I need to do?
Conduct Activities:
Design an experiment:
Observe, collect, record, analyze data, describe, predict, invent, compare, hypothesize.
Guess and Check/Revise/Guess and Check
Move to formulate predictable patterns
Read
Research
Explore
Form a model
Concrete
Conceptual
Mental
Computer
Test the Model:
What's the evidence?
What's the viewpoint?
How else might be considered?
How is this connected?
How can I re-present this information?
How do I know what I know?
What difference does it make?
Does this make sense?
How is it like? How is it different from?
Is this a reasonable conclusion?
Created Peg Codey/Carol Baker 11/30/01

Science and Special Needs Students

Science classes are heterogeneously grouped. All populations of students study science in the K-8 setting. All students are exposed to the same scientific concepts. Instructional and assessment modifications reflect individual student needs.

Teaching Methods

Each time one prematurely teaches a child
something he/she could have discovered himself,
that child is kept from inventing it and consequently
from understanding it completely

Jean Piaget

A variety of different teaching methods are employed to accommodate a variety of learning styles. Lecture, demonstrations, inquiry based lab activities, cooperative learning settings, peer instruction, group problem solving, and journal writing are some examples of the methods employed. Appropriate supporting literature and text support research and reading. Students are assessed on an individual basis.

In all methods, emphasis is placed on student interactions with each other and with the teacher. The teacher takes the role of facilitator as opposed to conveyor of knowledge. Problem solving skills are emphasized with emphasis placed on the methods devised for arriving at solutions. Labs are presented as problems, challenges and questions to be answered. Students have ample opportunity to apply their learning and to design procedures for experiments. The teacher uses guidelines, helpful hints and leading questions.

All science labs are infused with the appropriate use of technology to support all learners.

Pedagogy

How students construct knowledge and understanding guides the science program. In other words – how do we learn? Through understanding how students construct knowledge, teachers first ascertain students' prior conceptions and use this information to plan classroom content and learning strategies. Teachers design lessons that persuade students to give up old misconceptions and help them expand existing knowledge and apply it in new ways. Instruction links new information clearly and logically with what students have already learned both inside and outside the classroom.

Research shows that children learn more readily and remember concepts longer when they can connect new experiences and information with what they already know about the world. Connecting science concepts with real world phenomena and with the natural world gives students a reason and motivation for learning. Once the connections are made the concepts then become part of the learner.

In the traditional classroom, teachers rely on the textbook to drive the curriculum. In a constructivist, learner centered classroom, the text is used for research and as a resource. The curriculum is constructed so that students not only "do" science, but also apply critical thinking skills to their work. The teacher is no longer the "sage from the stage" but now a "guide from the side". Learning is placed in the hands of the learner. The classroom atmosphere is one in which students have ample opportunity to design and conduct experiments, identify and solve problems, participate to the fullest extent in all hands-on/minds-on activities, ask questions and act on answering questions. The type of problem solving recommended by research more closely parallels the processes and habits of mind that scientist use, including logical reasoning, questioning, analyzing and hypothesizing.

The types of jobs our students face in the future have drastically changed from thirty years ago. The manufacturing sector has diminished while the service, technology and scientific communities have flourished. Students will need to be "world class" problem solvers, possess the skills necessary to use an advanced technology and use higher order thinking skills to make a living.

Basic steps to support students' constructs:

Engage: 1. Provide an invitational/interactive phase at the beginning of new sequences in which students identify scientific phenomena and verbalize their existing theories to account for the problem, encourage alternative explanations and discussion by not judging their initial responses.

Explore: 2. Use student conceptions and thinking to drive lessons. Provide opportunities for testing ideas (even bad ones). Classroom experiences guide students to find their own modifications.

3. Alternate hands on data seeking with dialogue among peers and with the teacher. Students continually meet with the teacher to express and discuss student theories. The teacher is a world-class listener.

4. Ask probing questions, requiring the students to justify, back up or find evidence for their tentative explanations of scientific phenomena.

5. When holding individual and group discussions, the teacher gives ample wait time before responding to students' answers. Wait time is incorporated before students respond to a question and as students respond.

Explain/ Extend 6. Encourage students to elaborate on their explanations, but not to judge them. Look for opportunities to extend and clarify student thinking.

7. Respond to students with questions such as: "Why do you think that? How do you know that? How could you find out? How can you show evidence of that answer? Does that answer make sense?"

8. Insist on predictions of outcomes before conducting a scientific test or experiment. Prediction involves thinking and reasoning and is based on prior knowledge and experience.

9. Always be alert for students' alternative conceptions and design lessons through which evidence collection challenges misconceptions.

Evaluate: 10. Evaluate student understanding through instruction.

When teaching for understanding it is impossible to "cover" huge numbers of scientific concepts quickly. Developing student understanding takes time.

Collaborative Learning Skills

Skilled teachers of science fulfill three teaching roles:

1. Facilitate student learning;
2. Manage the learning environment;
3. Coordinate the curriculum for their students.

The constructivism orientation concerns us with "how students learn", and views the teacher as facilitator, while cooperative-learning techniques provide the classroom management techniques. Students are provided with opportunities for independent, individual work, small group interactions, as well as large group instruction and discussion. The teacher's role is to:

- Formulate the groups;
- Observe the groups and monitor their compliance with the criteria set within the classroom and within the group;
- Communicate his/her findings with the group and together with the students set reasonable goals for achieving cooperative learning skills;
- Answer questions;
- Encourage the flow of ideas;
- Design activities appropriate for group learning;
- Employ listening skills.

Simply putting children together to do a task meant for one child is not cooperative learning. The Flemington-Raritan School District provides ongoing training in the Kagan model of Cooperative Learning. All teachers are expected to become familiar with Cooperative Learning Strategies.

Assessment

"The intention of assessment is to validate the many ways students learn, think and communicate, recognize and build on strengths that each student brings to the classroom, gain insight into student knowledge, skills and progress, evaluate student performance and give feedback to the student and parents, reflect on specific learning objectives and how well the classroom experiences succeed in helping students increase their understandings." (Lawrence Hall

Research shows that the conventional methods of testing fall short of assessing students' progress in the area of science. Assessment should improve performance, not just monitor it. Instruction is assessment. Assessment is instruction and "informs" the curriculum based upon a standard.

It is possible for students to know facts and information and at the same time not understand the concept. Creating assessments that mirror critical thinking skills is time consuming and requires considerable scientific and technological know-how. Several forms of assessment fall under the title of performance assessment. Students have the opportunity to perform or demonstrate their knowledge and skills, such as: demonstrating a laboratory experiment, solving problems within context, and completing real world authentic tasks. These tasks are engaging, accessible, fair, and with clear purpose. Tasks are fun for the student and teacher. These are opportunities for learning, as well as opportunities to do something with knowledge such as making a toy, teaching another child, and making an invention. The tasks also provide an opportunity for students to use multiple approaches, strategies and solutions to the task.

Student performance is judged based on pre-set criteria against a standard.

Various means of assessment are employed to assess learning and guide instruction, such as, but not limited to:

- Student self assessment
- Test/Quizzes
- Lab Performance
- In class presentations
- Written and oral reports/projects
- Performance based demonstration of concepts
- Desiging an original investigation
- Peer assessment
- Journal Writing/ Notebook
- Teacher observation
- Model making
- Experiments
- Conventions, Conferences, Debates
- Graphic Organizers

NEW JERSEY CORE CURRICULUM CONTENT STANDARDS FOR SCIENCE

Science Education in the 21st Century

"Today more than ever before, science holds the key to our survival as a planet and our security and prosperity as a nation" (Obama, 2008).

Scientific literacy assumes an increasingly important role in the context of globalization. The rapid pace of technological advances, access to an unprecedented wealth of information, and the pervasive impact of science and technology on day-to day-living require a depth of understanding that can be enhanced through quality science education. In the 21st century, science education focuses on the practices of science that lead to a greater understanding of the growing body of scientific knowledge that is required of citizens in an ever-changing world.

Mission: Scientifically literate students possess the knowledge and understanding of scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

Vision: A quality science education fosters a population that:

- Experiences the richness and excitement of knowing about the natural world and understanding how it functions.
- Uses appropriate scientific processes and principles in making personal decisions.
- Engages intelligently in public discourse and debate about matters of scientific and technological concern.
- Applies scientific knowledge and skills to increase economic productivity.

Intent and Spirit of the Science Standards

"Scientific proficiency encompasses understanding key concepts and their connections to other fundamental concepts and principles of science; familiarity with the natural and designed world for both its diversity and unity; and use of scientific knowledge and scientific ways of thinking for individual and social purposes" (American Association for the Advancement of Science, 1990).

All students engage in science experiences that promote the ability to ask, find, or determine answers to questions derived from natural curiosity about everyday things and occurrences. The underpinning of the revised standards lies in the premise that science is experienced as an active process in which inquiry is central to learning and in which students engage in observation, inference, and experimentation on an ongoing basis, rather than as an isolated a process. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others in their community and around the world. They actively develop their understanding of science by identifying their assumptions, using critical and logical thinking, and considering alternative explanations.

Revised Standards

The revision of the science standards was driven by two key questions:

- What are the core scientific concepts and principles that all students need to understand in the 21st century?
- What should students be able to do in order to demonstrate understanding of the concepts and principles?

In an attempt to address these questions, science taskforce members examined the scientific concepts and principles common to the National Science Education Standards, Benchmarks and Atlases for Science Literacy, and the National Assessment of Educational Progress (NAEP) Framework. This resulted in narrowing the breadth of content from 10 standards to four standards that include 17 clearly-defined key concepts and principles.

- Science Practices (standard 5.1) embody the idea of "knowledge in use" and include understanding scientific explanations, generating scientific evidence, reflecting on scientific knowledge, and participating productively in science. Science practices are integrated into the Cumulative Progress Indicators within each science domain in recognition that science content and processes are inextricably linked; science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge.
- Science content is presented in Physical Science (standard 5.2), Life Science (standard 5.3), and Earth Systems (standard 5.4). The most current research on how science is learned informed the development of learning progressions for each strand, which increase in depth of understanding as students progress through the grades.

Laboratory Science in the 21st Century

Laboratory science is a practice not a place. It is important to emphasize that standards-driven lab science courses do not include student manipulation or analysis of data created by a teacher as a replacement or substitute for direct interaction with the natural or designed world.

The revised standards and course descriptions emphasize the importance of students independently creating scientific arguments and explanations for observations made during investigations. Science education thereby becomes a sense-making enterprise for students in which they are systematically provided with ongoing opportunities to:

- Interact directly with the natural and designed world using tools, data-collection techniques, models, and theories of science.
- Actively participate in scientific investigations and use cognitive and manipulative skills associated with the formulation of scientific explanations.
- Use evidence, apply logic, and construct arguments for their proposed explanations.

The 2009 Science Standards implicitly and explicitly point to a more student-centered approach to instructional design that engages learners in inquiry. Inquiry, as defined in the revised standards, envisions learners who:

- Are engaged by scientifically-oriented questions.
- Prioritize evidence that addresses scientifically-oriented questions.
- Formulate explanations from that evidence to address those scientifically-oriented questions.
- Evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding.
- Communicate and justify their proposed explanations.

Fundamental principles of instructional design assist students in achieving their intended learning goals through lab-science experiences that:

- Are designed with clear learning outcomes in mind.
- Are sequenced thoughtfully into the flow of classroom science instruction.
- Integrate learning of science content with learning about science practices.
- Incorporate ongoing student reflection and discussion (National Research Council, 2007).

Students' K-12 lab-science experiences should include the following:

- Physical manipulation of authentic substances or systems: This may include such activities as chemistry experiments, plant and animal observations, and investigations of force and motion.

- Interaction with simulations: In 21st-century laboratory science courses, students can work with computerized models, or simulations, that represent aspects of natural phenomena that cannot be observed directly because they are very large, very small, very slow, very fast, or very complex. Students may also model the interaction of molecules in chemistry or manipulate models of cells, animal or plant systems, wave motion, weather patterns, or geological formations using simulations.

- Interaction with authentic data: Students may interact with authentic data that are obtained and represented in a variety of forms. For example, they may study photographs to examine characteristics of the Moon or other heavenly bodies or analyze emission and absorption spectra in the light from stars. Data may be incorporated in films, DVDs, computer programs, or other formats.

- Access to large databases: In many fields of science, researchers have arranged for empirical data to be normalized and aggregated—for example, genome databases, astronomy image collections, databases of climatic events over long time periods, biological field observations. Some students may be able to access authentic and timely scientific data using the Internet and can also manipulate and analyze authentic data in new forms of laboratory experiences (Bell, 2005).

- Remote access to scientific instruments and observations: When available, laboratory experiences enabled by the Internet can link students to remote instruments, such as the environmental scanning electron microscope (Thakkar et al., 2000), or allow them to control automated telescopes (Gould, 2004).

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Content Area	Science		
Standard	**5.1 Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.		
Strand	**A. Understand Scientific Explanations**: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Who, what, when, where, why, and how questions form the basis for young learners' investigations during sensory explorations, experimentation, and focused inquiry.	5.1.P.A.1	Display curiosity about science objects, materials, activities, and longer-term investigations in progress.
4	Fundamental scientific concepts and principles and the links between them are more useful than discrete facts.	5.1.4.A.1	Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.
4	Connections developed between fundamental concepts are used to explain, interpret, build, and refine explanations, models, and theories.	5.1.4.A.2	Use outcomes of investigations to build and refine questions, models, and explanations.
4	Outcomes of investigations are used to build and refine questions, models, and explanations.	5.1.4.A.3	Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments.
8	Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.	5.1.8.A.1	Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
8	Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.	5.1.8.A.2	Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
8	Predictions and explanations are revised based on systematic observations, accurate measurements, and structured	5.1.8.A.3	Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

	data/evidence.		
12	Mathematical, physical, and computational tools are used to search for and explain core scientific concepts and principles.	5.1.12.A.1	Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
12	Interpretation and manipulation of evidence-based models are used to build and critique arguments/explanations.	5.1.12.A.2	Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories.
12	Revisions of predictions and explanations are based on systematic observations, accurate measurements, and structured data/evidence.	5.1.12.A.3	Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence.

Content Area	Science
Standard	**5.1 Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
Strand	**B. Generate Scientific Evidence Through Active Investigations:** Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Observations and investigations form young learners' understandings of science concepts.	5.1.P.B.1	Observe, question, predict, and investigate materials, objects, and phenomena (e.g., using simple tools to crack a nut and look inside) during indoor and outdoor classroom activities and during any longer-term investigations.
P	Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.	5.1.P.B.2	Use basic science terms and topic-related science vocabulary.
P	Experiments and explorations give young learners opportunities to use science tools and technology.	5.1.P.B.3	Identify and use basic tools and technology to extend exploration in conjunction with science investigations.
4	Building and refining models and explanations requires generation and evaluation of evidence.	5.1.4.B.1	Design and follow simple plans using systematic observations to explore questions and predictions.
4	Tools and technology are used to gather, analyze, and communicate results.	5.1.4.B.2	Measure, gather, evaluate, and share evidence using tools and technologies.
4	Evidence is used to construct and defend arguments.	5.1.4.B.3	Formulate explanations from evidence.
4	Reasoning is used to support scientific conclusions.	5.1.4.B.4	Communicate and justify explanations with reasonable and logical arguments.
8	Evidence is generated and evaluated as part of building and refining models and explanations.	5.1.8.B.1	Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
8	Mathematics and technology are used to gather, analyze, and communicate results.	5.1.8.B.2	Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
8	Carefully collected evidence is used to	5.1.8.B.3	Use qualitative and quantitative evidence to develop

	construct and defend arguments.		evidence-based arguments.
8	Scientific reasoning is used to support scientific conclusions.	5.1.8.B.4	Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.
12	Logically designed investigations are needed in order to generate the evidence required to build and refine models and explanations.	5.1.12.B.1	Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
12	Mathematical tools and technology are used to gather, analyze, and communicate results.	5.1.12.B.2	Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
12	Empirical evidence is used to construct and defend arguments.	5.1.12.B.3	Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.
12	Scientific reasoning is used to evaluate and interpret data patterns and scientific conclusions.	5.1.12.B.4	Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

Content Area	Science		
Standard	**5.1 Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.		
Strand	**C. Reflect on Scientific Knowledge:** Scientific knowledge builds on itself over time.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Interacting with peers and adults to share questions and explorations about the natural world builds young learners' scientific knowledge.	5.1.P.C.1	Communicate with other children and adults to share observations, pursue questions, and make predictions and/or conclusions.
4	Scientific understanding changes over time as new evidence and updated arguments emerge.	5.1.4.C.1	Monitor and reflect on one's own knowledge regarding how ideas change over time.
4	Revisions of predictions and explanations occur when new arguments emerge that account more completely for available evidence.	5.1.4.C.2	Revise predictions or explanations on the basis of learning new information.
4	Scientific knowledge is a particular kind of knowledge with its own sources, justifications, and uncertainties.	5.1.4.C.3	Present evidence to interpret and/or predict cause-and-effect outcomes of investigations.
8	Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.	5.1.8.C.1	Monitor one's own thinking as understandings of scientific concepts are refined.
8	Predictions and explanations are revised to account more completely for available evidence.	5.1.8.C.2	Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
8	Science is a practice in which an established body of knowledge is continually revised, refined, and extended.	5.1.8.C.3	Generate new and productive questions to evaluate and refine core explanations.
12	Refinement of understandings, explanations, and models occurs as new evidence is incorporated.	5.1.12.C.1	Reflect on and revise understandings as new evidence emerges.

12	Data and refined models are used to revise predictions and explanations.	5.1.12.C.2	Use data representations and new models to revise predictions and explanations.
12	Science is a practice in which an established body of knowledge is continually revised, refined, and extended as new evidence emerges.	5.1.12.C.3	Consider alternative theories to interpret and evaluate evidence-based arguments.

Content Area	Science
Standard	**5.1 Science Practices:** All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
Strand	**D. Participate Productively in Science:** The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Science practices include drawing or "writing" on observation clipboards, making rubbings, or charting the growth of plants.	5.1.P.D.1	Represent observations and work through drawing, recording data, and "writing."
4	Science has unique norms for participation. These include adopting a critical stance, demonstrating a willingness to ask questions and seek help, and developing a sense of trust and skepticism.	5.1.4.D.1	Actively participate in discussions about student data, questions, and understandings.
4	In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., scientific argumentation and representation).	5.1.4.D.2	Work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories.
4	Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.	5.1.4.D.3	Demonstrate how to safely use tools, instruments, and supplies.
4	Organisms are treated humanely, responsibly, and ethically.	5.1.4.D.4	Handle and treat organisms humanely, responsibly, and ethically.
8	Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.	5.1.8.D.1	Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
8	In order to determine which	5.1.8.D.2	Engage in productive scientific discussion practices during

	arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).		conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
8	Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.	5.1.8.D.3	Demonstrate how to safely use tools, instruments, and supplies.
8	Organisms are treated humanely, responsibly, and ethically.	5.1.8.D.4	Handle and treat organisms humanely, responsibly, and ethically.
12	Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.	5.1.12.D.1	Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
12	Science involves using language, both oral and written, as a tool for making thinking public.	5.1.12.D.2	Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
12	Ensure that instruments and specimens are properly cared for and that animals, when used, are treated humanely, responsibly, and ethically.	5.1.12.D.3	Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.

Content Area	Science
Standard	**5.2 Physical Science:** All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
Strand	**A. Properties of Matter:** All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Observations and investigations form a basis for young learners' understanding of the properties of matter.	5.2.P.A.1	Observe, manipulate, sort, and describe objects and materials (e.g., water, sand, clay, paint, glue, various types of blocks, collections of objects, simple household items that can be taken apart, or objects made of wood, metal, or cloth) in the classroom and outdoor environment based on size, shape, color, texture, and weight.
2	Living and nonliving things are made of parts and can be described in terms of the materials of which they are made and their physical properties.	5.2.2.A.1	Sort and describe objects based on the materials of which they are made and their physical properties.
2	Matter exists in several different states; the most commonly encountered are solids, liquids, and gases. Liquids take the shape of the part of the container they occupy. Solids retain their shape regardless of the container they occupy.	5.2.2.A. 2	Identify common objects as solids, liquids, or gases.
4	Some objects are composed of a single substance; others are composed of more than one substance.	5.2.4.A.1	Identify objects that are composed of a single substance and those that are composed of more than one substance using simple tools found in the classroom.
4	Each state of matter has unique properties (e.g., gases can be compressed, while solids and liquids cannot; the shape of a solid is independent of its container; liquids and gases take the shape of their containers).	5.2.4.A.2	Plan and carry out an investigation to distinguish among solids, liquids, and gasses.
4	Objects and substances have properties, such as weight and volume, that can be measured using	5.2.4.A.3	Determine the weight and volume of common objects using appropriate tools.

	appropriate tools. Unknown substances can sometimes be identified by their properties.		
4	Objects vary in the extent to which they absorb and reflect light and conduct heat (thermal energy) and electricity.	5.2.4.A.4	Categorize objects based on the ability to absorb or reflect light and conduct heat or electricity.
6	The volume of some objects can be determined using liquid (water) displacement.	5.2.6.A.1	Determine the volume of common objects using water displacement methods.
6	The density of an object can be determined from its volume and mass.	5.2.6.A.2	Calculate the density of objects or substances after determining volume and mass.
6	Pure substances have characteristic intrinsic properties, such as density, solubility, boiling point, and melting point, all of which are independent of the amount of the sample.	5.2.6.A.3	Determine the identity of an unknown substance using data about intrinsic properties.
8	All matter is made of atoms. Matter made of only one type of atom is called an element.	5.2.8.A.1	Explain that all matter is made of atoms, and give examples of common elements.
8	All substances are composed of one or more of approximately 100 elements.	5.2.8.A.2	Analyze and explain the implications of the statement "all substances are composed of elements."
8	Properties of solids, liquids, and gases are explained by a model of matter as composed of tiny particles (atoms) in motion.	5.2.8.A.3	Use the kinetic molecular model to predict how solids, liquids, and gases would behave under various physical circumstances, such as heating or cooling.
8	The Periodic Table organizes the elements into families of elements with similar properties.	5.2.8.A.4	Predict the physical and chemical properties of elements based on their positions on the Periodic Table.
8	Elements are a class of substances composed of a single kind of atom. Compounds are substances that are chemically formed and have physical and chemical properties that differ from the reacting substances.	5.2.8.A.5	Identify unknown substances based on data regarding their physical and chemical properties.
8	Substances are classified according to their physical and chemical properties. Metals are a class of elements that exhibit physical properties, such as conductivity, and chemical properties,	5.2.8.A.6	Determine whether a substance is a metal or nonmetal through student-designed investigations.

	such as producing salts when combined with nonmetals.		
8	Substances are classified according to their physical and chemical properties. Acids are a class of compounds that exhibit common chemical properties, including a sour taste, characteristic color changes with litmus and other acid/base indicators, and the tendency to react with bases to produce a salt and water.	5.2.8.A.7	Determine the relative acidity and reactivity of common acids, such as vinegar or cream of tartar, through a variety of student-designed investigations.
12	Electrons, protons, and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons.	5.2.12.A.1	Use atomic models to predict the behaviors of atoms in interactions.
12	Differences in the physical properties of solids, liquids, and gases are explained by the ways in which the atoms, ions, or molecules of the substances are arranged, and by the strength of the forces of attraction between the atoms, ions, or molecules.	5.2.12.A.2	Account for the differences in the physical properties of solids, liquids, and gases.
12	In the Periodic Table, elements are arranged according to the number of protons (the atomic number). This organization illustrates commonality and patterns of physical and chemical properties among the elements.	5.2.12.A.3	Predict the placement of unknown elements on the Periodic Table based on their physical and chemical properties.
12	In a neutral atom, the positively charged nucleus is surrounded by the same number of negatively charged electrons.	5.2.12.A.4	Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.

	Atoms of an element whose nuclei have different numbers of neutrons are called isotopes.		
12	Solids, liquids, and gases may dissolve to form solutions. When combining a solute and solvent to prepare a solution, exceeding a particular concentration of solute will lead to precipitation of the solute from the solution. Dynamic equilibrium occurs in saturated solutions. Concentration of solutions can be calculated in terms of molarity, molality, and percent by mass.	5.2.12.A.5	Describe the process by which solutes dissolve in solvents.
12	Acids and bases are important in numerous chemical processes that occur around us, from industrial to biological processes, from the laboratory to the environment.	5.2.12.A.6	Relate the pH scale to the concentrations of various acids and bases.

Content Area	Science		
Standard	**5.2 Physical Science:** All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.		
Strand	**B. Changes in Matter**: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Observations and investigations form a basis for young learners' understanding of changes in matter.	5.2.P.B.1	Explore changes in liquids and solids when substances are combined, heated, or cooled (e.g., mix sand or clay with various amounts of water; mix different colors of tempera paints; freeze and melt water and other liquids).
2	Some properties of matter can change as a result of processes such as heating and cooling. Not all materials respond the same way to these processes.	5.2.2.B.1	Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials, such as shortening or candle wax.
4	Many substances can be changed from one state to another by heating or cooling.	5.2.4.B.1	Predict and explain what happens when a common substance, such as shortening or candle wax, is heated to melting and then cooled to a solid.
6	When a new substance is made by combining two or more substances, it has properties that are different from the original substances.	5.2.6.B.1	Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically.
8	When substances undergo chemical change, the number and kinds of atoms in the reactants are the same as the number and kinds of atoms in the products. The mass of the reactants is the same as the mass of the products.	5.2.8.B.1	Explain, using an understanding of the concept of chemical change, why the mass of reactants and the mass of products remain constant.
8	Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances. The physical and chemical properties of the products are different from those of the	5.2.8.B.2	Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration.

	reacting substances.		
12	**An atom's electron configuration, particularly of the outermost electrons, determines how the atom interacts with other atoms.** Chemical bonds are the interactions between atoms that hold them together in molecules or between oppositely charged ions.	5.2.12.B.1	Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.
12	**A large number of important reactions involve the transfer of either electrons or hydrogen ions between reacting ions, molecules, or atoms. In other chemical reactions, atoms interact with one another by sharing electrons to create a bond.**	**5.2.12.B.2**	**Describe oxidation and reduction reactions, and give examples of oxidation and reduction reactions that have an impact on the environment, such as corrosion and the burning of fuel.**
12	**The conservation of atoms in chemical reactions leads to the ability to calculate the mass of products and reactants using the mole concept.**	**5.2.12.B.3**	**Balance chemical equations by applying the law of conservation of mass.**

Content Area	Science
Standard	**5.2 Physical Science:** All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
Strand	**C. Forms of Energy:** Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Observations and investigations form a basis for young learners' understanding of forms of energy.	5.2.P.C.1	Investigate sound, heat, and light energy (e.g., the pitch and volume of sound made by commercially made and homemade instruments, looking for shadows on the playground over time and under different weather conditions) through one or more of the senses.
2	The Sun warms the land, air, and water.	5.2.2.C.1	Compare, citing evidence, the heating of different colored objects placed in full sunlight.
2	An object can be seen when light strikes it and is reflected to a viewer's eye. If there is no light, objects cannot be seen.	5.2.2.C.2	Apply a variety of strategies to collect evidence that validates the principle that if there is no light, objects cannot be seen.
2	When light strikes substances and objects through which it cannot pass, shadows result.	5.2.2.C.3	Present evidence that represents the relationship between a light source, solid object, and the resulting shadow.
4	Heat (thermal energy), electricity, light, and sound are forms of energy.	5.2.4.C.1	Compare various forms of energy as observed in everyday life and describe their applications.
4	**Heat** (thermal energy) results when substances burn, when certain kinds of materials rub against each other, and when electricity flows though wires. Metals are good conductors of heat (thermal energy) and electricity. **Increasing** the temperature of any substance requires the addition of energy.	5.2.4.C.2	Compare the flow of heat through metals and nonmetals by taking and analyzing measurements.
4	Energy can be transferred from one place to another. Heat energy is transferred from warmer things to colder things.	5.2.4.C.3	Draw and label diagrams showing several ways that energy can be transferred from one place to another.

4	Light travels in straight lines. When light travels from one substance to another (air and water), it changes direction.	5.2.4.C.4	Illustrate and explain what happens when light travels from air into water.
6	**Light** travels in a straight line until it interacts with an object or material. Light can be absorbed, redirected, bounced back, or allowed to pass through. The path of reflected or refracted light can be predicted.	5.2.6.C.1	Predict the path of reflected or refracted light using reflecting and refracting telescopes as examples.
6	Visible light from the Sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.	5.2.6.C.2	Describe how to prisms can be used to demonstrate that visible light from the Sun is made up of different colors.
6	The transfer of thermal energy by conduction, convection, and radiation can produce large-scale events such as those seen in weather.	5.2.6.C.3	Relate the transfer of heat from oceans and land masses to the evolution of a hurricane.
8	**A tiny fraction of the light energy from the Sun reaches Earth.** Light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms.	5.2.8.C.1	Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley."
8	**Energy** is transferred from place to place. **Light** energy can be thought of as traveling in rays. Thermal energy travels via conduction and convection.	5.2.8.C.2	Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy.
12	Gas particles move independently and are far apart relative to each other. The behavior of gases can be explained by the kinetic molecular theory. The kinetic molecular theory can be used to explain the relationship between pressure and volume, volume and temperature, pressure and temperature, and the number of particles in a gas sample.	5.2.12.C.1	Use the kinetic molecular theory to describe and explain the properties of solids, liquids, and gases.

	There is a natural tendency for a system to move in the direction of disorder or entropy.		
12	Heating increases the energy of the atoms composing elements and the molecules or ions composing compounds. As the kinetic energy of the atoms, molecules, or ions increases, the temperature of the matter increases. Heating a pure solid increases the vibrational energy of its atoms, molecules, or ions. When the vibrational energy of the molecules of a pure substance becomes great enough, the solid melts.	5.2.12.C.2	Account for any trends in the melting points and boiling points of various compounds.

Content Area	Science
Standard	**5.2 Physical Science:** All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
Strand	**D. Energy Transfer and Conservation:** The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
2	Batteries supply energy to produce light, sound, or heat.	5.2.2.D.1	Predict and confirm the brightness of a light, the volume of sound, or the amount of heat when given the number of batteries, or the size of batteries.
4	Electrical circuits require a complete loop through conducting materials in which an electrical current can pass.	5.2.4.D.1	Repair an electric circuit by completing a closed loop that includes wires, a battery (or batteries), and at least one other electrical component to produce observable change.
6	The flow of current in an electric circuit depends upon the components of the circuit and their arrangement, such as in series or parallel. **Electricity** flowing through an electrical circuit produces magnetic effects in the wires.	5.2.6.D.1	Use simple circuits involving batteries and motors to compare and predict the current flow with different circuit arrangements.
8	**When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. As an object falls, its potential energy decreases as its speed, and consequently its kinetic energy, increases. While an object is falling, some of the object's kinetic energy is transferred to the medium through which it falls, setting the medium into motion and heating it.**	5.2.8.D.1	Relate the kinetic and potential energies of a roller coaster at various points on its path.
8	Nuclear reactions take place in the Sun. In plants, light energy from the Sun is	5.2.8.D.2	Describe the flow of energy from the Sun to the fuel tank of an automobile.

	transferred to oxygen and carbon compounds, which in combination, have chemical potential energy (photosynthesis).		
12	The potential energy of an object on Earth's surface is increased when the object's position is changed from one closer to Earth's surface to one farther from Earth's surface.	5.2.12.D.1	Model the relationship between the height of an object and its potential energy.
12	The driving forces of chemical reactions are energy and entropy. Chemical reactions either release energy to the environment (exothermic) or absorb energy from the environment (endothermic).	5.2.12.D.2	Describe the potential commercial applications of exothermic and endothermic reactions.
12	Nuclear reactions (fission and fusion) convert very small amounts of matter into energy.	5.2.12.D.3	Describe the products and potential applications of fission and fusion reactions.
12	Energy may be transferred from one object to another during collisions.	5.2.12.D.4	Measure quantitatively the energy transferred between objects during a collision.
12	Chemical equilibrium is a dynamic process that is significant in many systems, including biological, ecological, environmental, and geological systems. Chemical reactions occur at different rates. Factors such as temperature, mixing, concentration, particle size, and surface area affect the rates of chemical reactions.	5.2.12.D.5	Model the change in rate of a reaction by changing a factor.

Content Area	Science
Standard	**5.2 Physical Science:** All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
Strand	**E. Forces and Motion**: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Observations and investigations form a basis for young learners' understanding of motion.	5.2.P.E.1	Investigate how and why things move (e.g., slide blocks, balance structures, push structures over, use ramps to explore how far and how fast different objects move or roll).
2	Objects can move in many different ways (fast and slow, in a straight line, in a circular path, zigzag, and back and forth).	5.2.2.E.1	Investigate and model the various ways that inanimate objects can move.
2	A force is a push or a pull. Pushing or pulling can move an object. The speed an object moves is related to how strongly it is pushed or pulled. When an object does not move in response to a push or a pull, it is because another push or pull (friction) is being applied by the environment.	5.2.2.E.2	Predict an object's relative speed, path, or how far it will travel using various forces and surfaces.
2	Some forces act by touching, while other forces can act without touching.	5.2.2.E.3	Distinguish a force that acts by direct contact with an object (e.g., by pushing or pulling) from a force that can act without direct contact (e.g., the attraction between a magnet and a steel paper clip).
4	Motion can be described as a change in position over a period of time.	5.2.4.E.1	Demonstrate through modeling that motion is a change in position over a period of time.
4	There is always a force involved when something starts moving or changes its speed or direction of motion. A greater force can make an object move faster and farther.	5.2.4.E.2	Identify the force that starts something moving or changes its speed or direction of motion.
4	Magnets can repel or attract other magnets, but they attract all matter made of iron. Magnets can make some things move without being touched.	5.2.4.E.3	Investigate and categorize materials based on their interaction with magnets.

4	Earth pulls down on all objects with a force called gravity. Weight is a measure of how strongly an object is pulled down toward the ground by gravity. With a few exceptions, objects fall to the ground no matter where they are on Earth.	5.2.4.E.4	Investigate, construct, and generalize rules for the effect that force of gravity has on balls of different sizes and weights.
6	An object's position can be described by locating the object relative to other objects or a background. The description of an object's motion from one observer's view may be different from that reported from a different observer's view.	5.2.6.E.1	Model and explain how the description of an object's motion from one observer's view may be different from a different observer's view.
6	Magnetic, electrical, and gravitational forces can act at a distance.	5.2.6.E.2	Describe the force between two magnets as the distance between them is changed.
6	Friction is a force that acts to slow or stop the motion of objects.	5.2.6.E.3	Demonstrate and explain the frictional force acting on an object with the use of a physical model.
6	Sinking and floating can be predicted using forces that depend on the relative densities of objects and materials.	5.2.6.E.4	Predict if an object will sink or float using evidence and reasoning.
8	An object is in motion when its position is changing. The speed of an object is defined by how far it travels divided by the amount of time it took to travel that far.	5.2.8.E.1	Calculate the speed of an object when given distance and time.
8	Forces have magnitude and direction. Forces can be added. The net force on an object is the sum of all the forces acting on the object. An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force.	5.2.8.E.2	Compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces in a given specific scenario.
12	The motion of an object can be described by its position and velocity as functions of time and by its	5.2.12.E.1	Compare the calculated and measured speed, average speed, and acceleration of an object in motion, and account for differences that may exist between calculated and measured

	average speed and average acceleration during intervals of time.		values.
12	Objects undergo different kinds of motion (translational, rotational, and vibrational).	5.2.12.E.2	Compare the translational and rotational motions of a thrown object and potential applications of this understanding.
12	The motion of an object changes only when a net force is applied.	5.2.12.E.3	Create simple models to demonstrate the benefits of seatbelts using Newton's first law of motion.
12	The magnitude of acceleration of an object depends directly on the strength of the net force, and inversely on the mass of the object. This relationship ($a=F_{net}/m$) is independent of the nature of the force.	5.2.12.E.4	Measure and describe the relationship between the force acting on an object and the resulting acceleration.

Content Area	Science		
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Strand	**A. Organization and Development**: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Observations and discussions about the natural world form a basis for young learners' understanding of life science.	5.3.P.A.1	Investigate and compare the basic physical characteristics of plants, humans, and other animals.
P	Observations and discussions form a basis for young learners' understanding of the similarities and differences among living and nonliving things.	5.3.P.A.2	Observe similarities and differences in the needs of various living things, and differences between living and nonliving things.
2	Living organisms: • Exchange nutrients and water with the environment. • Reproduce. • Grow and develop in a predictable manner.	5.3.2.A.1	Group living and nonliving things according to the characteristics that they share.
4	Living organisms: • Interact with and cause changes in their environment. • Exchange materials (such as gases, nutrients, water, and waste) with the environment. • Reproduce. • Grow and develop in a predictable manner.	5.3.4.A.1	Develop and use evidence-based criteria to determine if an unfamiliar object is living or nonliving.
4	Essential functions required for the well-being of an organism are carried out by specialized structures in plants and animals.	5.3.4.A.2	Compare and contrast structures that have similar functions in various organisms, and explain how those functions may be carried out by structures that have different physical appearances.

4	Essential functions of the human body are carried out by specialized systems: ▪ Digestive ▪ Circulatory ▪ Respiratory ▪ Nervous ▪ Skeletal ▪ Muscular ▪ Reproductive	5.3.4.A.3	Describe the interactions of systems involved in carrying out everyday life activities.
6	Systems of the human body are interrelated and regulate the body's internal environment.	5.3.6.A.1	Model the interdependence of the human body's major systems in regulating its internal environment.
6	Essential functions of plant and animal cells are carried out by organelles.	5.3.6.A.2	Model and explain ways in which organelles work together to meet the cell's needs.
8	All organisms are composed of cell(s). In multicellular organisms, specialized cells perform specialized functions. Tissues, organs, and organ systems are composed of cells and function to serve the needs of cells for food, air, and waste removal.	5.3.8.A.1	Compare the benefits and limitations of existing as a single-celled organism and as a multicellular organism.
8	During the early development of an organism, cells differentiate and multiply to form the many specialized cells, tissues, and organs that compose the final organism. Tissues grow through cell division.	5.3.8.A.2	Relate the structures of cells, tissues, organs, and systems to their functions in supporting life.
12	Cells are made of complex molecules that consist mostly of a few elements. Each class of molecules has its own building blocks and specific functions.	5.3.12 A.1	Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models.
12	Cellular processes are carried out by many different types of molecules, mostly by the group of proteins known as enzymes.	5.3.12.A.2	Demonstrate the properties and functions of enzymes by designing and carrying out an experiment.
12	Cellular function is maintained through the regulation of cellular processes in response to internal and external environmental conditions.	5.3.12.A.3	Predict a cell's response in a given set of environmental conditions.

12	Cells divide through the process of mitosis, resulting in daughter cells that have the same genetic composition as the original cell.	5.3.12.A.4	Distinguish between the processes of cellular growth (cell division) and development (differentiation).
12	Cell differentiation is regulated through the expression of different genes during the development of complex multicellular organisms.	5.3.12.A.5	Describe modern applications of the regulation of cell differentiation and analyze the benefits and risks (e.g., stem cells, sex determination).
12	There is a relationship between the organization of cells into tissues and the organization of tissues into organs. The structures and functions of organs determine their relationships within body systems of an organism.	5.3.12.A.6	Describe how a disease is the result of a malfunctioning system, organ, and cell, and relate this to possible treatment interventions (e.g., diabetes, cystic fibrosis, lactose intolerance).

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Strand	**B. Matter and Energy Transformations**: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Investigations form a young learners' understanding of how a habitat provides for an organism's energy needs.	5.3.P.B.1	Observe and describe how plants and animals obtain food from their environment, such as by observing the interactions between organisms in a natural habitat.
2	A source of energy is needed for all organisms to stay alive and grow. Both plants and animals need to take in water, and animals need to take in food. Plants need light.	5.3.2.B.1	Describe the requirements for the care of plants and animals related to meeting their energy needs.
2	Animals have various ways of obtaining food and water. Nearly all animals drink water or eat foods that contain water.	5.3.2.B.2	Compare how different animals obtain food and water.
2	Most plants have roots to get water and leaves to gather sunlight.	5.3.2.B.3	Explain that most plants get water from soil through their roots and gather light through their leaves.
4	Almost all energy (food) and matter can be traced to the Sun.	5.3.4.B.1	Identify sources of energy (food) in a variety of settings (farm, zoo, ocean, forest).
6	Plants are producers: They use the energy from light to make food (sugar) from carbon dioxide and water. Plants are used as a source of food (energy) for other organisms.	5.3.6.B.1	Describe the sources of the reactants of photosynthesis and trace the pathway to the products.
6	All animals, including humans, are consumers that meet their energy needs by eating other organisms or their products.	5.3.6.B.2	Illustrate the flow of energy (food) through a community.
8	Food is broken down to provide	5.3.8.B.1	Relate the energy and nutritional needs of organisms in a

	energy for the work that cells do, and is a source of the molecular building blocks from which needed materials are assembled.		variety of life stages and situations, including stages of development and periods of maintenance.
8	All animals, including humans, are consumers that meet their energy needs by eating other organisms or their products.	5.3.8.B.2	Analyze the components of a consumer's diet and trace them back to plants and plant products.
12	As matter cycles and energy flows through different levels of organization within living systems (cells, organs, organisms, communities), and between living systems and the physical environment, chemical elements are recombined into different products.	5.3.12.B.1	Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting.
12	Each recombination of matter and energy results in storage and dissipation of energy into the environment as heat.	5.3.12.B.2	Use mathematical formulas to justify the concept of an efficient diet.
12	Continual input of energy from sunlight keeps matter and energy flowing through ecosystems.	5.3.12.B.3	Predict what would happen to an ecosystem if an energy source was removed.
12	Plants have the capability to take energy from light to form sugar molecules containing carbon, hydrogen, and oxygen.	5.3.12.B.4	Explain how environmental factors (such as temperature, light intensity, and the amount of water available) can affect photosynthesis as an energy storing process.
12	In both plant and animal cells, sugar is a source of energy and can be used to make other carbon-containing (organic) molecules.	5.3.12.B.5	Investigate and describe the complementary relationship (cycling of matter and flow of energy) between photosynthesis and cellular respiration.
12	All organisms must break the high-energy chemical bonds in food molecules during cellular respiration to obtain the energy needed for life processes.	5.3.12.B.6	Explain how the process of cellular respiration is similar to the burning of fossil fuels.

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Strand	**C. Interdependence:** All animals and most plants depend on both other organisms and their environment to meet their basic needs.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Investigations and observations of the interactions between plants and animals form a basis for young learners' understanding of interdependence in life science.	5.3.P.C.1	Observe and describe how natural habitats provide for the basic needs of plants and animals with respect to shelter, food, water, air, and light (e.g., dig outside in the soil to investigate the kinds of animal life that live in and around the ground).
2	Organisms interact and are interdependent in various ways; for example, they provide food and shelter to one another.	5.3.2.C.1	Describe the ways in which organisms interact with each other and their habitats in order to meet basic needs.
2	A habitat supports the growth of many different plants and animals by meeting their basic needs of food, water, and shelter.	5.3.2.C.2	Identify the characteristics of a habitat that enable the habitat to support the growth of many different plants and animals.
2	Humans can change natural habitats in ways that can be helpful or harmful for the plants and animals that live there.	5.3.2.C.3	Communicate ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans might harm habitats.
4	Organisms can only survive in environments in which their needs are met. Within ecosystems, organisms interact with and are dependent on their physical and living environment.	5.3.4.C.1	Predict the biotic and abiotic characteristics of an unfamiliar organism's habitat.
4	Some changes in ecosystems occur slowly, while others occur rapidly. Changes can affect life forms, including humans.	5.3.4.C.2	Explain the consequences of rapid ecosystem change (e.g., flooding, wind storms, snowfall, volcanic eruptions), and compare them to consequences of gradual ecosystem change (e.g., gradual increase or decrease in daily temperatures, change in yearly rainfall).
6	Various human activities have changed the capacity of the	5.3.6.C.1	Explain the impact of meeting human needs and wants on local and global environments.

	environment to support some life forms.		
6	The number of organisms and populations an ecosystem can support depends on the biotic resources available and on abiotic factors, such as quantities of light and water, range of temperatures, and soil composition.	5.3.6.C.2	Predict the impact that altering biotic and abiotic factors has on an ecosystem.
6	All organisms cause changes in the ecosystem in which they live. If this change reduces another organism's access to resources, that organism may move to another location or die.	5.3.6.C.3	Describe how one population of organisms may affect other plants and/or animals in an ecosystem.
8	Symbiotic interactions among organisms of different species can be classified as: • Producer/consumer • Predator/prey • Parasite/host • Scavenger/prey • Decomposer/prey	5.3.8.C.1	Model the effect of positive and negative changes in population size on a symbiotic pairing.
12	Biological communities in ecosystems are based on stable interrelationships and interdependence of organisms.	5.3.12.C.1	Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem.
12	Stability in an ecosystem can be disrupted by natural or human interactions.	5.3.12.C.2	Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.

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Strand	**D. Heredity and Reproduction:** Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Observations of developmental changes in a plant or animal over time form a basis for young learners' understanding of heredity and reproduction.	5.3.P.D.1	Observe and record change over time and cycles of change that affect living things (e.g., use baby photographs to discuss human change and growth, observe and photograph tree growth and leaf changes throughout the year, monitor the life cycle of a plant).
2	Plants and animals often resemble their parents.	5.3.2.D.1	Record the observable characteristics of plants and animals to determine the similarities and differences between parents and their offspring.
2	Organisms have predictable characteristics at different stages of development.	5.3.2.D.2	Determine the characteristic changes that occur during the life cycle of plants and animals by examining a variety of species, and distinguish between growth and development.
4	Plants and animals have life cycles (they begin life, develop into adults, reproduce, and eventually die). The characteristics of each stage of life vary by species.	5.3.4.D.1	Compare the physical characteristics of the different stages of the life cycle of an individual organism, and compare the characteristics of life stages among species.
6	Reproduction is essential to the continuation of every species.	5.3.6.D.1	Predict the long-term effect of interference with normal patterns of reproduction.
6	Variations exist among organisms of the same generation (e.g., siblings) and of different generations (e.g., parent to offspring).	5.3.6.D.2	Explain how knowledge of inherited variations within and between generations is applied to farming and animal breeding.
6	Traits such as eye color in human beings or fruit/flower color in plants are inherited.	5.3.6.D.3	Distinguish between inherited and acquired traits/characteristics.
8	Some organisms reproduce asexually. In these organisms, all genetic information comes from a single	5.3.8.D.1	Defend the principle that, through reproduction, genetic traits are passed from one generation to the next, using evidence collected from observations of inherited traits.

	parent. Some organisms reproduce sexually, through which half of the genetic information comes from each parent.		
8	The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation.	5.3.8.D.2	Explain the source of variation among siblings.
8	Characteristics of organisms are influenced by heredity and/or their environment.	5.3.8.D.3	Describe the environmental conditions or factors that may lead to a change in a cell's genetic information or to an organism's development, and how these changes are passed on.
12	Genes are segments of DNA molecules located in the chromosome of each cell. DNA molecules contain information that determines a sequence of amino acids, which result in specific proteins.	5.3.12.D.1	Explain the value and potential applications of genome projects.
12	Inserting, deleting, or substituting DNA segments can alter the genetic code. An altered gene may be passed on to every cell that develops from it. The resulting features may help, harm, or have little or no effect on the offspring's success in its environment.	5.3.12.D.2	Predict the potential impact on an organism (no impact, significant impact) given a change in a specific DNA code, and provide specific real world examples of conditions caused by mutations.
12	Sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations in the offspring of any two parents.	5.3.12.D.3	Demonstrate through modeling how the sorting and recombination of genes during sexual reproduction has an effect on variation in offspring (meiosis, fertilization).

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Strand	**E. Evolution and Diversity**: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
2	Variations exist within a group of the same kind of organism.	5.3.2.E.1	Describe similarities and differences in observable traits between parents and offspring.
2	Plants and animals have features that help them survive in different environments.	5.3.2.E.2	Describe how similar structures found in different organisms (e.g., eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.
4	Individuals of the same species may differ in their characteristics, and sometimes these differences give individuals an advantage in surviving and reproducing in different environments.	5.3.4.E.1	Model an adaptation to a species that would increase its chances of survival, should the environment become wetter, dryer, warmer, or colder over time.
4	In any ecosystem, some populations of organisms thrive and grow, some decline, and others do not survive at all.	5.3.4.E.2	Evaluate similar populations in an ecosystem with regard to their ability to thrive and grow.
6	Changes in environmental conditions can affect the survival of individual organisms and entire species.	5.3.6.E.1	Describe the impact on the survival of species during specific times in geologic history when environmental conditions changed.
8	Individual organisms with certain traits are more likely than others to survive and have offspring in particular environments. The advantages or disadvantages of specific characteristics can change when the environment in which they exist changes. Extinction of a species occurs when the environment changes and the characteristics of a species	5.3.8.E.1	Organize and present evidence to show how the extinction of a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data.

	are insufficient to allow survival.		
8	Anatomical evidence supports evolution and provides additional detail about the sequence of branching of various lines of descent.	5.3.8.E.2	Compare the anatomical structures of a living species with fossil records to derive a line of descent.
12	New traits may result from new combinations of existing genes or from mutations of genes in reproductive cells within a population.	5.3.12.E.1	Account for the appearance of a novel trait that arose in a given population.
12	Molecular evidence (e.g., DNA, protein structures, etc.) substantiates the anatomical evidence for evolution and provides additional detail about the sequence in which various lines of descent branched.	5.3.12.E.2	Estimate how closely related species are, based on scientific evidence (e.g., anatomical similarities, similarities of DNA base and/or amino acid sequence).
12	The principles of evolution (including natural selection and common descent) provide a scientific explanation for the history of life on Earth as evidenced in the fossil record and in the similarities that exist within the diversity of existing organisms.	5.3.12.E.3	Provide a scientific explanation for the history of life on Earth using scientific evidence (e.g., fossil record, DNA, protein structures, etc.).
12	Evolution occurs as a result of a combination of the following factors: • Ability of a species to reproduce • Genetic variability of offspring due to mutation and recombination of genes • Finite supply of the resources required for life • Natural selection, due to environmental pressure, of those organisms better able to survive and leave offspring	5.3.12.E.4	Account for the evolution of a species by citing specific evidence of biological mechanisms.

Content Area	Science		
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.		
Strand	**A. Objects in the Universe:** Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution through the processes of stellar birth and death. These same processes governed the formation of our solar system 4.6 billion years ago.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
2	The Sun is a star that can only be seen during the day. The Moon is not a star and can be seen sometimes at night and sometimes during the day. The Moon appears to have different shapes on different days.	5.4.2.A.1	Determine a set of general rules describing when the Sun and Moon are visible based on actual sky observations.
4	Objects in the sky have patterns of movement. The Sun and Moon appear to move across the sky on a daily basis. The shadows of an object on Earth change over the course of a day, indicating the changing position of the Sun during the day.	5.4.4.A.1	Formulate a general description of the daily motion of the Sun across the sky based on shadow observations. Explain how shadows could be used to tell the time of day.
4	The observable shape of the Moon changes from day to day in a cycle that lasts 29.5 days.	5.4.4.A.2	Identify patterns of the Moon's appearance and make predictions about its future appearance based observational data.
4	Earth is approximately spherical in shape. Objects fall towards the center of the Earth because of the pull of the force of gravity.	5.4.4.A.3	Generate a model with explanatory value that explains both why objects roll down ramps as well as why the Moon orbits Earth.
4	Earth is the third planet from the Sun in our solar system, which includes seven other planets.	5.4.4.A.4	Analyze and evaluate evidence in the form of data tables and photographs to categorize and relate solar system objects (e.g., planets, dwarf planets, moons, asteroids, and comets).
6	The height of the path of the Sun in the sky and the length of a shadow change over the course of a year.	5.4.6.A.1	Generate and analyze evidence (through simulations) that the Sun's apparent motion across the sky changes over the course of a year.
6	Earth's position relative to the Sun,	5.4.6.A.2	Construct and evaluate models demonstrating the rotation of

	and the rotation of Earth on its axis, result in patterns and cycles that define time units of days and years.		Earth on its axis and the orbit of Earth around the Sun.
6	The Sun's gravity holds planets and other objects in the solar system in orbit, and planets' gravity holds moons in orbit.	5.4.6.A.3	Predict what would happen to an orbiting object if gravity were increased, decreased, or taken away.
6	The Sun is the central and most massive body in our solar system, which includes eight planets and their moons, dwarf planets, asteroids, and comets.	5.4.6.A.4	Compare and contrast the major physical characteristics (including size and scale) of solar system objects using evidence in the form of data tables and photographs.
8	The relative positions and motions of the Sun, Earth, and Moon result in the phases of the Moon, eclipses, and the daily and monthly cycle of tides.	5.4.8.A.1	Analyze moon-phase, eclipse, and tidal data to construct models that explain how the relative positions and motions of the Sun, Earth, and Moon cause these three phenomena.
8	Earth's tilt, rotation, and revolution around the Sun cause changes in the height and duration of the Sun in the sky. These factors combine to explain the changes in the length of the day and seasons.	5.4.8.A.2	Use evidence of global variations in day length, temperature, and the amount of solar radiation striking Earth's surface to create models that explain these phenomena and seasons.
8	Gravitation is a universal attractive force by which objects with mass attract one another. The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the objects.	5.4.8.A.3	Predict how the gravitational force between two bodies would differ for bodies of different masses or bodies that are different distances apart.
8	The regular and predictable motion of objects in the solar system (Kepler's Laws) is explained by gravitational forces.	5.4.8.A.4	Analyze data regarding the motion of comets, planets, and moons to find general patterns of orbital motion.
12	Prior to the work of 17th-century astronomers, scientists believed the Earth was the center of the universe (geocentric model).	5.4.12.A.1	Explain how new evidence obtained using telescopes (e.g., the phases of Venus or the moons of Jupiter) allowed 17th-century astronomers to displace the geocentric model of the universe.
12	The properties and characteristics of solar system objects, combined with radioactive dating of meteorites and	5.4.12.A.2	Collect, analyze, and critique evidence that supports the theory that Earth and the rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago.

	lunar samples, provide evidence that Earth and the rest of the solar system formed from a nebular cloud of dust and gas 4.6 billion years ago.		
12	Stars experience significant changes during their life cycles, which can be illustrated with an Hertzsprung-Russell (H-R) Diagram.	5.4.12.A.3	Analyze an H-R diagram and explain the life cycle of stars of different masses using simple stellar models.
12	The Sun is one of an estimated two hundred billion stars in our Milky Way galaxy, which together with over one hundred billion other galaxies, make up the universe.	5.4.12.A.4	Analyze simulated and/or real data to estimate the number of stars in our galaxy and the number of galaxies in our universe.
12	The Big Bang theory places the origin of the universe at approximately 13.7 billion years ago. Shortly after the Big Bang, matter (primarily hydrogen and helium) began to coalesce to form galaxies and stars.	5.4.12.A.5	Critique evidence for the theory that the universe evolved as it expanded from a single point 13.7 billion years ago.
12	According to the Big Bang theory, the universe has been expanding since its beginning, explaining the apparent movement of galaxies away from one another.	5.4.12.A.6	Argue, citing evidence (e.g., Hubble Diagram), the theory of an expanding universe.

Content Area	**Science**
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
Strand	**B. History of Earth:** From the time that Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.

By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
4	Fossils provide evidence about the plants and animals that lived long ago, including whether they lived on the land or in the sea as well as ways species changed over time.	5.4.4.B.1	Use data gathered from observations of fossils to argue whether a given fossil is terrestrial or marine in origin.
6	Successive layers of sedimentary rock and the fossils contained in them tell the factual story of the age, history, changing life forms, and geology of Earth.	5.4.6.B.1	Interpret a representation of a rock layer sequence to establish oldest and youngest layers, geologic events, and changing life forms.
6	Earth's current structure has been influenced by both sporadic and gradual events. Changes caused by earthquakes and volcanic eruptions can be observed on a human time scale, but many geological processes, such as mountain building and the shifting of continents, are observed on a geologic time scale.	5.4.6.B.2	Examine Earth's surface features and identify those created on a scale of human life or on a geologic time scale.
6	Moving water, wind, and ice continually shape Earth's surface by eroding rock and soil in some areas and depositing them in other areas.	5.4.6.B.3	Determine if landforms were created by processes of erosion (e.g., wind, water, and/or ice) based on evidence in pictures, video, and/or maps.
6	Erosion plays an important role in the formation of soil, but too much erosion can wash away fertile soil from ecosystems, including farms.	5.4.6.B.4	Describe methods people use to reduce soil erosion.
8	Today's planet is very different than early Earth. Evidence for one-celled forms of life (bacteria) extends back	5.4.8.B.1	Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time.

	more than 3.5 billion years.		
8	Fossils provide evidence of how life and environmental conditions have changed. The principle of Uniformitarianism makes possible the interpretation of Earth's history. The same Earth processes that occurred in the past occur today.	5.4.8.B.2	Evaluate the appropriateness of increasing the human population in a region (e.g., barrier islands, Pacific Northwest, Midwest United States) based on the region's history of catastrophic events, such as volcanic eruptions, earthquakes, and floods.
12	The evolution of life caused dramatic changes in the composition of Earth's atmosphere, which did not originally contain oxygen gas.	5.4.12.B.1	Trace the evolution of our atmosphere and relate the changes in rock types and life forms to the evolving atmosphere.
12	Relative dating uses index fossils and stratigraphic sequences to determine the sequence of geologic events.	5.4.12.B.2	Correlate stratigraphic columns from various locations by using index fossils and other dating techniques.
12	Absolute dating, using radioactive isotopes in rocks, makes it possible to determine how many years ago a given rock sample formed.	5.4.12.B.3	Account for the evolution of species by citing specific absolute-dating evidence of fossil samples.

Content Area	Science
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
Strand	**C. Properties of Earth Materials:** Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
P	Observations and investigations form a basis for young learners' understanding of properties of Earth materials.	5.4.P.C.1	Explore and describe characteristics of and concepts about soil, rocks, water, and air.
2	Soils are made of many living and nonliving substances. The attributes and properties of soil (e.g., moisture, kind and size of particles, living/organic elements, etc.) vary depending on location.	5.4.2.C.1	Describe Earth materials using appropriate terms, such as hard, soft, dry, wet, heavy, and light.
4	Rocks can be broken down to make soil.	5.4.4.C.1	Create a model to represent how soil is formed.
4	Earth materials in nature include rocks, minerals, soils, water, and the gases of the atmosphere. Attributes of rocks and minerals assist in their identification.	5.4.4.C.2	Categorize unknown samples as either rocks or minerals.
6	Soil attributes/properties affect the soil's ability to support animal life and grow plants.	5.4.6.C.1	Predict the types of ecosystems that unknown soil samples could support based on soil properties.
6	The rock cycle is a model of creation and transformation of rocks from one form (sedimentary, igneous, or metamorphic) to another. Rock families are determined by the origin and transformations of the rock.	5.4.6.C.2	Distinguish physical properties of sedimentary, igneous, or metamorphic rocks and explain how one kind of rock could eventually become a different kind of rock.
6	Rocks and rock formations contain evidence that tell a story about their past. The story is dependent on the minerals, materials, tectonic conditions, and erosion forces that	5.4.6.C.3	Deduce the story of the tectonic conditions and erosion forces that created sample rocks or rock formations.

	created them.		
8	Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, each having a different chemical composition and texture.	5.4.8.C.1	Determine the chemical properties of soil samples in order to select an appropriate location for a community garden.
8	Physical and chemical changes take place in Earth materials when Earth features are modified through weathering and erosion.	5.4.8.C.2	Explain how chemical and physical mechanisms (changes) are responsible for creating a variety of landforms.
8	Earth's atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has a different physical and chemical composition at different elevations.	5.4.8.C.3	Model the vertical structure of the atmosphere using information from active and passive remote-sensing tools (e.g., satellites, balloons, and/or ground-based sensors) in the analysis.
12	Soils are at the interface of the Earth systems, linking together the biosphere, geosphere, atmosphere, and hydrosphere.	5.4.12.C.1	Model the interrelationships among the spheres in the Earth systems by creating a flow chart.
12	The chemical and physical properties of the vertical structure of the atmosphere support life on Earth.	5.4.12.C.2	Analyze the vertical structure of Earth's atmosphere, and account for the global, regional, and local variations of these characteristics and their impact on life.

Content Area	Science
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
Strand	**D. Tectonics:** The theory of plate tectonics provides a framework for understanding the dynamic processes within and on Earth.

By the end of grade	Content Statement	CPI #	Cumulative Progress Indicator (CPI)
6	Lithospheric plates consisting of continents and ocean floors move in response to movements in the mantle.	5.4.6.D.1	Apply understanding of the motion of lithospheric plates to explain why the Pacific Rim is referred to as the Ring of Fire.
6	Earth's landforms are created through constructive (deposition) and destructive (erosion) processes.	5.4.6.D.2	Locate areas that are being created (deposition) and destroyed (erosion) using maps and satellite images.
6	Earth has a magnetic field that is detectable at the surface with a compass.	5.4.6.D.3	Apply knowledge of Earth's magnetic fields to successfully complete an orienteering challenge.
8	Earth is layered with a lithosphere, a hot, convecting mantle, and a dense, metallic core.	5.4.8.D.1	Model the interactions between the layers of Earth.
8	Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from the motion of plates. Sea floor spreading, revealed in mapping of the MidAtlantic Ridge& subduction zones are evidence for the theory of plate tectonics.	5.4.8.D.2	Present evidence to support arguments for the theory of plate motion.
8	Earth's magnetic field has north and south poles and lines of force that are used for navigation.	5.4.8.D.3	Explain why geomagnetic north and geographic north are at different locations.
12	Convection currents in the upper mantle drive plate motion. Plates are pushed apart at spreading zones and pulled down into the crust at subduction zones.	5.4.12.D.1	Explain the mechanisms for plate motions using earthquake data, mathematics, and conceptual models.
12	Evidence from lava flows and ocean-floor rocks shows that Earth's magnetic field reverses (North – South) over geologic time.	5.4.12.D.2	Calculate the average rate of seafloor spreading using archived geomagnetic-reversals data.

Content Area	**Science**		
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.		
Strand	**E. Energy in Earth Systems:** Internal and external sources of energy drive Earth systems.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Observations and investigations form the basis for young learners' understanding of energy in Earth systems.	5.4.P.E.1	Explore the effects of sunlight on living and nonliving things.
2	Plants need sunlight to grow.	5.4.2.E.1	Describe the relationship between the Sun and plant growth.
4	Land, air, and water absorb the Sun's energy at different rates.	5.4.4.E.1	Develop a general set of rules to predict temperature changes of Earth materials, such as water, soil, and sand, when placed in the Sun and in the shade.
6	The Sun is the major source of energy for circulating the atmosphere and oceans.	5.4.6.E.1	Generate a conclusion about energy transfer and circulation by observing a model of convection currents.
8	The Sun provides energy for plants to grow and drives convection within the atmosphere and oceans, producing winds, ocean currents, and the water cycle.	5.4.8.E.1	Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle.
12	The Sun is the major external source of energy for Earth's global energy budget.	5.4.12.E.1	Model and explain the physical science principles that account for the global energy budget.
12	Earth systems have internal and external sources of energy, both of which create heat.	5.4.12.E.2	Predict what the impact on biogeochemical systems would be if there were an increase or decrease in internal and external energy.

Content Area	Science		
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.		
Strand	**F. Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.**		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Observations and investigations form the basis for young learners' understanding of weather and climate.	5.4.P.F.1	Observe and record weather.
2	Current weather conditions include air movement, clouds, and precipitation. Weather conditions affect our daily lives.	5.4.2.F.1	Observe and document daily weather conditions and discuss how the weather influences your activities for the day.
4	Weather changes that occur from day to day and across the seasons can be measured and documented using basic instruments such as a thermometer, wind vane, anemometer, and rain gauge.	5.4.4.F.1	Identify patterns in data collected from basic weather instruments.
6	Weather is the result of short-term variations in temperature, humidity, and air pressure.	5.4.6.F.1	Explain the interrelationships between daily temperature, air pressure, and relative humidity data.
6	Climate is the result of long-term patterns of temperature and precipitation.	5.4.6.F.2	Create climatographs for various locations around Earth and categorize the climate based on the yearly patterns of temperature and precipitation.
8	Global patterns of atmospheric movement influence local weather.	5.4.8.F.1	Determine the origin of local weather by exploring national and international weather maps.
8	Climate is influenced locally and globally by atmospheric interactions with land masses and bodies of water.	5.4.8.F.2	Explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country.
8	Weather (in the short term) and climate (in the long term) involve the transfer of energy and water in and out of the atmosphere.	5.4.8.F.3	Create a model of the hydrologic cycle that focuses on the transfer of water in and out of the atmosphere. Apply the model to different climates around the world.
12	Global climate differences result from the uneven heating of Earth's surface by the Sun. Seasonal climate	5.4.12.F.1	Explain that it is warmer in summer and colder in winter for people in New Jersey because the intensity of sunlight is greater and the days are longer in summer than in winter.

	variations are due to the tilt of Earth's axis with respect to the plane of Earth's nearly circular orbit around the Sun.		Connect these seasonal changes in sunlight to the tilt of Earth's axis with respect to the plane of its orbit around the Sun.
12	Climate is determined by energy transfer from the Sun at and near Earth's surface. This energy transfer is influenced by dynamic processes, such as cloud cover and Earth's rotation, as well as static conditions, such as proximity to mountain ranges and the ocean. Human activities, such as the burning of fossil fuels, also affect the global climate.	5.4.12.F.2	Explain how the climate in regions throughout the world is affected by seasonal weather patterns, as well as other factors, such as the addition of greenhouse gases to the atmosphere and proximity to mountain ranges and to the ocean.
12	Earth's radiation budget varies globally, but is balanced. Earth's hydrologic cycle is complex and varies globally, regionally, and locally.	5.4.12.F.3	Explain variations in the global energy budget and hydrologic cycle at the local, regional, and global scales.

Content Area	Science		
Standard	**5.4 Earth Systems Science**: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.		
Strand	**G. Biogeochemical Cycles**: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.		
By the end of grade	**Content Statement**	**CPI #**	**Cumulative Progress Indicator (CPI)**
P	Investigations in environmental awareness activities form a basis for young learners' understanding of biogeochemical changes.	5.4.P.G.1	Demonstrate emergent awareness for conservation, recycling, and respect for the environment (e.g., turning off water faucets, using paper from a classroom scrap box when whole sheets are not needed, keeping the playground neat and clean).
2	Water can disappear (evaporate) and collect (condense) on surfaces.	5.4.2.G.1	Observe and discuss evaporation and condensation.
2	There are many sources and uses of water.	5.4.2.G.2	Identify and use water conservation practices.
2	Organisms have basic needs and they meet those needs within their environment.	5.4.2.G.3	Identify and categorize the basic needs of living organisms as they relate to the environment.
2	The origin of everyday manufactured products such as paper and cans can be traced back to natural resources.	5.4.2.G.4	Identify the natural resources used in the process of making various manufactured products.
4	Clouds and fog are made of tiny droplets of water and, at times, tiny particles of ice.	5.4.4.G.1	Explain how clouds form.
4	Rain, snow, and other forms of precipitation come from clouds; not all clouds produce precipitation.	5.4.4.G.2	Observe daily cloud patterns, types of precipitation, and temperature, and categorize the clouds by the conditions that form precipitation.
4	Most of Earth's surface is covered by water. Water circulates through the crust, oceans, and atmosphere in what is known as the water cycle.	5.4.4.G.3	Trace a path a drop of water might follow through the water cycle.
4	Properties of water depend on where the water is located (oceans, rivers, lakes, underground sources, and glaciers).	5.4.4.G.4	Model how the properties of water can change as water moves through the water cycle.

6	Circulation of water in marine environments is dependent on factors such as the composition of water masses and energy from the Sun or wind.	5.4.6.G.1	Illustrate global winds and surface currents through the creation of a world map of global winds and currents that explains the relationship between the two factors.
6	An ecosystem includes all of the plant and animal populations and nonliving resources in a given area. Organisms interact with each other and with other components of an ecosystem.	5.4.6.G.2	Create a model of ecosystems in two different locations, and compare and contrast the living and nonliving components.
6	Personal activities impact the local and global environment.	5.4.6.G.3	Describe ways that humans can improve the health of ecosystems around the world.
8	Water in the oceans holds a large amount of heat, and therefore significantly affects the global climate system.	5.4.8.G.1	Represent and explain, using sea surface temperature maps, how ocean currents impact the climate of coastal communities.
8	Investigations of environmental issues address underlying scientific causes and may inform possible solutions.	5.4.8.G.2	Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions.
12	Natural and human-made chemicals circulate with water in the hydrologic cycle.	5.4.12.G.1	Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay).
12	Natural ecosystems provide an array of basic functions that affect humans. These functions include maintenance of the quality of the atmosphere, generation of soils, control of the hydrologic cycle, disposal of wastes, and recycling of nutrients.	5.4.12.G.2	Explain the unintended consequences of harvesting natural resources from an ecosystem.
12	Movement of matter through Earth's system is driven by Earth's internal and external sources of energy and results in changes in the physical and chemical properties of the matter.	5.4.12.G.3	Demonstrate, using models, how internal and external sources of energy drive the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles.
12	Natural and human activities impact the cycling of matter and the flow of energy through ecosystems.	5.4.12.G.4	Compare over time the impact of human activity on the cycling of matter and energy through ecosystems.
12	Human activities have changed Earth's land, oceans, and atmosphere, as well	5.4.12.G.5	Assess (using maps, local planning documents, and historical records) how the natural environment has changed

	as its populations of plant and animal species.		since humans have inhabited the region.
12	Scientific, economic, and other data can assist in assessing environmental risks and benefits associated with societal activity.	5.4.12.G.6	Assess (using scientific, economic, and other data) the potential environmental impact of large-scale adoption of emerging technologies (e.g., wind farming, harnessing geothermal energy).
12	Earth is a system in which chemical elements exist in fixed amounts and move through the solid Earth, oceans, atmosphere, and living things as part of geochemical cycles.	5.4.12.G.7	Relate information to detailed models of the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles, identifying major sources, sinks, fluxes, and residence times.

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Year at a Glance

The following is an example of appropriate pacing for the Kindergarten science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team. These units are also integrated throughout the school year in all units.

Five Senses	2 weeks
Living Organisms	4 weeks
Seasons	1 week per season (daily elements with weather review)
Nutrition & Health	2 weeks
Properties of Matter	Ongoing throughout the year
Earth & Recycling	1 week

Flemington-Raritan Regional School
Science Curriculum
Grade Kindergarten

Properties of Matter

Essential Questions:
What processes do scientists use to find out about matter?
What tools do scientists use to record information?
How do magnets work?
What things float and what things sink?
How can we classify things?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A: Properties of Matter: All objects and substances in the natural world are composed of Matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.2.A.1 Living and nonliving things are made of parts and can be described in terms of the materials of which they are made and their physical properties.

E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of force.

5.2.4.E.3 Magnets can repel or attract other magnets, but they attract all matter made of iron. Magnets can make some things move without being touched.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Sort and describe objects based on the materials of which they are made and their physical properties.	Sorting by color, texture, or characteristic Students will be able to sort and classify objects by their physical properties	Identify the 3 primary colors and secondary colors Mix colors using food coloring or paint Sort blocks by attributes	SCIS Beginnings chapter 2
Sort and describe objects based on the materials of which they are made and their physical properties. (*Optional*)	"Sink/Float" worksheet Students will differentiate between sinking and floating	Free exploration with water tubs Activity 1 "Sink or Float?"	Sifting Through Science (7-23)

		Record findings on worksheet	
Investigate and categorize materials based on their interaction with magnets.	"Magnet" worksheet Students begin to develop an understanding of magnetism	Read book Free exploration with magnets Activity 2 "Magnets"	The Mystery of Magnets (Big Book) by M.Berger Sifting Through Science (25-35)
Sort and describe objects based on the materials of which they are made and their physical properties.	Investigation findings Students will begin to develop an understanding of the property of size	Free exploration with the sand table Sifting various size objects out of sand	Sifting Through Science (37-47)

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Earth/Recycling

Essential Questions:
What can we do to help our Earth?

New Jersey Core Curriculum Content Standards

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs

5.3.2.C.3 Humans can change natural habitats in ways that can be helpful or harmful for the plants and animals that live there.

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
G: Biogeochemical Cycles: The biogeochemical cycles in Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.2.G.4 The origin of everyday manufactured products such as paper and cans can be traced back to natural resources.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Identify the natural resources used in the process of making various manufactured products.	Discussion list Students will identify the Earth's resources and how they help us sustain life	Read book Show a globe Discuss the Earth's make-up and natural resources	Earth by M. & G. Berger
Communicate the ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans may harm	Chart Class discussion Students will develop an	Read book Discuss the need for keeping the air, water, and land clean	Kids for the Earth (Big Book) by M. Berger

habitats.	understanding of how their actions impact the environment	Discuss how we share the earth with other living things	
Communicate the ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans may harm habitats.	Class results of lab experiment Students will identify ways to help the environment	Read book Brainstorm ways students can help at home and school by reducing, reusing, and recycling Recycling activities: recycle crayons, recycle newspapers Reducing activities: packaging peanuts experiment	How Paper is Made by N. Curtis Long Live Earth by M. Morrison See Lab Book for experiments on crayons, packaging peanuts and recycling of paper

Flemington-Raritan Regional School
Science Curriculum
Grade Kindergarten

Five Senses

Essential Questions:
How do we find out about our world?
What do scientists do?
What can we learn through our senses?
How does mathematics help us learn about things?
What kind of information do we get from each sense?

New Jersey Core Curriculum Content Standards

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
A. Understand Scientific Explanations: Students understand core concepts and principals of science and use measurement observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A: Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Sort and describe objects based on the materials of which they are made and their physical properties.	Students will use their senses to gather information about objects and their properties.	Read books Introduce the five senses	See, Hear, Touch, Taste, Smell (Big Book) by M. Berger My Five Senses by Aliki
Describe the interactions of systems	Teacher will observe students'	Read books	The Five Senses Series by Maria

involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	ability to identify the sense of sight. Students will identify the sense of sight	Identify the body part used for sight (eyes) Felt board activity Blindfold partner game Introduction to Braille Graph eye colors	Ruis (focus on sight) What Can You See? by A. Davidson Look! Look! Look! by T. Hoban
Describe the interactions of systems involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	Teacher will observe students' ability to identify the sense of hearing Students will identify the sense of hearing	Read books Identify the body part used for hearing (ears) Everyday sounds game with tape/CD "Sound Tubes" exploration Identifying counts through listening Introduction to Sign Language	The Five Senses Series by Maria Ruis (focus on sound) "Handmade Alphabet" (located in Everyday Math Teacher Activity Book)
Describe the interactions of systems involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	Teacher will observe students' ability to identify the sense of touch. Students will identify the sense of touch.	Read books Identify the body part used for touch (hands/skin) Feely box activities Texture sorting activities	The Five Senses Series by Maria Ruis (focus on touch) Is it Rough? Is it Smooth? Is it Shiny? by T. Hoban SCIS Beginnings: sections 2,4,5,7
Describe the interactions of systems	Teacher will observe students'	Read books	The Five Senses Series by Maria

involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	ability to identify the sense of taste. Students will identify the sense of taste.	Identify the body part used for taste (tongue) Introduce the four different tastes: sweet, salty, sour, and bitter Tasting activity: classify foods by tasting them and record findings Tongue/taste bud chart	Ruis (focus on taste)
Describe the interactions of systems involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	Teacher will observe students' ability to identify the sense of smell Students will identify the sense of smell.	Read books Identify the body part used for smell (nose) Smell and Tell game Partner scent match	The Five Senses Series by Maria Ruis (focus on smell)
Describe the interactions of systems involved in carrying out everyday activities. Display curiosity about science objects, materials, activities, and longer term investigations in progress.	Teacher will observe students' ability to identify all five senses. Students will recall the five senses	Read books Review five senses Prepare popcorn for a culminating activity Students complete five senses booklet	See, Hear, Touch, Taste, Smell (Big Book) by M. Berger

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Living Organisms

Essential Questions:
How do we know things are living?
What do living things need?
Can we find patterns in how plants and animals grow?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties; matter takes up space and matter has inertia.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units of composed of molecules, which also carry out biological functions.
D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable lifecycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
E. Energy and Earth Systems: Internal and external sources drive Earth systems.
G. Biogeochemical Cycles: The biogeochemical cycles in the Earth system include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal or external sources of energy, and are impacted by human activity.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Sort and describe objects based on the materials of which they are made	Living/ non-living chart	Read books	Living Things by Holloway & Harper

and their physical properties.	Students will be able to classify living and non-living organisms	Classroom hunt for living/non-living objects Teacher records students' findings on chart Observe classroom pets and/or plants	Living or Not Living by Halloway & Harper
Describe the relationship between the Sun and plant growth.	Identify what plants need to grow Students will identify what plants need to grow	Discuss where seeds come from & read books Plant seeds Observe seed growth Student play: "Ralph the Seed"	I'm a Seed by J. Marzollo The Dandelion by B &J Cutting SCIS Beginnings: Chapter 6 and 7 "Ralph the Seed" in Lab Book
Determine the characteristic changes that occur during the lifecycle of plants and animals by examining a variety of species, and distinguish between growth and development.	Sequence pictures of a life-cycle Butterfly life-cycle worksheet Students will identify the stages in an animal's life-cycle	Read books Observe life-cycle of a butterfly Record observations in class butterfly journal	Caterpillar Diary by D. Drew I'm a Caterpillar by J. Marzollo A Butterfly is Born by M. Berger
Identify and categorize the basic needs of living organisms as they relate to the environment.	Teacher observation Students will identify the basic needs of animals	Discuss the basic needs of animals Discuss pets' needs Observe birds in nature	SCIS Beginnings: Chapter 8
Group living and nonliving things according to the characteristics that they share.	Sort animals into groups Students will classify animals by their basic characteristics	Read books about animals Sort animal pictures/figurines into groups Identify animals by their body coverings	Animal Clues by D. Drew Fur, Feathers, Scale, Skin (Big Book) by M. Berger Creature Features by D. Drew

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Grade Kindergarten

The Seasons

Essential Questions:
Do seasonal changes affect me?
What are seasonal patterns that can be observed and recorded daily?
What evidence can help me predict weather changes and seasonal changes?

New Jersey Core Curriculum Content Standards

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
F: Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

5.4.P.F.1 Observations and investigations for the basis for young learners' understanding of weather and climate.
5.4.4.F.1 Weather changes that occur from day to day and across the seasons can be measured and documented using basic instruments such as a thermometer, wind vane, and anemometer, and rain gauge.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Identify patterns in data collected from basic weather instruments.	Record daily weather/morning meeting discussion of weather. The student will recognize seasonal changes.	Read book Introduce the four seasons as they occur	The Four Seasons (Big Book) by M.Berger
Identify patterns in data collected from basic weather instruments.	Record daily weather The students will identify the daily weather and temperature	Daily weather graph/ temperature tally Introduction to thermometer and reading of temperature in Fahrenheit	Everyday Math (38-41)
Observe and record weather.	Signs of the Season class chart The students will predict and recognize the attributes of each season	Read book about the fall season Observe signs of fall and record on a chart during a fall walk	How Do You Know It's Fall? by A. Fowler

		Leaf exploration/sorting	
Observe and record weather.	Signs of the Season class chart The students will predict and recognize the attributes of each season	Teacher will read a book about the winter season Observe signs of winter and record on a class chart Observation of snow in cold and warm temperatures Individual winter checklist	How Do You Know It's Winter? by A. Fowler
Observe and record weather.	Signs of the Season class chart The students will predict and recognize the attributes of each season	Teacher will read a book about spring Observe signs of spring and record on chart Rain and wind discussion Make predictions about wind and its impact on various objects	How Do You Know It's Spring? by A. Fowler I Like the Rain by Claude Belanger
Observe and record weather.	Signs of the Season class chart The students will predict and recognize the attributes of each season	Read book Predict what signs they may see in the summer	How Do You Know it's Summer? by A.Fowler

Flemington-Raritan Regional School
Science Curriculum
Grade Kindergarten

Nutrition/Health

Essential Questions:
What do humans need to be healthy?

New Jersey Core Curriculum Content Standards

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

5.1.P.D.1 Science practices included drawing and "writing" on observation clipboards, making rubbings, or charting the growth of plants.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

5.3.P.B.1 Investigations form a young learner's understanding of how a habitat provides for an organisms energy needs.
5.3.2.B.1 A source of energy is needed for all organisms to stay alive and grow. Both plants and animals need to take in water, and animals need to take in food. Plants need light.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Describe the requirements for the care of plants and animals related to meeting their energy needs.	Class chart / class discussion Students will be able to identify the basic needs of humans.	Basic needs discussion: food, water, shelter Read book	You Are What You Eat (Big Book) by M. Berger
	Class chart Students will identify healthy habits and unhealthy habits.	Read aloud about healthy habits Brainstorm and chart good habits vs. bad habits	Good for You by J. Cowley Sorting worksheet on habits

		Discuss importance of exercise and rest Picture sort of healthy/unhealthy habits School nurse visit Puppet show using germ puppets Healthy hand washing demonstration and modeling	School nurse Video "Scrubby Bear" Lab Book
Observe and describe how plants and animals obtain food from their environment, such as by observing the interactions between organisms in a natural habitat. Represent observations and work through drawing, recording data, and "writing".	Food sorting Shopping Cart game "I Am Healthy" booklet Students will become familiar with the food groups.	Read books Introduce the food groups Sorting foods by groups Introduce new food guide and old food guide pyramid Make a vegetable garden mural Food pyramid placemat Pizza day culmination	The Little Red Hen by Paul Gauldone (grains) Green Bananas by P. Neville & A. Butler (fruits) Growing Vegetable Soup by L. Ehlert (vegetables) Blue Bugs Vegetable Garden by V. Powlet Video "The Milk Makers" The Milk Makers by G. Gibbons Video "Milk, Cheese, Moo, Cow"
Observe and describe how plants and animals obtain food from their environment, such as by observing the interactions between organisms in a natural habitat. Represent observations and work through drawing, recording data, and "writing".	Tooth brushing chart Students will understand the importance of dental health.	Dentist visit Puppet show Video "Healthy Habits of Dental Health" Tooth brushing chart Tooth brushing practice on model	Video "Dudley Goes to the Dentist"

Flemington-Raritan Regional Schools
Science Curriculum
Grade 1

Year at a Glance

The following is an example of appropriate pacing for the First grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team.

Insect	5 – 7 weeks
Plants and Seeds	5 – 7 weeks
Rocks and Soils	4 – 6 weeks
Solid, Liquid, and Gas	4 – 6 weeks
What is a Scientist?	1 – 2 weeks

Flemington-Raritan Regional Schools
Science Curriculum Supplement
Grade 1

Insects

Essential Questions:
What features do insects have that help them live in their environments?
How can we find out about the characteristic properties of insects in their environments?
How do changes in the environment affect organisms?

New Jersey Core Curriculum Content Standards

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.2.C.3 Humans can change natural habitats in ways that can be helpful or harmful for the plants and animals that live there.

D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms can contain genetic information that influences their traits and they pass this on to their offspring during reproduction.

5.3.2.D.2 Organisms have predictable characteristics at different stages of development.

E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.2.E.2 Plants and animals have features that help them survive in different environments.

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.P.B.2 Experiments and explorations provide opportunities for young learners to uses scientific vocabulary and scientific terms.

5.1.4.B.1 Building and refining models and explanations requires generation and evaluation of evidence.
5.1.4.B.4 Reasoning is used to support scientific conclusions.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Describe how similar structures found in different organisms (eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Invent an insect with all of its body parts Construct a model and identify body parts Identify body parts on a diagram	Use magnifier to observe an insect and identify parts (Illustrate before and after viewing.) Show video "Backyard Science Insects" Use diagrams of various insects, label parts Make an illustration or model of an insect	Video: Eyewitness "Insect" Video: "Bugs Don't Bug Us!" Video: "Reading Rainbow "Bugs!" Big Book: The World of Insects
Describe how similar structures found in different organisms (eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Appropriate classification by using T chart or picture sort	Sort collections from nature walk Classify and sort pictures of insects and non-insects based on insect characteristics Read The Very Quiet Cricket by Eric Carle. Discuss the changes throughout the book T Chart- compare insect versus non-insect	The Very Quiet Cricket by Eric Carle Eyewitness Books: Insects by Lawrence Mound GEMS Insect Kits
Describe how similar structures found in different organisms (eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Illustration of insect with defense mechanism (example: camouflage, bee stinger)	Hide a butterfly activity (GEMS) Observe where insects are in their natural habitat and see how they blend in with their surrounding (Nature Walk/ Bug Collecting Books)	GEMS "Hide a Butterfly"
Determine the characteristic changes that occur during the lifecycle of plants and animals by	Match pictures with vocabulary of stages	Observe and record the life cycle changes of an insect	The Very Hungry Caterpillar by Eric Carle

examining a variety of species, and distinguish between growth and development.	Create a diagram of metamorphosis	Students will simulate life cycle changes Use drama or story.	Carolina Science and Math
Describe how similar structures found in different organisms (eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Teacher observation of following proper procedures	Read aloud Class discussion Students make guide book or poster for collecting, caring for, and releasing insects	The Rainbow Collection- The Bug Book and The Bug Battle
Describe how similar structures found in different organisms (eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Design, construct, and maintain an appropriate insect habitat Illustration of an insect in its habitat	Design, construct, and maintain an insect habitat Create an illustration of an insect in its habitat Define and follow proper procedure for collecting, observing and releasing an insect (*optional*)	The Rainbow Collection- The Bug Book and The Bug Battle
Communicate ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans might harm the environment.	Journal prompt	KWL Read aloud Class discussion	GEMS Insect Kits
Use basic science terms and topic related science vocabulary.	Match vocabulary to definitions	Write to or invite an entomologist asking about his/her work Role play the part of an entomologist	http://insected.arizona.edu/www.htm
Design and follow simple plans using systematic operations to explore questions and predictions and communicate and justify explanations with reasonable and logical arguments.	Teacher observation of following proper procedures	Throughout unit of study, students will use the following scientific process skills to learn about insects: observe, predict, classify, analyze, record data, communicate, measure List scientific process on a poster	Chart of scientific process skills

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Science Curriculum Supplement
Grade 1

Plants and Seeds

Essential Questions:
How can we find out about characteristic properties of living things in different environments?
How do plants, trees, and seeds impact the environment?
What features do plants, trees, and seeds have?
How do changes in the environment affect organisms?
How does our environment affect us and how do we impact the environment?

New Jersey Core Curriculum Content Standards

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.P.B.2 Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.
5.1.4.B.1 Building and refining models and explanations requires generation and evaluation of evidence.
5.1.4.B.4 Reasoning is used to support scientific conclusions.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
A. Organization and Developments: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

5.3.2.A.1 Living organisms:
- Exchange nutrients and water with the environment.
- Reproduce.
- Grow and Develop in a predictable manner.

B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

5.3.2.B.3 Most plants have roots to get water and leaves to gather sunlight.

C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.2.C.1 Organisms interact and are interdependent in various ways; for example, they provide food and shelter to one another.

D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms can contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

5.3.2.D.1 Plants and animals often resemble their parents.

E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.2.E.2 Plants and animals have features that help them survive in different environments.

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
G. Biogeochemical Cycles: The biogeochemical cycles in Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.2.G.3 Organisms have basic needs and they meet those needs within their environment.

5.4.2.G.4 The origin of everyday manufactured products such as paper and cans can be traced back to natural resources.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Describe the ways in which organisms interact with each other and their habitats in order to meet basic needs.	Illustration Diorama Writing samples	Nature walk Read aloud	Mr. Brown's Magnificent Apple Tree by Yvonne Winer Who Lives In a Tree? by Susan Canizares
Identify the natural resources used in the process of making manufactured products.	Collage Journal entries Play/skit	Discussions Read aloud Identify foods containing plants	The Giving Tree by Shel Silverstein Once There Was A Tree by Natalia Romanova

		Houghton Mifflin- Unit A, Chapter 1, Lesson 2	The Vegetable Garden by Melvin Berger
Identify the natural resources used in the process of making manufactured products.	Collage Journal entries	List foods from plants Cut pictures from magazines Classify food items by plant part Create class graph from student's lunches (explain which foods come from which plants)	Houghton Mifflin- Chapter 1, Lesson 2, A16-A19 Mighty Tree by Dick Gackenbach Have You Seen Trees? by Joanne Oppenheim Tops and Bottoms by Janet Stevens
Design and follow simple plans using systematic observations to explore questions and predictions.	Identification of objects as plants or not plants	Provide pictures or plant samples; students examine and identify characteristics	Houghton Mifflin- Unit A, Chapter 1, Lesson 2
Communicate and justify explanations with reasonable and logical arguments.	Clay model Illustration of a plant with parts labeled	Put together a cut up picture of a plant Dissect a plant into parts Label and identify parts of a picture or an actual plant Interactive Computer Games (eduplace)	Houghton Mifflin- Unit A, Chapter 1, Lesson 1 www.eduplace.com/science/hmsc/
Communicate and justify explanations with reasonable and logical arguments.	Journal observations Experiments	Observe water in a stem	Houghton Mifflin- Unit A, Chapter 1, Lesson 1
Group living and nonliving things according to the characteristics that they share.	Illustrations Observations	Grow plants under different conditions of light, water, soil (Observe and record changes)	Houghton Mifflin- Unit A, A9- Unit B, Lesson 2, B14-19 What's Alive - by Kathleen Weidner Zoehfeld
Design and follow simple plans using systematic observations to explore questions and predictions.	Journal observations	Select a tree and record observations by whole class, small groups, or individual journal/log throughout the year	Adopt a Tree- by Karen Lee Siepak

		Photograph the tree during each season	
Explain that most plants get water form soil through their roots and gather light through their leaves.	Illustration of a tree with parts labeled	Put together a cut up picture of a tree Label and identify parts of a picture of an actual tree	Discover the Wonder (Scott Foresman) Houghton Mifflin- Unit A, Chapter 1, Lesson 1
Design and follow simple plans using systematic observations to explore questions and predictions.	Student leaf sorts Leaf rubbing observations Written observations	Leaf sorting, graphing, grouping Leaf rubbings Leaf pressing Look at leaves closely with a hand lens Compare vein patterns of leaves	Houghton Mifflin- Unit A, Chapter 1, Lesson 1, A10 Life and Environment by Frank Blackwell Why Do Leaves Change Color? By Marian B. Jacobs
Communicate and justify explanations with reasonable and logical arguments	Student observations Examinations	Children can measure their adopted tree's circumference by wrapping a string around the trunk and measuring the string at a later time Observe and record data on physical appearance; new or old bark and branches, height, thickness of trunk (compare to other trees in the area)	Houghton Mifflin- Unit A, Chapter 1, Lesson 3, A22-24
Design and follow simple plans using systematic observations to explore questions and predictions.	Participation in experiments and/or discussions	KWL Throughout unit of study, students will use scientific process skills to learn about plants; observe, predict, classify, analyze, record data, communicate, measure	Houghton Mifflin- S2-S16 Seeds and Seedlings by Terry Jennings (Young Scientist Investigates Series)
Use basic science terms and basic science vocabulary.	Match vocabulary to definitions		
Use basic science terms and basic science vocabulary.	Discuss and describe careers and hobbies related to plants	Have a botanist visit class	

	(Botanist, horticulturist, dendrologist, nursery person, landscaper, gardener, local farmers, etc.) Research scientists	Student will draw self as an botanist in his/her surroundings	
Record the observable characteristics of plants and animals to determine the similarities and differences between parents and their offspring.	Discussions		Houghton Mifflin- Unit A, Chapter 1, Lesson 3, A22-A23
Describe how similar structures found in different organisms (eyes, ears, mouth) have similar functions and enable those organisms to survive in different environments.	Discussions	Match picture of plant to different environments	Houghton Mifflin- Unit B- Chapter 5, Lessons 1-3 Houghton Mifflin- Unit A, Chapter 1, Lesson 2, A14-A15
Design and follow simple plans using systematic observations to explore questions and predictions.	Bean chart assessment Journal of seed observations	Examine soaked lima bean using a hand lens to identify the three main seed parts (draw and label each part) Examine a dry lima bean and use senses to describe it in a journal	The Reason for a Flower by Ruth Heller
Design and follow simple plans using systematic observations to explore questions and predictions.	Bean chart assessment Journal of seed observations	Examine soaked lima bean using a hand lens to identify the three main seed parts	The Magic School Bus Plants a Seed by Joanna Cole "The Magic School Bus Goes to Seed" Video
Design and follow simple plans using systematic observations to explore questions and predictions.	Bean chart assessment Journal of seed observations	Students grow individual seeds and record daily observations	Seeds Grow (Big Book) From One Seed by Vera R. Webster How a Seed Grows by Helen Jordan http://www.urbanext.uiuc.edu/gpe/case3/case3.html

Design and follow simple plans using systematic observations to explore questions and predictions.	Journal of seed observations	Students grow individual seeds and record daily observations	
Identify and categorize the basic needs of living organisms as they relate to the environment	Illustrations and observations	Grow seeds under different conditions of light, water, soil; observe and record changes	How Do Plants Get Food? By M. Goldish
Describe the ways in which organisms interact with each other and their habitats in order to meet basic needs.	Observations of traveling seed experiment	Experiment using a fan to represent wind, a tub of water, any fur like material to represent animal fur to simulate how seeds travel	How Seeds Travel by Cynthia Overbeck The Tiny Seed by Eric Carle From Seed to Plant by Gail Gibbons Life & Environment by Frank Blackwood Seeds Get Around (Big Book)
Design and follow simple plans using systematic observations to explore questions and predictions.	Classification	Seed Sort Classify seeds by color and size Brainstorm a list of properties that can be used to classify seeds "Seed Center" to compare and contrast seeds	Look at Seeds and Weeds by Rena Kirkpatrick

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Rocks and Soils

Essential Questions:
What covers the earth?
What is a natural resource?
How do people use rocks and soil?

New Jersey Core Curriculum Content Standards

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.
B. History of Earth: From the time that Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.

5.4.4.B.1 Fossils provide evidence about the plants and animals that lived long ago, including whether they lived on the land or in the sea as well as ways species changed over time.

C. Properties of Earth Materials: Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

5.4.2.C.1 Soils are made of many living and nonliving substances. The attributes and properties of soil (example; moisture, kind and size of particles, living/organic elements, etc.) vary depending on location.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Describe Earth materials using appropriate terms, such as hard, soft, dry, wet, heavy and light.	Observations Recorded data	Class discussion Rock report Sort rocks based on color, size, shape, texture Sort soil based on color and texture First Grade Rock Concert	Dirt by Steve Tomecek Rocks and Soil by Neil Morris 1st Grade Houghton Mifflin- Unit C, Chapter 6 Learning Science Activity Tub- Rocks & Soil (Lakeshore) Scientists Who Study the Earth

			by Mel Higginson Rock by Chris Oxlade Rocks and Minerals by Ruth Chasek
Use data gathered from observations of fossils to argue whether a given fossil is terrestrial or marine in origin.	Journal / Class discussion	Fossil Dig	2nd Grade Houghton Mifflin- Unit C- Chapter 6, Lesson 3, C20-C26 Fossils by Allan Roberts Digging For Dinosaurs by Aliki
Use data gathered from observations of fossils to argue whether a given fossil is terrestrial or marine in origin.	• Journal / Class discussion	• Class discussion • Read aloud	• Video Laser Disc- Primary Science, Volume 2 • Fossils Tell of Long Ago by Aliki

Flemington-Raritan Regional Schools
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Grade 1

Solid, Liquid, and Gas

Essential Questions:
How do we describe and predict the behavior of matter in our world?
What systems in our world cause matter to change?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A. Properties of Matter: All objects and substances in the natural world are composed of Matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.2.A.1 Living and nonliving things are made of parts and can be described in terms of the materials of which they are made and their physical properties.
5.2.2.A.2 Matter exists in different states; the most commonly encountered are solids, liquids and gasses. Liquids take the shape of the part of the container they occupy. Solids retain their shape regardless of the container they occupy.

B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

5.2.2.B.1 Some properties of matter can change as a result of processes such as heating and cooling. Not all materials respond the same way to these processes.

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
G. Biogeochemical Cycles: The biogeochemical cycles in Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.2.G.1 Water can disappear (evaporate) and collect (condense) on surfaces.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials such as shortening or candle way.	Name, draw, or discuss an example of change	Melt ice pops, ice cubes, snowballs; apply salt to ice- watch it melt; apply heat to cause melting	Houghton Mifflin- Unit E, Chapter 11, Lesson 2
Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials such as shortening or candle way.	Name, draw, or discuss an example of change	Boil water or observe glass of water over time	Houghton Mifflin- Unit E, Chapter 11, Lesson 2, E46
Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials such as shortening or candle way.	Name, draw, or discuss an example of change	Create steam- cover pot, remove lid, and observe what has formed on the underside of it	
Sort and describe objects based on the materials of which they are made and their physical properties.	Sort liquids Compare and contrast appearance and behavior of liquids	"Liquid Classification" game	Houghton Mifflin- Unit E, Chapter 11, Lesson 1, E40 Liquid Exploration- Activity 2, 3, and 4 (GEMS) Involving Dissolving (GEMS)
Sort and describe objects based on the materials of which they are made and their physical properties.	Observations	Make bubbles Blow up balloons	Houghton Mifflin- Unit E, Chapter 11, Lesson 1, E41

Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials such as shortening or candle way.	Observations	Make Jell-O, ice, ice pops, scrambled eggs	2nd Grade Houghton Mifflin- Unit E, Lesson 2, E14-E15 Houghton Mifflin- Unit E, Chapter 11, Lesson 1, E44
Identify common objects as solids, liquids or gasses.	Compare and contrast appearance of objects	Sort lunches into solids, liquids, and gases Picture sort	Houghton Mifflin- Unit E, Chapter 11, Lesson 1, E36-E37 What is the World Made of? by Kathleen Weidner Zoehfeld Solid, Liquid, or Gas? by Sally Hewitt
Sort and describe objects based on the materials of which they are made and their physical properties.	Sort and classify objects		Houghton Mifflin- Unit E, Chapter 10, Lesson 1, E6-E7, E10-E11
Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials such as shortening or candle way.	Observations	Liquid classification Freeze water	Houghton Mifflin- Unit E, Chapter 10, Lesson 2, E44-E45
Observe and discuss evaporation and condensation.	Observations of water in various states	Boil water Create steam	Houghton Mifflin- Unit E, Chapter 10, Lesson 2, E46
Sort and describe objects based on the materials of which they are made and their physical properties.	Observations	Observe solids using senses	Houghton Mifflin- Unit E, Chapter 11, Lesson 1, E38-39

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What is a Scientist?

Essential Questions:
How can we be scientists?
How can we find answers to our questions?
How do we provide proof that our answers are reasonable?

New Jersey Core Curriculum Content Standards

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL- BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
B. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

5.1.P.B.1 Observe, question, predict, and investigate materials, objects, and phenomena (example using simple tools to crack a nut and look inside) during indoor and outdoor activities and during any longer-term investigations.
5.1.P.B.2 Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.
5.1.P.B.3 Experiments and explorations give young learners opportunities to use science tools and technology.
5.1.4.B.1 Building and refining models and explanation requires generation and evaluation of evidence.
5.1.4.B.2 Tools and technology are used to gather, analyze, and communicate results.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Design and follow simple plans using systematic observations to explore observations and predictions.	Experimental design	Class discussion List correct procedures	Being a Scientist (Big Book) Houghton Mifflin- S2-S16 You are a Scientist by Marcia S. Freeman
Design and follow simple plans using systematic observations to explore observations and predictions.	Class discussion / questioning practices in discussion	Experimenting throughout science units	Houghton Mifflin- S2-S16
Use basic science terms and topic related science vocabulary.	Match picture of scientist to job title	Guest speakers	

		E-mail or write a letter to a scientist	
Identify and use basic tools and technology to extend exploration in conjunction with science investigations.	Class discussion / class practices	Class discussion List correct safety procedures	Houghton Mifflin- S2-S16
Design and follow simple plans using systematic observations to explore observations and predictions.	Class discussions / experimental designs	Class discussion- how to be an inventor	Houghton Mifflin- S2-S16
Measure, gather, evaluate, and share evidence using tools and technologies.	Observation of proper tool use	Experimenting throughout science units	Houghton Mifflin- S2-S16
Identify and use basic tools and technology to extend exploration in conjunction with science investigations.	Class discussion	Experimenting throughout science units	

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Year at a Glance

The following is an example of appropriate pacing for the second grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team.

Weather	4 – 6 weeks
Forces and Motion	2 – 3 weeks
Vertebrates	6 – 8 weeks
Astronomy	2 – 3 weeks
How am I a Scientist?	1 – 2 weeks

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Scientist

Essential Questions:
How can we be scientists?
How can we find answers to our questions?
How do we provide proof that our answers are reasonable?

New Jersey Core Curriculum Content Standards

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
A. Understand Scientific Explanations: Students understand core concepts and principals of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

5.1.P.A.1 Who, what, when, where, why, and how questions form the basis for young learners' investigations during sensory explorations, experimentation, and focused inquiry.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.P.B.2 Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.
5.1.P.B.3 Experiments and explorations give young learners opportunities to use science tools and technology.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

5.1.P.C.1 Interacting with peers and adults to share questions and explorations about the natural world builds young learners' scientific knowledge.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Display curiosity about science objects, materials, activities, and longer-term investigations in progress.	Class discussion	Class discussion Create a list of procedures	Houghton Mifflin, Unit A (S2-S16) You Are A Scientist by Marcia S. Freeman

Communicate with other children and adults to share observations, pursue questions, and make predictions and/or conclusions.	Class discussion	Complete "My Scientific Observations" Draw and label measuring tools with "Scientific Measuring"	Lab Book
Use basic science terms and topic related science vocabulary.	Class discussion Bulletin board match activity with job titles and descriptions of science they study	Guest speakers E-mail or write a letter to a meteorologist Observe a weather report	Guest speakers
Communicate with other children and adults to share observations, pursue questions, and make predictions and/or conclusions.	Class discussion Safety quiz-quiz match game	Class discussion List procedures	Houghton Mifflin, Unit A (S2-S16)
Identify and use basic tools and technology to extend exploration in conjunction with science investigations.	Entries in lab book	Complete "Scientific Observation" survey Read Big Book, Being a Scientist (Newbridge - Thinking Like a Scientist series)	Lab book

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Astronomy

Essential Questions:
What are the patterns that affect our daily lives?
How do patterns affect our daily lives?
How do the patterns behave?

New Jersey Core Curriculum Content Standards

STANDARD 5.4: EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.

A. Objects in the Universe: Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution of the processes of stellar birth and death. These same processes govern the formation of our solar system 4.6 billion years ago.

5.4.2.A.1 The Sun is a star that can only be seen during the day. The Moon is not a star and can be seen at night and sometimes during the day. The moon appears to have different shapes on different days.

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.

C: Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.2.C.1 The Sun warms the land, air and water.
5.2.2.C.2 An object can be seen when light strikes it and is reflected to a viewers eye. If there is no light, an object cannot be seen.

D: Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

5.2.2.D.1 Batteries supply energy to produce light, sound, or heat.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Observe and record patterns of day and night and the movements of the shadows of objects on the Earth during the course of a day	Journal writing	Read aloud Lakeshore: "Ready-To-Go Light and Shadow" Activity Tote Activity 4 "Making Shadows"	Houghton Mifflin Unit D Chapter 9 (D62-63) Sun: Where Do You Go? by Francesca Grazzini Lakeshore: "Ready-To-Go Light and Shadow Activity Tote"
The Sun is a star that can only be seen during the day. The Moon is not a star and can be seen sometimes at night and sometimes during the day. The Moon appears to have different shapes on different days.	Journal writing	Video "A Look at the Moon" (National Geographic Video Series) Read aloud Houghton Mifflin, Unit D Chapter 9 (D42-D43) Lakeshore: Learning Science Activity Tub "Solar System" KWL chart "Moonlight Model" "Read About It" "Earth vs. Moon"	Video "A Look at the Moon" (National Geographic Video Series) The Sun and Moon by Patrick Moore The Moon Book by Gail Gibbons Houghton Mifflin Unit D Chapter 9 (D42-D43) Lakeshore: Learning Science Activity Tub "Solar System"
Observe that stars are many, scattered and different in brightness	Journal entry	Read aloud, Houghton Mifflin, Unit D Chapter 9 Lesson 4 (D9.4) Lakeshore: Learning Science Activity Tub "Solar System," "Constellation Cards," "Stargazing at Home," and "Starlight, Star Bright"	Houghton Mifflin, Unit D Chapter 9 Lesson 4 Stars and Constellations by Raman K. Prinja Watching the Stars by Edana Eckart

Recognize that the sun applies light and heat to the Earth (land, air, and water)	Teacher will assess student understanding through the use of a Venn Diagram	Read Houghton Mifflin, Unit D, Chapter 9 Lesson 1 (D37) Investigate and Activity Support Master D42 Lakeshore: Learning Science Activity Tub "Solar System," "Around the Sun"	Read Houghton Mifflin, Unit D, Chapter 9 Lesson 1 (D37)
Observe that the positions of the stars with respect to each other (constellations) is unchanging	Journal entry	Houghton Mifflin Unit D Chapter 9 Lesson 4: Art Link and Study Guide Lakeshore: Learning Science Activity Tub "Solar System," "It's In the Stars"	Houghton Mifflin, Unit D, Chapter 9 Lesson 4 (D58D-60) Find the Constellations by H.A. Rey Where's the Big Dipper? by Sidney Rosen
An object can be seen when light strikes it and is reflected to a viewer's eye. If there is no light, objects cannot be seen.	Observations of whole group discussion	Observe shadows by completing the investigation on pD41 of text	Houghton Mifflin, Unit D, Chapter 9 Lesson 2
Predict and confirm the brightness of a light, the volume of sound, or the amount of heat when given the number of batteries or the size of batteries.	Student made list of battery uses	Experiments with batteries	Teacher created materials

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Weather

Essential Questions:
How does our environment affect us and how do we impact our environment?
What systems in our world cause matter to change?
How are we affected by various systems?
What patterns affect our daily lives?
How do constant patterns affect our daily lives?

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.

F. Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

5.4.2.F.1 Current weather conditions include air movement, clouds, and precipitation. Weather conditions affect our daily lives.

G. Biogeochemical Cycles: The biogeochemical cycles in Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.2.G.1 Water can disappear (evaporate) or collect (condense) on surfaces.
5.4.2.G.2 There are many sources and uses of water.
5.4.4.G.3 Most of the Earth's surface is covered by water. Water circulates through the crust, oceans, and atmosphere in what is known as the water cycle.

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.

A. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.P.B.2 Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Current weather conditions include air movement, clouds, and precipitation. Weather conditions affect our daily lives.	•Drawing conclusions	• Make a windsock to observe the wind • Watch the movements of objects (flags, leaves, bubbles)	• Houghton Mifflin: Weather Patterns Chapter 8 • Air is All Around You by Franklin M. Branley • What Makes the Wind? By Laurence Santrey
Observe and document daily weather conditions and discuss how the weather influences your activities for the day.	Create flip book of sun, air, water	KWL "What is Weather?" Write about how they are affected by the weather	Earth Weather As Explained by Professor Xargle by Jeanne Willis Windows on Science: Earth's Weather Lesson 6 Who Cares About The Weather? Big Book
Identify that a meteorologist is a scientist who specializes in the study of weather, and uses tools and technology to help predict the weather.	Create class book with illustrations of students as meteorologists	View weather report and discuss observations Recognize the ways weather can be monitored and measured Read Aloud Critical Thinking View Windows On Science: "Earth's Weather" lesson 14	A Day In the Life of a Meteorologist by Margot & Ken Witty Weather Forecasting by Gail Gibbons Studying Weather by Ann & Jim Merk What Will the Weather Be? by Lynda DeWitt Weather Report Series by Ted O'Hare FOSS Activity 1 Part 2: "Setting Up Your Weather Station" Houghton Mifflin, Unit D Chapter 8 Lesson 1

Observe that objects in direct sunlight become warmer than objects in indirect sunlight and recognize how this affects daily and seasonal changes and patterns in the weather	• Season assessment • Direct and indirect sunlight assessment • Writing Prompt: "what you think the earth would be like without the sun?" • Illustration of self in each season • Participate in a Season Scavenger Hunt (Science Notebook – Going on a Scavenger Hunt)	• Read Aloud Our Sun The Nearest Star by Franklin M. Branley • Track daily, monthly, seasonal weather changes • Read thermometers • Graph temperatures • "Signs of the Season" activity • Houghton Mifflin Unit D Chapter 8 Lesson 1-3 • Windows on Science "Earth's Weather" Lesson 15 • Fill two cups with water and measure the temperature; place one cup in direct sunlight and the other in indirect sunlight; record difference.	• Houghton Mifflin Unit D Chapter 8 Lessons 1-3 • Windows on Science: "Earth's Weather" Lesson 15 • Classroom Weather Calendar
Describe and record current weather conditions and recognize how those conditions affect daily life.	Performance assessment, Houghton Mifflin (D7-D10) "Dress For the Weather" assessment	Read aloud Keep a daily weather chart and record temperature Write in journal about weather conditions over a period of time Graph results of monthly weather Discuss how weather affects our daily lives (what to wear, do, etc.)	Daily weather chart Weather Report Series Houghton Mifflin, Unit D Performance Assessment (D7-D10)
Observe, identify, and record the three main cloud types: cumulus, cirrus, and stratus and make weather predictions associated with each type	• Sort cloud pictures	• Read aloud •ViewVideo"CanISitona Cloud?" • Windows on Science: "Earth's Weather" lesson 8 • Houghton Mifflin Unit D Chapter 8 Lesson 1(D10)	• Clouds by Ann & Jim Merk • Cloudland by John Burningham • The Cloud Book by Tomie DePaola • Little Cloud by Eric Carle • It Looked Like Spilt Milk by

		Science Coach Background and Writing Link • Class cloud walk	Charles Green Shaw • Video " • Windows on Science: Earth's Weather Lesson 8 • Houghton Mifflin Unit D Chapter 8 Lesson 1
Observe and discuss evaporation, condensation and precipitation. Trace a path a drop of water might follow through the water cycle.	Water cycle assessment	Read aloud View Video Bill Nye's "The Water Cycle" Windows on Science: "Earth's Weather" Lesson 3 and 4 Houghton Mifflin, Unit D Chapter 8 Lesson 1 (Activity Support Master, Study Guide A&B)	Water Water Everywhere by Melvin Berger Water Water Everywhere by Mark J. Rauzon Water Dance by Thomas Locker Video "Bill Nye's The Water Cycle" Windows on Science: Earth's Weather Lesson 3 and 4 Houghton Mifflin, Unit D Chapter 8 Lesson 1 Study Guide (A & B)
Identify and use water conservation practices.		Read aloud AIMS Video " I Like Water"	Water by Jason Cooper Water by Neil Morris AIMS Video "I Like Water"

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Forces and Motion

Essential Questions:
How do things move?
How can we change how objects move?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.

E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.2.E.1 Objects can move in many different ways (fast and slow, in a straight line, in a circular path, zigzag, and back and forth).
5.2.2.E.2 A force is a push or pull. Pushing or pulling can move an object. The speed an object moves is related to how strongly it is pushed or pulled. When an object does not move in response to a push or a pull, it is because another push or pull (friction) is being applied by the environment.
5.2.2.E.3 Some forces act by touching, while other forces can act without touching.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
A force is a push or a pull. Pushing or pulling can move an object. The speed an object moves is related to how strongly it is pushed or pulled. When an object does not move in response to a push or pull, it is because another push or pull (friction) is being applied by the environment.	Recorded observations	Houghton Mifflin, Unit F, Chapter 13, Lesson 1 (F34-F35)	Houghton Mifflin, Unit F, Chapter 13, Lesson 1 (F36-37)

Investigate and model the various ways that inanimate objects can move.	Recorded observations	Houghton Mifflin, Unit F, Lesson 2, Chapter 13 (F40-F41) Houghton Mifflin, Unit F, Lesson 2, Chapter 13 (F48-F49) Using toy cars, students explore the effect of different angles of inclined planes on speed and distance Using gym scooters, students observe how force will affect motion	Houghton Mifflin, Unit F, Chapter 13, Lesson 2 (F42-F45) Teaching Physics With Toys (Terrific Science Press) The Lazy Bear by Brian Wild Smith
Distinguish a force that acts in direct contact with an object (e.g., by pushing or pulling) from a force that can act without direct contact (e.g., the attraction between a magnet and a steel paper clip).	"Testing Magnets" Investigation	Read Houghton Mifflin, Unit F, Chapter 13, Lessons 1 and 3. Complete investigation: Testing Magnets, pF35 Complete investigation: Observe force, pF49	Houghton Mifflin, Unit F, Chapter 13, Lessons 1 and 3

Flemington-Raritan Regional Schools
Science Curriculum
Grade 2

Vertebrates

Essential Questions:
How can we find out about the characteristic properties of living and nonliving things in different environments?
What features do vertebrates have that help them live in different environments?
How do changes in the environment affect organisms?
How does our environment affect us and how do we impact our environment?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space and matter has inertia.

5.2.2.A.1 Living and nonliving things are made of parts and can be described in terms of the materials of which they are made and their physical properties.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

5.3.2.A.1 Living organisms:
- Exchange nutrient and water with the environment
- Reproduce
- Grow and develop in a predictable manner

B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food and some organisms obtain their food from other organisms.

5.3.2.B.1 A source of energy is needed for all organisms to stay alive and grow. Both plants and animals need to take in water, and animals need to take in food. Plants need light.
5.3.2.B.2 Animals have various ways of obtaining food and water. Nearly all animals drink water or eat foods that contain water.

C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.2.C.2 A habitat supports the growth of many different plants and animals by meeting their basic needs of food, water, and shelter.
5.3.2.C.3 Humans can change natural habitats in ways that can be helpful or harmful for the plants and animals that live there.

E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.2.E.1 Variations exist within a group of the same kind of organism.
5.3.2.E.2 Plants and animals have features that help them survive in different environments.

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.
A. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.P.B.2 Experiments and explorations provide opportunities for young learners to use science vocabulary and scientific terms.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Compare and contrast essential characteristics that distinguish living things from nonliving things.	Teacher observation of living/nonliving sort	Windows on Science: Life Science Volume 1 Lesson 1, 20, 21, 23, and 24 Read aloud Venn diagram Scavenger hunt outside Bring in pictures from magazines to sort on chart	Windows on Science: Life Science Volume 1 Lesson 1, 20, 21, 23, and 24 What's Alive? By Kathleen Weidner Zoehfeld Houghton Mifflin, Unit B, Chapter 4 (B4-B11)

Identify the characteristics that distinguish mammals, reptiles, amphibians, birds, and fish from each other	Houghton Mifflin Unit A Chapter 2 (A67-A70) • Animal unit assessment	Read aloud View "Eyewitness" videos Label parts Sort by animal group Houghton Mifflin Unit A Chapter 2 Lesson 1 (A34-A47)	Animals Born Alive and Well by Ruth Heller Chickens Aren't the Only Ones by Ruth Heller Rourke Series *The Animal Kingdom What's the Difference?* Series "*Eyewitness*" videos
Group living and nonliving things according to the characteristics that they share. For example: living things reproduce, grow and develop in a predictable manner, and exchange nutrients and water with the environment.	"Life Cycle of a Frog" assessment	Houghton Mifflin, Unit A, Chapter 3 (A62-A67, A70-A76) Study Guide (A & B) Read aloud Match Houghton Mifflin "Animal Cards" into groups to show how they are alike	Houghton Mifflin, Unit A, Chapter 3 Lesson (A62A-67), (A70-A76) The Tadpole Diary *Nature Up Close* Series Animal Lives by Marcia S. Freeman www.enchantedlearning.com
Define the needs and common behaviors of vertebrate animals: growth, reproduction, movement, breathing air, eating food, drinking water, elimination of waste; and how these needs are met within their environment	Animal chart assessment	Read aloud Houghton Mifflin, Unit A, Chapter 2, Lesson 3 (A52-55) Study Guide (A & B) Bird Beak Kit experiment	Rourke Series *The Animal Kingdom* Houghton Mifflin, Unit A, Chapter 2 Lesson 3 (A52-A55) Bird Beak Kit
Describe how similar structures found in different organisms (e.g., eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments.	Animal research	Read aloud Animal Jeopardy Houghton Mifflin, Unit B, Chapter 4 (B6-31)	It's Science All Kinds Of Habitats by Sally Hewitt Animal Homes by Ann O'Squire Houghton Mifflin Unit B Chapter 4 (B6-B31)
Identify John James Audobon and Jane Goodall by their contribution to the classification systems and observation of vertebrate animals	Journal entry	Read aloud Journal writing: "How did Goodall accomplish her goals? What are your goals?"	Jane Goodall, The Chimpanzee's Friend by Carol Fuchs Jane Goodall, Living with the Chimps by Julie Fromer

		Draw objects to scale using grid paper as Audobon did	John James Audobon by Jan Gleiter
Identify the characteristics of a habitat (including food, water, and shelter) that enable the habitat to support the growth of many different plants and animals.	Animal picture sort	Animal Cut Outs	Lab Book
Describe the requirements for the care of plants and animals relating to meeting their energy needs.	Needs of Living Things Venn Diagram	Read Houghton Mifflin, Unit A, Chapter 1, Lesson 1 and Chapter 2, Lesson 1	Houghton Mifflin, Unit A, Chapter 1, Lesson 1 and Chapter 2, Lesson 1
Communicate ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans might harm habitats.	Draw pictures that demonstrate the effect that humans have on nature	Shared reading and illustration of ways humans help and harm habitats	*Wump World*, by Bill Peet The Lorax, by Dr. Seuss
Describe similarities and differences in observable traits between parents and offspring.	Teacher observation of animal sort cards (see investigation on pA63)	Read Houghton Mifflin, Unit A, Chapter 3, Lesson 1 and Lesson 2	Houghton Mifflin, Unit A, Chapter 3, Lesson 1 and Lesson 2

Flemington-Raritan Regional Schools
Science Curriculum
Grade 3

Year at a Glance

The following is an example of appropriate pacing for the third grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team.

Energy and Change	4 – 6 weeks
Ecosystems	6 – 8 weeks
Astronomy/Solar Systems	5 – 7 weeks

Flemington-Raritan Regional Schools
Science Curriculum
Grade 3

Energy and Change

Essential Questions:
What are the different ways objects can move? (fast/slow, straight line, circular path, back and forth)
How do different degrees of force change motion?
Do forces act at a distance? (gravity, magnetism, static electricity)
How does light travel?
What produces sound?

New Jersey Core Curriculum Content Standards

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
C: Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.4.C.4 Light travels in straight lines. When light travels from one substance to another (air and water), it changes direction.

E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.4.E.1 Motion can be described as a change in position over a period of time.
5.2.4.E.2 There is always a force involved when something starts moving or changes its speed or direction of motion. A greater force can make an object move faster and farther.
5.2.4.E.3 Magnets can repel or attract other magnets, but they attract all matter made of iron. Magnets can make some things move without being touched.
5.2.4.E.4 Earth pulls down on all objects with a force called gravity. Weight is a measure of how strongly an object is pulled down toward the ground by gravity. With a few exceptions, objects fall to the ground no matter where they are on Earth.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Earth pulls down on all objects with a force called gravity. Weight is a measure oh how strongly an object is pulled down toward the ground by gravity.	Journal entry drawings and list Questioning students Teacher observation	Guided discovery Partner demonstration List of pushes and pulls	Houghton Mifflin, Force and Motion Unit F Chapter 15
Investigate rules for the effect	Predict and write	Experiment: How does gravity	Houghton Mifflin, Force and

gravity has on balls of different sizes and weights.	Diagram Investigation	affect balls of different sizes and weights?	Motion Unit F Chapter 15
Identify different surfaces that affect motion by reducing or increasing friction	Student predictions Open-ended responses	"Feel Friction" kinesthetic activity Hand lotion experiment	Houghton Mifflin: Force and Motion Unit F Chapter 15 (F76) "How Can You Decrease Friction" experiment (See Lab Book)
Identify the force that starts something moving or changes its speed or direction of motion.	Predict and write Diagram Investigation	Independent Inquiry "Does it Measure Up?" "Moving Marbles" investigation or "Describing Motion" Pressed for Time Lab	Houghton Mifflin, Force and Motion Unit F Chapter 15 (F68M) Unit F Chapter 15 (F79)
Predict, measure, and record the amount of force needed to move an object. The greater the force the faster and farther an object moves.	Predict and write Diagram Investigation conclusion	Independent Inquiry "Moving Marbles" investigation or "Describing Motion" Pressed for Time lab	Houghton Mifflin, Force and Motion Unit F Chapter 15 (F68M) Unit F Chapter 15 (F79)
Motion can be described as a change in position over a period of time.	Model drawn in science notebook	Create a model showing that motion is a change in position over time.	Houghton Mifflin, Force and Motion Unit F Chapter 15 (F68M) Unit F Chapter 15 (F79)
Understand that work requires energy to make things move	Student observation Interpret and analyze data Questioning students	Independent Inquiry "Does it Measure Up?"	Houghton Mifflin, Force and Motion Unit F Chapter 15 (F68M)
Magnets can repel and attract other magnets, but they attract all matter	Teacher observation	"Polar Opposites" investigation or	Houghton Mifflin, Force and Motion Unit F Chapter 15 (F71)

made of iron. Magnets can make some things move without being touched.	Journal entry Test and/or quiz	 "Push and Pull with Magnets" Pressed for Time Lab	
Light travels in straight lines. Illustrate and explain what happens when light travels from air into water.	Interpret and analyze data Student conclusions Teacher observation	"Shining Light" investigation or "Blocking Light" Pressed for Time Lab	Houghton Mifflin: Forms of Energy Unit F Chapter 14 Lesson 3 (F57)
Recognize that sound energy travels through matter at sound waves. Sound wave characteristics determine how people hear sound.	Interpret and analyze data Students' conclusions •Teacher observation	"Seeing Sounds" investigation or "Waves in Water" Pressed for Time Lab "Sound Safari" Readers' Theater Turn Up the Sound" take-home activity	Houghton Mifflin: Forms of Energy Unit F Chapter 13 (F13) Unit F Chapter 13 (F22) •Unit F Chapter 13 (F3)
Identify and examine the six types of simple machines (lever, pulley, wheel and axle, wedge, screw, and inclined plane) (optional)	Label Investigation conclusion Quizzes and/or tests Create a model Identify simple machines in everyday life	"Load Them Up" investigation or "Build a Machine" Pressed for Time Lab "Simple Machines in Action" take-home activity	Houghton Mifflin: Force and Motion Unit F Chapter 15 (F89) Simple Machine Concept Map (see Lab Book)
Determine how simple machines make work easier (optional)	Classify	Simple Machine Picture/Word Dictionary	Simple Machine Booklet (see Lab Book)
Classify everyday objects by the type of simple machine (optional)	Classify Identify simple machines in everyday life	BLM (F81) "What Are Simple Machines"	Houghton Mifflin: Force and Motion Unit F Chapter 15 (F90)

Flemington-Raritan Regional Schools
Science Curriculum
Grade 3

Ecosystems

Essential Questions:
What are the basic needs of all living things?
How do we differentiate between the needs of plants and animals?
What are the similarities and differences between the lifecycles of various living things?
What are the roles of organisms in our environment?
How do organisms affect their environment?
What roles do organisms serve in a food chain?
What can we investigate about the flow of energy in an ecosystem, community, and environment?
What are the influences of the regions of New Jersey on food webs? (flow of energy)
How do organisms interact and compete for resources and space in their environment?
How do plants and animals adapt to survive in different ecosystems?
How do humans impact the environment?
How do humans affect the flow of energy in the environment?

New Jersey Core Curriculum Content Standards

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARRISES IN ACCORDANCE WITH RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

5.3.4.A.1 Living organisms:
- Interact with and cause changes in their environment.
- Exchange materials (such as gasses, nutrients, water, and waste) with the environment.
- Reproduce
- Grow and develop in a predictable manner.

5.3.4.A.2 Essential functions required for the well being of an organism are carried out by specialized structures in plants and animals.

B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food and some organisms obtain their food from other organisms.

5.3.4.B.1 Almost all energy (food) and matter can be traced to the Sun

C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.4.C.1 Organisms can only survive in environments in which their needs are met. Within ecosystems, organisms interact with and are dependent on their physical and living environment.
5.3.4.C.2 Some changes in ecosystems occur slowly, while others occur rapidly. Changes can affect life forms, including humans.

D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

5.3.4.D.1 Plants and animals have lifecycles (they begin life, develop into adults, reproduce, and eventually die). The characteristics of each stage of life vary by species.

E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.4.E.1 Individuals of the same species may differ in their characteristics, and sometimes these differences give individuals and advantage in surviving and reproducing in different environments.
5.3.4.E.2 In any ecosystem, some populations of organisms thrive and grow, some decline, and others do not survive at all.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Define an ecosystem	entry in science notebook	Ecosystem Poetry- describing different types of ecosystems	Houghton Mifflin: Survival of Living Things Unit B Chapter 5 (B59) Unit B Chapter 5 (B60)
Classify plants and animals that inhabit aquatic or terrestrial ecosystems (optional)	Infer Communicate Classify	"Match Things Up" investigation or "Different Food Chains" Pressed for Time Lab "What are Some Different Food Chains" BLM (B64)	Houghton Mifflin: Survival of Living Things Unit B Chapter 5 (B59) Unit B Chapter 5 (B60)
Define adaptation and understand how they allow individuals to survive and reproduce in different environments.	Models Infer Recorded observation	Venn diagram, word card and/or picture sort	Lab Book
Classify adaptation as behavioral or physical	Entry in science notebook	"Best Bird Beak" investigation or "Built-in Tools" Pressed for Time	Houghton Mifflin: Survival of Living Things Unit B Chapter 4

		Lab	(B21)
Model physical adaptations	Connection of adaptation to environment Written response in journal entry	"How Fast Does It Dry Out" activity	"The Wump World" by Bill Peet See Lab Book
Distinguish how plants and animals are uniquely adapted to inhabit specific ecosystems. Understand that organisms interact with and are dependent on their environment.	Observe Communicate Collect, record, display and interpret data	"Critter Create" create a species with a physical adaptation to survive in a specific type of environment	Houghton Mifflin: Survival of Living Things Unit B Chapter 4 (B5) • DSM Kit Activity 5 pages 47-52
Investigate and describe the importance of the sun in relation to the survival of organisms	•Experiment •Use variables •Hypothesize •Collect, record, display, and interpret data	Explain adaptation in journal	DSM Kit Activity 3 pages 31-38
Living organisms: • Interact with and cause changes in their environments. • Exchange materials (such as gases, nutrients, water, and waste) with the environment. • Reproduce • Grow and develop in a predictable pattern •	•Measure •Observe	"Staying Alive" investigation or "The Needs of Living Things" Pressed for Time Lab "Observing Anoles"	DSM Kit Activity 6 pages 53-58
Essential functions required for the well-being of an organism are carried out by specialized structures in plants and animals.	illustrations and labels in science notebook	Label parts of plants and animals that allow it to survive in science notebook	Houghton Mifflin: Survival of Living Things Unit B Chapter 4
Investigate how organisms interact cooperatively and competitively in an ecosystem	Analyze and predict Student observation Bar graph	"Competition" investigation or "Group Soup" Pressed for Time Lab "Plants as Producers"	Houghton Mifflin: Survival of Living Things Unit B Chapter 4 (B13) •DSM Kit Activity 3 pages 31-38 •DSM Kit Activity 7 pages 59-66 •DSM Kit Activity 8 pages

	Infer	"Animal Behavior"	67-72 •DSM Kit Activity 9 pages 73-80 •DSM Kit Activity 11 pages 89-96
Some changes in ecosystems occur slowly while others occur rapidly. Changes can affect life forms, including humans.	Entry in science notebooks	Explore the consequences of rapid ecosystem change (flooding, wind storms, snowfall, volcanic eruptions) and compare them to gradual change (gradual increases or decreases in daily temperatures, change in yearly rainfall.	Houghton Mifflin: Survival of Living Things Unit B Chapter 4
Plants and animals have life cycles. The characteristics of each stage of life vary by species.	Life cycle diagrams in science notebooks	Compare the physical characteristics of the different stages of the life cycle of an individual organism with another.	Houghton Mifflin: Survival of Living Things Unit B Chapter 4
Determine how humans impact the environment	Model Hypothesize Predict	"What Do Crickets Eat" "Earthworms and Decomposers" "The Food Chain Game"	Houghton Mifflin: Survival of Living Things Unit B Chapter 4 (B31) "Deer, Moose, Elk, Caribou" by Deborah Hodge
Create simple food chains	Assessment Resources B532h and B32i Illustrations: final food chains	Arrange plant and animal cards to create food chains on paper	Chapter 6: B36-B41 Plant and animal cards (see lab book for cards)
Construct food webs: Develop a simple classification scheme for grouping organisms (herbivore, carnivore, omnivore)	Illustration: Tangled Web Chart: Kidspiration web	Create webs using index cards Web food chains using Kidspiration	Chapter 6 investigations "A Tangled Web" page B35 Food chain papers from above using plant and animal cards (See technology teacher about using Kidspiration)
Investigate owl pellets (optional)	Assembly of skeleton	Dissect owl pellets and use bone reference sheet to identify and classify bones Assemble the bones into an animal skeleton	Owl pellets (must be ordered the year before)

Recognize that fluctuations in wildlife populations are natural as ecological systems undergo constant change	Graph	"Oh Deer" game Create a bar graph of data to recognize fluctuations	"Project Wild" book

Flemington-Raritan Regional Schools
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Astronomy

Essential Questions:
What does our solar system consist of?
What forces are responsible for keeping the objects in the solar system in orbit?
Why do the Sun and Moon appear to move in the sky?
What causes day and night?
Does the shape of the moon have a predictable pattern?
What tools do scientists use to explore objects in space?

New Jersey Core Curriculum Content Standards

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.

A. Objects in the Universe: Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution of the processes of stellar birth and death. These same processes govern the formation of our solar system 4.6 billion years ago.

5.4.4.A.1 Objects in the sky have patterns of movement. The Sun and Moon appear to move across the sky on a daily basis. The shadows of an object on Earth change over the course of the day indicating the changing position of the Sun during the day.
5.4.4.A.2 The observable shape of the moon changes from day to day in a cycle that lasts 29.5 days.
5.4.4.A.3 Earth is approximately spherical in shape. Objects fall towards the center of the Earth because of the pull of the force of gravity.
5.4.4.A.4 Earth is the third planet from our Sun in the solar system, which includes seven other planets.

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.

A. Understand Scientific Explanations: Students understand core concepts and principals of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

5.1.4.A.3 Outcomes of investigations are used to build and refine questions, models, and explanations.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.4.B.2 Tools and technology are used to gather, analyze and communicate results.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Observe the movement of the sun using shadow sticks	Collecting data Analyzing data Hypothesizing Inferring and measuring	"Making Shadow Sticks"	Lab Book
Model the relative size and distance of the earth, moon, and sun	Measure Compare Journal entry drawings Chart	"What is the Solar System?" BLM (D51) "Relative Size and Distance of the Earth/Moon System" investigation	Houghton Mifflin, Our Solar System, Unit D Chapter 9 (D44) www.nasa.gov
Investigate the moon and its movement across the sky by exploring the moon's position at the same time over the course of one week. Make predictions about its future appearance for a cycle that lasts 29.5 days.	Hypothesize Record data Interpret and analyze data Predict Observe	Independent Inquiry "Moon Journal" "Moon Motion" investigation or "What is a Month?" Pressed for Time Lab Nasa observation "Pizza Wheel Moon Phases"	Houghton Mifflin: Our Solar System Unit D Chapter 10 (D64n) Houghton Mifflin: Our Solar System Unit D Chapter 10 (D73) Lab Book www.nasa.gov
Investigate and observe lunar and earth rotation and revolution (optional)	Infer Measure Model Analyze data Use of numbers	"Planet Movements" investigation or "Bowling" Pressed for Time Lab "A Long Day" investigation or "Revolve Around" Pressed for Time Lab "Lunar Rotation and Revolution"	Houghton Mifflin, Our Solar System, Unit D Chapter 9 (D43), Unit D Chapter 10 (D73) Lab Book

		investigation	
Earth is the third planet from the Sun in our solar system, which includes seven other planets.	Compare Questioning students Written response	Create a model of the solar system	Houghton Mifflin, Our Solar System, Unit D Chapter 9
Identify and describe constellations as groupings of stars (optional)	Compare Questioning students Written response	"Star Gazing" investigation or "Compare Constellations" Pressed for Time Lab "Star Light Star Bright" coordinate griding activity	Houghton Mifflin: Our Solar System Unit D Chapter 10 (D83) Lab Book
Identify the eight planets	Compare Infer Chart Test and/or quiz	"Orbiting the Sun" investigation or "It's Really, Really Far" Pressed for Time Lab "What are the Inner Planets?" BLM (D56) Jeopardy review	Houghton Mifflin, Our Solar System, Unit D Chapter 9 (D53), Unit D Chapter 9 (D54) Lab Book
Demonstrate the distance between planets	Make observations Record data Conclusions Communicate results	Independent Inquiry "The Planets are Far Out"	Houghton Mifflin, Our Solar System, Unit D Chapter 9 (D34n)
Demonstrate and explain how gravitational pull affects the solar system and explain why the Moon orbits Earth.	Questioning students Participation in human modeling of planetary movement in relation to sun Written response / journaling	"Planet Movements" Investigation Unit D Chapter 9 (D43)	Houghton Mifflin, Our Solar System, Unit D Chapter 9

Identify what causes seasons (optional)	Questioning students Participation in human modeling of rotation/revolution Written response / journaling	Modeling of rotation and revolution of Earth and sun	Houghton Mifflin, Our Solar System, Unit D Chapter 10 (D70)
Identify tools such as space probes and telescopes used to magnify celestial objects	Compare Infer	"Making a Telescope" investigation or "Say What?" Pressed for Time Lab	Houghton Mifflin, Our Solar System, Unit D Chapter 9 (D37)
Investigate how craters are formed (optional)	Measure and chart Conclusions Comparisons	"How are Craters Formed?"	Lab Book

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Year at a Glance

The following is an example of appropriate pacing for the fourth grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team.

Weather	5 – 6 weeks
Solid Earth	3 – 4 weeks
Matter	4 – 6 weeks
Magnetism & Electricity	4 – 5 weeks

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Magnetism & Electricity

Essential Questions:
What materials are attracted to magnets?
How does distance change the force of a magnet?
How does electricity work?
What components are needed to create a circuit?
How are magnets and electricity related?

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A: Properties of Matter: All objects and substances in the natural world are composed of Matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.4.A.4 Objects vary in the extent to which they absorb and reflect light and conduct heat (thermal energy) and electricity.

C: Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.4.C.1 Heat (thermal energy), electricity, light, and sound are forms of energy.
5.2.4.C.2 Heat (thermal energy) results when substances burn, when certain kinds of materials rub against each other, and when electricity flows through wires. Metals are good conductors of heat (thermal energy) and electricity. Increasing the temperature of any substance requires the addition of energy.
5.2.4.C.3 Energy can be transferred from one place to another. Heat energy is transferred from warmer things to colder things.

D: Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

5.2.4.D.1 Electrical circuits require a complete loop through conducting materials in which an electrical current can pass.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Use devices that show electricity producing heat, light, sound, and magnetic effects	Student responses in science notebooks Teacher assessment charts	"The Force" investigation "Magnets and Materials" investigation	FOSS Kit Teacher's Guide: Magnetism and Electricity

	Performance assessments Student sheets End of module assessment Portfolio checklist Chart	"More Magnetic Properties" investigation "Breaking the Force" investigation "Detecting the Force of Magnetism" investigation	
Repair an electric circuit by completing a closed loop that includes wires, a battery (or batteries), and at least one other electrical component to produce observable changes.	Student response sheets Teacher assessment charts Performance assessments Student sheets End of module assessment Portfolio checklist	"Advanced Connections" investigation "Building Series Circuits" investigation "Building Parallel Circuits" investigation "Solving the String of Lights" investigation	Student response sheet Performance assessments End of module assessment Student sheets
Compare the flow of heat through metals and nonmetals by taking and analyzing measurements. Understand that metals are good conductors of heat (thermal energy). Draw and label diagrams showing several ways that energy can be transferred from one place to another.	Student response sheets Teacher assessment charts Performance assessments Student sheets End of module assessment Portfolio checklist	"Current Attractions" investigation "Building an Electromagnet" investigation "Changing the Number of Winds" investigation "Investigating more Electromagnets" investigation	FOSS Kit Teachers Guide: Magnetism and Electricity
Understand that heat (thermal energy) results when substances burn, when materials rub against each other, or when electricity flows through wires.	Students' responses in science notebooks	Discovery lessons and activities	Teacher created discovery lessons

Increasing the temperature of any substance requires adding energy.	Students' responses in science notebooks	Discovery lessons and activities	Teacher created discovery lessons
Categorize objects based upon the ability to absorb or reflect light and conduct heat or electricity.	Students' responses in science notebooks	Discovery lessons and activities	Teacher created discovery lessons
Objects vary in the extent to which they absorb and reflect light and conduct heat (thermal energy) and electricity.	Entries in science notebook	Categorize objects based upon the ability to absorb or reflect light and conduct heat or electricity.	Teacher created materials
Heat (thermal energy), electricity, light, and sound are forms of energy.	Chart Entries in science notebook	Compare various forms of energy as observed in everyday life and describe their applications.	Teacher created materials

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Matter

Essential Questions:
What are the properties of matter?
How can matter be classified?
How can matter be changed (physical and chemical)?
How does energy change states of matter?
How can you use specific properties to separate a mixture?
Does all matter behave in the same manner when exposed to the same conditions?
How can you form a new substance having properties different from the original properties?

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A: Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.4.A.1 Some objects are composed of a single substance; others are composed of more than one substance.
5.2.4.A.2 Each state of matter has unique properties (e.g., gasses can be compressed while solids and liquids cannot; a shape of a solid is independent of its container; liquids and gasses take the shape of their containers).
5.2.4.A.3 Objects and substances have properties, such as weight and volume, that can be measured using appropriate tools. Unknown substances can sometimes be identified by their properties.
5.2.4.A.4 Objects vary in the extent to which they absorb and reflect light and conduct heat (thermal energy) and electricity.

B: Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

5.2.4.B.1 Many substances can be changed from one state to another by heating or cooling.
5.2.8.B.2 (Optional) Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances. The physical and chemical properties of the products are different from those of the reacting substances.
C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, that natural world can be explained and predictable.

5.2.4.C.1 Heat (thermal energy), electricity, light, and sound are forms of energy. (This strand is in the Electricity/Magnetism Unit)
5.2.4.C.3 Energy can be transferred from one place to another. Heat energy is transferred from warmer things to colder things. (This strand is in the Electricity/Magnetism Unit)

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND AN EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFICIENT IN SCIENCE.

A. Understand Scientific Explanations: Students understand core concepts and principals of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

5.1.4.A.1 Fundamental scientific concepts and principles and the links between them are more useful than discrete facts.
5.1.4.A.2 Connections developed between fundamental concepts are used to explain, interpret, build, and refine explanations, models, and theories.

B.Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluation claims.

5.1.4.B.2 Tools and technology are used to gather, analyze and communicate results.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Learn that matter is anything that has mass and volume	Performance Assessment using balance scale and graduate cylinders	"Measure It" investigation	Houghton Mifflin Unit E Ch. 12 Houghton Mifflin Unit E Ch. 13
Investigate various substances by observing their physical properties (size, shape, color, state, texture, and density)	Performance assessment Rubric	Compare Liquids Making models of compounds Mystery Powders	GEMS Kit National Geographic Video "Properties of Matter" Houghton Mifflin Unit E Ch. 12 (E23)
Investigate matter by measuring its physical properties using tools (i.e., balance, graduated cylinder, rulers)	Performance assessment Rubric	"Measure It" investigation Compare Liquids	Houghton Mifflin Unit E Ch. 12 (E23)

Investigate physical changes and define them as changes in size, shape, color, and state with no new kind of matter being formed	Student Resources (blackline masters E2d) Performance assessments Chart Rubric	"Compare Matter" investigation	Houghton Mifflin Unit E Ch. 12
Describe and create models to describe the motion of particles in solids, liquids, and gases	Performance assessment Rubric	Graphic organizer on 3 states of matter (see lab book) Phases of Matter – Temperature of Energy Worksheet (see lab book)	Graphic organizer and worksheet in lab book
Understand that heating and cooling is a form of energy that causes a change in matter	Student Resources (blackline masters E2d & 34 j) Activity sheet Rubric	Balloon Bath	Houghton Mifflin Unit E Ch. 12 Houghton Mifflin Unit E Ch. 13 (E43)
Understand gases can be compressed while solids and gases cannot; a solid has a definite shape while liquids and gases take the shape of their containers	Student-made chart in science notebook	Create a chart based upon the three states of matter, their shapes, and their sizes	Hougton Mifflin Unit E Ch 12 (E10-E11)
Observe that water can be a liquid or a solid and can change from one form to the other and the mass remains the same	Student Resources (blackline masters E34j) • Activity Sheet • Rubric	"Matter Changes" investigation	Houghton Mifflin Unit E Ch. 13
Observe and compare mixtures and solutions and understand how they can be made and separated	Performance assessment • Rubric	"Making Mixtures" investigation	Houghton Mifflin Unit E Ch. 13 (E52-E53)
Read about scientists who have developed technology that has advanced the exploration of science	Discussion Writing follow-up activity	Gertrude Elron	Houghton Mifflin Unit E Ch. 12 (E20-E21)

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Weather

Essential Questions:
What is weather?
How does it impact the region's environment?
How are air and water essential to the earth?
What is air and what can it do?
What are clouds and how are they used to predict the weather?
How does weather affect the earth? (erosion and deposition)

New Jersey Core Curriculum Content Standards:

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.
E: Energy and Earth Systems: Internal and external sources of energy drive Earth systems.

5.4.4.E.1 Land, air, and water absorb the sun's energy at different rates.

F: Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

5.4.4.F.1 Weather changes that occur from day to day and across the seasons can be measured and documented using basic instruments such as a thermometer, wind vane, and anemometer, and rain gauge.

G: Biogeochemical Cycles: The biogeochemical cycles in Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.4.G.1 Clouds and fog are made of tiny droplets of water and, at times, tiny particles of ice.
5.4.4.G.2 Rain, snow and other forms of precipitation come from clouds; not all clouds produce precipitation.
5.4.4.G.3 Most of the Earth's surface is covered by water. Water circulates through the crust, oceans, and atmosphere in what is known as the water cycle.
5.4.4.G.4 Properties of water depend on where the water is located (ocean, rivers, lakes, underground sources, and glaciers).

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Understand that air is matter in the	Interactive science notebook	"Balancing Air" investigation	Houghton Mifflin Unit D Chapter

gaseous state; it takes up space and has weight		"What is Air" investigation	10 Lesson 1
Land, air and water absorb the Sun's energy at different rates	Interactive science notebook	"Sun Effects" investigation "How is the Sun Important to Earth?" investigation	Houghton Mifflin Unit D Chapter 11 Lesson 1
Develop the understanding that winds are caused when air is heated unevenly	Chapter assessment	How Winds are Formed - Land and Sea Breezes, worksheet	Houghton Mifflin Unit D Chapter 10 Lesson 3 (D24) Lab book – How Winds are Formed worksheet Weatherwizkids.com
Use weather maps to interpret weather conditions in specific locations (optional)	Read weather map Predict the weather	Use current weather information from various media types to interpret and analyze a weather map Use weather maps to predict weather conditions	Houghton Mifflin Unit D Chapter 10 Lesson 3 (D22-D29)
Measure air temperature with a thermometer	Graph collected temperature data	Measure and record daily air temperature Find high, low, and average temperature after set time period	Thermometers and chart
Use a barometer to measure air temperature	Collect data on air pressure, and record	Build instrument	Barometers and chart
Determine the direction of the wind by using a wind vane	Rubric	Weather journals	Lab Book "Weather Chart" Brainpop "Wind"
Demonstrate that the speed of the wind can be measured with an anemometer	Collect and graph data	Build instrument	Brainpop "Wind"

Develop their knowledge that fluctuations in water vapor result in variations of clouds, precipitation, and humidity (optional)	Lab worksheet	"Cloud in a Bottle"	Bill Nye "Weather" Houghton Mifflin Unit D Chapter 10 Lesson 3 (D23)
Review the four cloud types (cirrus, stratus, cumulus, and nimbus) and their role in weather prediction	Label pictures of cloud types Cloud charts	Drawing and painting clouds	Brainpop "Clouds"
Recognize that different clouds produce different forms of precipitation; not all clouds produce precipitation	Weather journals Student discussions "Cloud in a Bottle" Activity Conclusions	Drawing and painting clouds Weather journal Weather Aces School Reporting	weatherwizkids.com
Recognize that clouds and fog are made of tiny droplets of water and possible tiny particles of ice.	Illustration in interactive science notebook	"Cloud in a Bottle"	Bill Nye "Weather"
Read about Benjamin Banneker (1731-1806), an African- American who experimented with meteorology	Interactive science notebook	Read aloud biography about Benjamin Banneker	School library Online resources
Recognize that most of the Earth's surface is covered by water and be able to identify the properties of those sources of water: oceans, rivers, lakes, underground sources of glaciers	Journaling: "name two ways of conserving water and why it continues to be important to conserve water"	Demonstrate how much water there is on Earth and how much of that water is fresh water (vs. salt water), and how much of that fresh water is usable (may use model, pie chart, etc.)	Lab Book Brainpop "Groundwater" Brainpop "Voyage of the Mimi"
Understand that water circulates through the crust, bodies of water, and the atmosphere in what is known as the water cycle.	Diagram of water cycle	Diagram of water cycle	Brainpop "Water Cycle"
Model how the properties of water can change as water moves through the water cycle.	•Interactive science notebook	• "Water Cycle Model" investigation • Extra support (D. 14) • Independent Inquiry "Into Thin Air"	•Houghton Mifflin Chapter 10 Lesson 2 (B27)

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Solid Earth

Essential Questions:
What can we find out about the Earth's land?
Why does the land look the way it does?
What kind of materials are in rocks and soils?
What are minerals?
What are fossils?
Where are fossils found?
What might Earth's land look like in the future?
How have humans changed the Earth's surface?
What types of rocks are found in New Jersey?
What minerals are found in New Jersey in abundance?
How do we use 'earth materials' (minerals) in New Jersey and other places?

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX DYNAMIC AND INTERCONNECTED SYSTEMS AND IS PART OF THE ALL-ENCOMPINGS SYSTEM OF THE UNIVERSE.

B. History of Earth: From the time that Earth formed from a nebula from 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.

5.4.4.B.1 Fossils provide evidence of the plants and animals that lived long ago, whether they lived on the land or in the sea as well as the way species changed over time.

C. Properties of Earth Materials: Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

5.4.4.C.1 Rocks can be broken down to make soil.
5.4.4.C.2 Earth materials in nature include rocks, minerals, soils, water, and the gasses of the atmosphere. Attributes of rocks and minerals assist in their identification.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Recognize that the earth is made of the crust, mantle, and core (optional)	Draw and label diagram	Classify each type of rock Compare and contrast crust and mantle Model the parts of the Earth using a hard boiled egg	Houghton Mifflin Unit E Chapter 8 Lesson 1
Demonstrate that minerals have their own characteristics and can be identified based on those characteristics including: color, hardness, streak, cleavage, luster	Mineral testing: identify 5 mystery minerals by observing characteristics	Define what a mineral is Build salt with Geostix (example: yellow connectors are sodium, blue connectors are chloride) "What is a Mineral?"	Brainpop.com (key words - mineral identification)
Categorize unknown samples as either rocks or minerals	Draw and label layers of soil and rock	Use hand lens to look at rocks and soils. Soil samples	Reaching All Learners "Soil Sequencing" (C52) Brainpop.com (key word - layers in soil)
Understand that rocks can be broken down to make soil	Student drawn illustration complete with labels in science notebook	Create a model to represent how soil is formed	Houghton Mifflin Unit C (C52-C53)
Use data gathered from observations of fossils to argue whether a given fossil is terrestrial or marine in origin	Formal assessment, Houghton Mifflin B80	Brain Pop "Fossils" Investigation "Make a Fossil", page B75	Brain Pop "Fossils" Houghton Mifflin Unit C Chapter 8 (C8) Houghton Mifflin Unit B Chapter 7 (B76-80)

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The following is an example of appropriate pacing for fifth grade science units. The units do not have to be taught in this exact order. However, it is recommended that the "Science Practices" Unit be completed at the beginning of the school year in order to introduce science notebooks and science skills. Teachers sharing science materials and lab rooms should plan with their team to determine the optimal schedule for that team.

Science Practices	2 – 3 weeks
Ocean Water Movement	4 – 5 weeks
Ecosystems	7 – 8 weeks
Cells and Genetics	5 – 6 weeks
Electricty & Magnetism	3 – 4 weeks

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Science Curriculum
Grade 5

Electricity and Magnetism

Essential Question:
What is electricity and how does it affect my life?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

5.1.8.D.1 Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, & motion, are powerful conceptual tools for making sense of phenomena in physical, living, and earth systems science.
D: Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

5.2.6.D.1 The flow of current in an electric circuit depends upon the components of the circuit and their arrangement, such as in series or parallel. Electricity flowing through an electrical circuit produces magnetic effects in the wires.
5.4.6.D.3 Earth has a magnetic field that is detectable at the surface with a compass.

E: Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.6.E.2 Magnetic, electrical and gravitational forces can act at a distance.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experience	Resources
Use simple circuits involving batteries and motors to compare and predict the current flow with different circuit arrangements. Engage in multiple forms of	Design and build a circuit that successfully does desired work Written or oral demonstration of understanding of why circuit is	Discovery learning: Make the bulb light (battery, **one** wire and bulb) Design and build an electrical circuit (series and parallel)	See 5th Grade Science Resource Binder See 5th Grade Science Resource Binder

discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.	successful Benchmark Test: Electricity	Conductor and Insulator lab Read *DW*: "Current Electricity/Two Types of Circuits"	See 5th Grade Science Resource Binder *Discovery Works* Discover Magazine: *Electricity* Science Court on Electricity (VHS/CD) BrainPop videos Bill Nye video on electricity and magnetism
Describe the force between two magnets as the distance between them is changed Apply knowledge of Earth's magnetic fields to successfully complete an orienteering challenge.	Benchmark Test: Magnetism	*DW* Activity: *A Magnet's Ends* *DW* Activity: *Pulling Through* Force Fields Activity: use sealed force field models Read *DW*: "Properties of Magnets, Force Fields" Read *DW"* Earth as a Magnet" Orienteering Activity	www.energyquest.ca.gov/index.html (click on computer icon) *Discovery Works* Force Fields Teacher's Manual *Discovery Works* See 5th Grade Science Resource Binder

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Ocean Water Movement

Essential Questions:
How does ocean water move?
How does the movement of the ocean water affect me and the planet?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.

5.1.8.B.2 Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.3 Carefully collected evidence is used to construct and defend arguments.
5.1.8.B.4 Scientific reasoning is used to support scientific conclusions.

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, & motion, are powerful conceptual tools for making sense of phenomena in physical, living, and earth systems science.
A. Properties of Matter : All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.6.A.1 The volume of some objects can be determined using liquid (water) displacement.

E. Forces and Motion : It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.6.E.4 Sinking and floating can be predicted using forces that depend on the relative densities of objects and materials.

STANDARD 5.4 Earth Systems Science: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
E. Energy in Earth Systems : Internal and external sources of energy drive Earth systems.

5.4.6.E.1 The Sun is the major source of energy for circulating the atmosphere and oceans.

G. Biogeochemical Cycles : The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.6.G.1 Circulation of water in marine environments is dependent on factors such as the composition of water masses and energy from the Sun or wind.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experience	Additional Resources
Determine the volume of common objects using water displacement methods. Predict if an object will sink or float using evidence and reasoning. Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies Use qualitative and quantitative evidence to develop evidence-based arguments. Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.	Everyday Math journal pages 382 & 383 Study Link 11.5 Exit Ticket and/or assess science notebook using observation rubric	Everyday Math 11.5 "Beyond Predictions: Sink or Float" Inquiry based activity "Density Dilemma: Temperature and Salinity"	*Everyday Mathematics* *Science & Children* October 2010 volume 48 Number 2, pages 48-52 See 5th Grade Science Resource Binder
Illustrate global winds and surface currents through the creation of a world map of global winds and currents that explain the relationship between the two factors. Generate a conclusion about energy transfer and circulation by observing a model of	Exit Ticket and/or assess science notebook using observation rubric; Wind Driven Currents lab report Alternate assessment: Layering Liquids (GEMS: *Ocean Currents,* Activity	Demonstrating Wind Driven Currents (GEMS: *Ocean Currents,* Activity 2: Session 2) Discovery Works Reading Current Trends Lab: (GEMS *Ocean Currents,* Activity 3) Salinity Lab Temperature Lab	GEMS*: Ocean Currents Teacher Reference Manual* Bill Nye video on ocean currents *Blow up globes*

convection currents.	4) Benchmark Assessment on Density and Ocean Currents	Polar vs. Tropical Lab	Brainpop videos See 5th Grade Science Resource Binder for additional resources

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Cells and Genetics

Essential Questions:
What are the basic building blocks of life?
How do we understand things that we cannot see?
How are traits passed on through generations of organisms?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

5.1.8.D.3 Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.

STANDARD 5.3 Life Science: All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.

5.3.6.A.2 Essential functions of plant and animal cells are carried out by organelles
5.3.6.A.1 Systems of the human body are interrelated and regulate the body's internal environment.

B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

5.3.6.B.1 Plants are producers: They use the energy from light to make food (sugar) from carbon dioxide and water. Plants are used as a source of food (energy) for other organisms.

D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction

5.3.6.D.2 Variations exist among organisms of the same generation (e.g., siblings) and of different generations (e.g., parent to offspring).

5.3.6.D.3 Traits such as eye color in human beings or fruit/flower color in plants are inherited.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experience	Additional Resources
Demonstrate how to safely use tools, instruments, and supplies.	Microscope Parts and Functions Test	Learning: identify parts of a microscope Investigate the properties of magnifiers	See 5th Grade Science Resource Binder
Scientists use tools to gather information about our world	Students will use their knowledge of the proper use of scientific tools to accurately record observations of items from GEMS lab (assess using science notebook: observation rubric)	GEMS -*Microscopic explorations:* "Dots & Dollars," "Fingerprint Ridges," "Fabrics," "Salts," "Kitchen Powders"	GEMS teachers manual: *Microscopic Explorations*
Model and explain ways in which organelles work together to meet the cell's needs.	Benchmark Assessment: Cells and Systems Labeled drawings and descriptions of specimen	Students will read *DW* "Animal and Plant Cells" Students view prepared slides of plant and animal cells and complete lab sheet	*Discovery Works* "Cell Rap" See 5th Grade Science Resource Binder
Describe the sources of the reactants of photosynthesis and trace the pathway to the products.	Student Observation in notebook (assess using Science Notebook: Observations Rubric)	Students will read *DW* "Cells and Energy" *Learning Tree* Activity 28 "Air Plants" or 42 "Sunlight and Shades of Green"	*Learning Tree* pages 120-121 and 182-184 (see 5th Grade Science Resource Binder)
Model the interdependence of the human body's major systems in regulating its internal environment.	Benchmark Assessment: Cells and Systems	Students will read *"Tissues, Organs and Systems"*	
Explain how knowledge of inherited variations within and between generations is applied to farming and animal breeding. Distinguish between inherited and acquired traits/characteristics.	Completed Lab Report: Chart for Genetic Traits Assess completed Bothead using rubric	*Treasures (5.3 week3) Farming and the Future* Tracking Traits Genetic Demo Kit Botheads: A Genetic Simulation	*Treasures* Teacher Guide Genetic Demo Teacher Guide Bothead Teacher Guide

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Grade 5

Ecosystems

Essential Questions:
What is an ecosystem?
What factors affect an ecosystem?
How are ecosystems similar and different?

New Jersey Core Curriculum Content Standards:

STANDARD 5.3 Life Science: All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.

5.3.6.B.2 All animals, including humans, are consumers that meet their energy needs by eating other organisms or their products.

C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.6.C.1 Various human activities have changed the capacity of the environment to support some life forms.
5.3.6.C.2 The number of organisms and populations an ecosystem can support depends on the biotic resources available and on abiotic factors, such as quantities of light and water, range of temperatures, and soil composition.
5.3.6.C.3 All organisms cause changes in the ecosystem in which they live. If this change reduces another organism's access to resources, that organism may move to another location or die.

D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.

5.3.6.D.1 Reproduction is essential to the continuation of every species.

STANDARD 5.4 Earth Systems Science: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
C. Properties of Earth Materials: Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

5.4.6.C.1 Soil attributes/properties affect the soil's ability to support animal life and grow plants.

G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.6.G.2 An ecosystem includes all of the plant and animal populations and nonliving resources in a given area. Organisms interact with each other and with other components of an ecosystem.
5.4.6.G.3 Personal activities impact the local and global environment.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experience	Additional Resources
Predict the types of ecosystems that unknown soil samples could support based on soil properties.	Student Predictions/Observations (use Science Notebook Prediction and/or Observation Rubric)	"Soil Sleuths" Introductory Activity to Ecosystems	See 5th Grade Science Resource Binder
Predict the impact that altering biotic and abiotic factors has on an ecosystem. Describe how one population of organisms may affect other plants and/or animals in an ecosystem. Predict the long-term effect of interference with normal patterns of reproduction. Illustrate the flow of energy (food) through a community.	Exit Ticket/Reflection Exit Ticket analyzing data from "Bean Hunt" lab Adaptations Assessment Create your own food web – Kidspiration, PowerPoint, model, poster (student choice) Exit Ticket/Reflection and/or quiz	Beach Bucket Scavenger Hunt (Gems: *On Sandy Shores* Activity 1) *used to introduce abiotic and biotic factors* *"Bean Hunt Lab" (*Adaptations: Camouflage experience) Other activities to introduce adaptations such as: coloration, body shape, special body features, and symbiosis Watershed Field & Lab Experiences Ocean Zones "Deep Sea Biome" video and/or "The Amazing Undersea Food Web" (Reading A to Z quick reader) *used to show the effect of abiotic factors on the biotic factors in the ocean* Read *DW*, "All Creatures Great and Small" *used to introduce trophic levels of classification:*	GEMS: *On Sandy Shores Teacher Reference Manual* See 5th Grade Science Resource Binder *An Elephant Never Forgets its Snorkel* by Lisa Collin Evans; *Eyewitness: Fish* video; *A House for a Hermit Crab* by Eric Carle; *Swimmy* by Leo Lionni; Brain Pop video called *Natural Selection* South Branch Watershed Association "Deep Sea Biome" video from www.untamedscience.com See 5th Grade Science Resource Binder "Energy Flow in Coral Reef Ecosystem" video from www.teachersdomain.org Kidspiration or Powerpoint

		plankton, nekton, and benthos "Energy Pipeline" activity from *Project Wild* (make it ocean themed) pages 105-110	*Discovery Works* Teacher's Manual See 5th Grade Science Resource Binder
Explain the impact of meeting human needs and wants on local and global environments.	Oil Spill Bumper Sticker Exit Ticket/Reflection	"Apples and Oceans" (Gems: *Only One Ocean, Activity 1)* Engage Activity: "Don't Use it All Up!" "Oil on the Beach" (Gems: *On Sandy Shores*, Activity 5) Watershed Field & Lab Experiences	Gems: *Only One Ocean* Teacher Reference Manual (http://www.eduref.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Science/Environmental_Education/ENV0039.html) Gems: *Sandy Shores* Teacher Reference Manual *Oil Spill Disaster in the Gulf* scholastic book South Branch Watershed Association
Describe ways that humans can improve the health of ecosystems around the world.	"Letter to Mother Earth" Reflection Activity	Dr. Seuss's *The Lorax* reading activity *Treasures: Searching for Tomorrow's Energy*	http://www.seussville.com/activities/LORAX_DearMotherEarth.pdf *Treasures* Teacher's Manual
Create a model of ecosystems in two different locations, and compare and contrast the living and nonliving components.	Academic Choice Project: Ecosystem Research project comparing/contrasting ocean ecosystem to ecosystem of student's choice	Independent Research Project	See 5th Grade Science Resource Binder

Flemington-Raritan Regional Schools
Science Curriculum
Grade 5

Science Practices

Essential Questions:
What is a scientist?
What do scientists do?
How will I be a scientist this year?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices: All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

5.1.8.A.1 Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.
5.1.8.A.3 Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

5.1.8.C.1 Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.
5.1.8.C.2 Predictions and explanations are revised to account more completely for available evidence.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.

5.1.8.D.1 Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experience	Additional Resources
Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.	Student Predictions/Exit Ticket (use Science Notebook Prediction and/or Exit Ticket Rubric)	"Mystery Box"	See 5th Grade Science Resource Binder

Use scientific principles and models to frame and synthesize scientific arguments and pose theories. Monitor one's own thinking as understandings of scientific concepts are refined.			
Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.	Student Exit Ticket/Reflection (use Science Notebook Exit Ticket Rubric) Student Predictions/Exit Ticket (use Science Notebook Prediction and/or Exit Ticket Rubric)	"What is a Scientist?" "What is the Scientific Method?" "Ker-plunk" "Egg Drop"	See 5th Grade Science Resource Binder
Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.	Student Observations (use Science Notebook Observation Rubric)	"Sea Star Observation" Lab and/or "Monster Mash"	See 5th Grade Science Resource Binder

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Year at a Glance

The following is an example of appropriate pacing for the sixth grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan with their team to determine the optimal schedule for that team.

Physical Science (Chemistry)	8 – 10 weeks
Astronomy	3 – 5 weeks
Weather, Climate, & Environment	4 – 6 weeks
Geology	7 – 9 weeks
Physical Science (Light)	1 – 2 weeks

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Physical Science

Essential Questions:
How do you calculate the density of various objects or substances?
How do determine the identity of an unknown substance using data about intrinsic properties?
How do the properties of elements change when they are combined and react chemically?

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, & MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENONMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
A: Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: Matter takes up space, matter has inertia.

5.2.6.A.2 The density of an object can be determined from its volume and mass.
5.2.6.A.3 Pure substances have characteristic intrinsic properties such as density, solubility, boiling point and melting point, all of which are independent of the amount of the sample.

B: Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

5.2.6.B.1 When a new substance is made by combining two or more substances, it has properties that are different from the original substance.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Calculate the density of objects or substances after determining volume and mass.	Observe, predict, form a hypothesis about density, sinking and floating by manipulating materials to conduct an experiment, using numbers to measure volume and mass. Based on their findings, students will be able to predict what will sink and float in water.	Diet Coke/Coke Demonstration Popcorn Density Demonstration Study Inquiry Activity Lab: What Sinks or Floats?	Study of Density Kit Teacher designed lab procedures and handouts Chemistry Mark Twain Media/Carson-Dellosa Publishing Company, Inc. Prentice Hall Motion, Forces & Energy, 2002.

			Prentice Hall Matter: Building Block of the Universe, 1994. Mystery Density Set, Carolina Biological Density Cube Set, Carolina Biological Digital Balances
Pure substances have characteristic intrinsic properties, such as density, solubility, boiling point, and melting point, all of which are independents of the amount of the sample.	Observe various unknown white substances and identify them according to their intrinsic properties.	Whodunit Lab (using demo from Prentice Hall Motion, Forces & Energy book, 2002, p93)	Teacher designed lab procedures and handouts Chemistry Mark Twain Media/Carson-Dellosa Publishing Company, Inc. Prentice Hall Motion, Forces & Energy, 2002. Prentice Hall Matter: Building Block of the Universe, 1994.
When a new substance is made by combining two or more substances, it has properties that are different than the original substances.	Building Compounds Lab	Building Compounds Lab	Teacher designed lab procedures and handouts Chemistry Mark Twain Media/Carson-Dellosa Publishing Company, Inc. Prentice Hall Motion, Forces & Energy, 2002. Prentice Hall Matter: Building Block of the Universe, 1994.

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Astronomy

Essential Questions:
How have scientific ideas, beliefs, and instruments evolved over time?
How does the movement of the Earth define units of time, specifically day and year?
How is the solar system, which includes eight planets and their moons, asteroids, and comets, held in orbit by the Sun?

New Jersey Core Curriculum Content Standards:

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX, DYNAMIC, AND INTERCONNECTED SYSTEMS, AND IS PART OF ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.
A. Objects in the Universe: Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars govern its evolution through the processes of stellar birth and death. These same processes governed the formation of our solar system 4.6 billion years ago.

5.4.6.A.1 The height of the path of the Sun in the sky and the length of a shadow change over the course of a year.
5.4.6.A.2 Earth's position relative to the Sun, and the rotation of Earth on its axis, result in patterns and cycles that define time units of days and years.
5.4.6.A.3 The Sun's gravity holds planets and other objects in the solar system in orbit, and planets' gravity holds moons in orbit.
5.4.6.A.4 The Sun is the central and most massive body in our solar system, which includes eight planets and their moons, dwarf planets, asteroids, and comets.

STANDARD 5.1 SCIENCE PRACTICES: ALL STUDENTS WILL UNDERSTAND THAT SCIENCE IS BOTH A BODY OF KNOWLEDGE AND EVIDENCE-BASED, MODEL-BUILDING ENTERPRISE THAT CONTINUALLY EXTENDS, REFINES, AND REVISES KNOWLEDGE. THE FOUR SCIENCE PRACTICES STRANDS ENCOMPASS THE KNOWLEDGE AND REASONING SKILLS THAT STUDENTS MUST AQUIRE TO BE PROFIENT IN SCIENCE.
C: Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

5.1.8.C.2 Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.3 Science is a practice in which an established body of knowledge is continually revised, refined, and extended.

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENONMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.

E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.6.E.1 An object's position can be described by locating the object relative to other objects or a background. The description of an object's motion from one observer's view may be different from that reported from a different observer's view.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Predict what would happen to an orbiting object if gravity were increased, decreased or taken away.	Explain and draw a diagram/model of how gravity and inertia balance to keep the planets in orbit around the Sun.	Orbiting Satellites Demonstration	Prentice Hall Motion, Forces & Energy, 2002, p70. Prentice Hall Astronomy, 2002 p53-55.
Compare and contrast the major physical characteristics (including size and scale) of solar system objects using evidence in the form of data tables and photographs.	Justify the distance planets are from each other and from the Sun. List the order of planets according to size. Create a scale model or relative size and distance of Earth and moon.	Toilet Paper Solar System Lab Planetary Size and Spheres Activity Play-Doh Earth and Moon Scale Model Activity *Optional: Planet Poster Activity*	Teacher designed Toilet Paper Solar System Lab Teacher designed Planetary Size and Spheres Activity Teacher designed Play-Doh Earth and Moon Scale Model Activity Picture of comparative sizes of the planets, Sun, and other stars.
Construct and evaluate models demonstrating the rotation of the Earth on its axis and the orbit of the Earth around the Sun.	Compare and contrast the difference between revolution and rotation. Determine which movements of the Earth cause the different units of time; day and year.	Revolution and Rotation Student Demonstrations and Activities	Teacher designed revolution and rotation activities GEMS Kit, Mt. Nose Activity Age on different planets on teachers' website pages Prentice Hall Astronomy, 2002
Generate and analyze evidence (through simulations) that the Sun's apparent motion across the sky changes over the course of the year.	Compare and contrast the differing intensity of the Sun's light depending on the angle of insolation.	Angle of Insolation Lab	Raritan Valley Community College Angle of Insolation Lab Prentice Hall Astronomy, 2002

Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models. Model and explain how the description of an object's motion from one observer's view may be different from different observer's view. Generate new and productive questions to evaluate and refine core explanations.	Develop and create a historic and scientific collection of evidence that explains how beliefs and inventions evolved throughout history, example; create a timeline. Moons of Jupiter Benchmark Portfolio Assessment	Moons of Jupiter Benchmark Activity Ancient Civilizations Activity History of Astronomy Power Point Presentation	Teacher designed Portfolio Assessment Teacher designed History of Astronomy Power Point United Streaming video clip of the trial of Galileo

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Grade 6

Weather, Climate, & Environment

Essential Questions:
How does the transfer of energy affect weather and climate?
When environmental conditions change, how does this affect the evolution of species?

New Jersey Core Curriculum Content Standards:

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX, DYNAMIC, AND INTERCONNECTED SYSTEMS, AND IS PART OF THE ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.
F. Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

5.4.6.F.1 Weather is the result of short term variations in temperature, humidity, and air pressure.
5.4.6.F.2 Climate is the result of long term patterns of temperature and precipitation.

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENOMENA IN PHYSICAL, LIVING AND EARTH SYSTEMS SCIENCE.
C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.6.C.3 The transfer of thermal energy by conduction, convection, and radiation can produce large-scale events such as those seen in weather.

STANDARD 5.3 LIFE SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT LIFE SCIENCE PRINCIPLES ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF THE COMPLEXITY, DIVERSITY, AND INTERCONNECTEDNESS OF LIFE ON EARTH. ORDER AND NATURAL SYSTEMS ARISES IN ACCORDANCE OF RULES THAT GOVERN THE PHYSICAL WORLD, AND THE ORDER OF NATURAL SYSTEMS CAN BE MODELED AND PREDICTED THROUGH THE USE OF MATHEMATICS.
E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selected differences made lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.6.E.1 Changes in environmental conditions can affect the survival of individual organisms and entire species.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Explain the interrelationships between daily temperature, air pressure, and relative humidity data. Create Climatographs for various locations around Earth and categorize the climate based on the yearly patterns of temperature and precipitation.	Comparing Temperature, Pressure and Humidity Investigation	Learn how to compare data on temperature, pressure and humidity Learn how to do unit conversions Make graphs of the data Understand how to interpret a graph	Prentice Hall Weather and Climate 2002, p25-30, 46-51, 88-90 & 110-142. Comparing Temperature, Pressure, and Humidity using ARM Program Data from the US Department of Energy. Discovery Channel School Weather and Climate 2004 CD-ROM
Relate the transfer of heat from oceans and land masses to the evolution of a hurricane.	Heating Earth's Surface Lab (pgs 46-47 & 88-90) Predict when and where a hurricane will come ashore (pgs 92-94)	Develop and test a hypothesis about how quickly different materials absorb radiation Relate the transfer of energy over oceans and land masses to understand the formation and movement of a hurricane	Prentice Hall Weather and Climate 2002, pgs 46-51 & 88-94 **Weather Watch Investigation** Carolina Biological Kit
Describe the impact of the survival of species during specific times in geologic history when environmental conditions change.	Peppered Moth Study (Natural Selection kit) Global Warming – Earth's Climate and Climate Change Investigation Activities (Global Warming kit)	Simulate changes in moth population due to pollution and predation, and observe how species can change over time due to environmental changes Investigate how human activity influences the climate	Prentice Hall Weather and Climate 2002, pgs 134-138. **Natural Selection** Carolina Biological Kit

Flemington-Raritan Regional Schools
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Grade 6

Geology

Essential Questions:
What changes can be measured on a geologic time scale and a human time scale?
How does Earth's crust change shape due to external forces (erosion and deposition) and internal forces (plate tectonics)?
What forces contribute to the cyclical change of physical properties of rocks; igneous, sedimentary and metamorphic?

New Jersey Core Curriculum Content Standards:

STANDARD 5.4 EARTH SYSTEMS SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT EARTH OPERATES AS A SET OF COMPLEX, DYNAMIC AND INTERCONNECTED SYSTEMS, AND IS A PART OF THE ALL-ENCOMPASSING SYSTEM OF THE UNIVERSE.
B. History of the Earth: From the time Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical and chemical processes.

5.4.6.B.1 Successive layers of sedimentary rock and the fossils contained in them tell the factual story of the age, history, changing life forms, and geology of the Earth.
5.4.6.B.2 Earth's current structure has been influenced by both sporadic and gradual events. Changes caused by earthquakes and volcanic eruptions can be observed on a human time scale, but many geology process, such as mountain building and the shifting of continents, are observed on a geologic time scale.
5.4.6.B.3 Moving water, wind and ice continually shape Earth's surface by eroding rock and soil in some areas and depositing them ' in other areas.
5.4.6.B.4 Erosion plays an important role in the formation of soil, but too much erosion can was away fertile soil from ecosystems, including farms.

C. Properties of Earth Materials: Earths composition is unique, is related to the origin of our solar system, and provides us with the resources needed to sustain life.

5.4.6.C.2 The rock cycle is a model of creation and transformation of rocks from one form (sedimentary, igneous, or metamorphic) to another. Rock families are determined by the origin and transformations of the rock.
5.4.6.C.3 Rocks and rock formations contain evidence that tell a story about their past. The story is dependent on the minerals, material, tectonic conditions, and erosion forces that created them.

D. Tectonics: The theory of plate tectonics provides a framework for understanding the dynamic processes within and on Earth.

5.4.6.D.1 Lithospheric plates consisting of continents and ocean floors move in response to movements in the mantle.
5.4.6.D.2 Earth's landforms are created through constructive (deposition) and destructive (erosion) processes.

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENONMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.6.E.3 Friction is a force that acts to slow or stop the motion of objects.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Determine if landforms were created by processes of erosion (eg, wind, water and/or ice) based on evidence in pictures, video, and/or maps. Describe methods people use to reduce soil erosion. Local areas that are being created (deposition) and destroyed (erosion) using maps and satellite images.	Cause and Effect Chart Group Poster/presentation Physical Weather – "Rotten Rocks" Lab Erosion – "Shake It Up, Move It Out!" Lab	Researching and gathering information about erosion processes To learn about the processes and products of physical weathering To understand how chemical weathering makes rocks smaller and more rounded	National Geographic Theme Sets 2011, (Leveled Readers) Ice Water Wind Rock Cycle Video Lab (Stations 2 and 4) River Cutters, GEMS Kit Lab Aids, Groundwater Contamination: Trouble in Fruitvale Binocular Microscopes Pictures of erosion and deposition Google Earth
Distinguish physical properties of sedimentary, igneous or metamorphic rocks and explain how one kind of rock could eventually become a different kind of rock.	Crystal Growth – "A Warm Bath Just Melts Me!" Igneous Rocks – "Crystal Clear Clues"	Observe the process of crystallization from a liquid To understand how to use color and crystal size to classify igneous rocks	Rock Cycle Video Lab (Stations 1 and 3) Rock and Mineral kits Rock to Rock story illustration GEMS kit Rock cycle diagram

Interpret a representation of a rock layer sequence to establish oldest and youngest layers, geologic events, and changing life forms.	Geological Time Lab/Activity (p134 -135) or teacher designed	Constructing a model of geological time scale Place fossil organisms and geologic events on a timeline	Rock Cycle Video McDougal Littell Science, The Changing Earth, 2005 (Chapter 4 pgs. 108 -134)
Apply understanding of the motion of lithospheric plates to explain why the Pacific Rim is referred to as the Ring of Fire Demonstrate and explain the frictional force acting on an object with the use of a physical model	Plate Tectonics Book *(Possible future Benchmark; Pangaea, Alfred Wegener, Technology, Hypothesis – Theory, 5 Boundaries and geological events associated with the movement of them, Layers of Earth, Convection Currents)*	Create a Book about the 5 tectonic plate boundaries and the geological forms created from plate movements Transform Boundary Magnetic Model	McDougal Littell Science, The Changing Earth, 2005 (Chapters 1-3 pgs. 6 – 103) Tasa Graphic Arts, The Theory of Plate Tectonics CD-ROM (2004) **Tectonic Sandbox** Carolina Biological Kit

Flemington-Raritan Regional Schools
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Grade 6

Physical Science

Essential Questions:
How does our understanding of light waves impact our daily living?
How can light cause change?
How does light change?

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 PHYSICAL SCIENCE: ALL STUDENTS WILL UNDERSTAND THAT PHYSICAL SCIENCE PRINCIPLES, INCLUDING FUNDAMENTAL IDEAS ABOUT MATTER, ENERGY, AND MOTION, ARE POWERFUL CONCEPTUAL TOOLS FOR MAKING SENSE OF PHENONMENA IN PHYSICAL, LIVING, AND EARTH SYSTEMS SCIENCE.
C: Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful to coming to the understanding that, for the most part, the natural world can be explained and predictable.

5.2.6.C.1 Light travels in a straight line until it interacts with an object or material. Light can be absorbed, redirected, bounced back, or allowed to pass through. The path of reflected or refracted light can be predicted.
5.2.6.C.2 Visible light from the sun is made up of a mixture of all colors of light. To see an object, light emitted or reflected by that object must enter the eye.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Predict the path of reflective or refractive light using reflecting or refracting telescopes as examples.	Light Box Investigation(s)	Observe and predict the path of visible light	**Hodson Light Box and Optical Set** Carolina Biological Light Boxes and Power Supplies Online Pictures of reflecting and refracting telescopes
Describe how prisms can be used to demonstrate that visible light from the sun is made up of different colors.	Light Box Investigation(s)	Demonstrate an understanding of how white light can be separated into the visible color spectrum	Prisms **Hodson Light Box and Optical Set** Carolina Biological Light Boxes and Power Supplies

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Grade 7

Year at a Glance

The following is an example of appropriate pacing for the seventh grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan with their team to determine the optimal schedule for that team.

Matter & Energy	7 – 9 weeks
Motion & Forces	4 weeks
Ecology	2 weeks
Evolution	2 weeks
Weather	5 – 6 weeks
Geology	5 – 6 weeks

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New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.

5.1.8.A.3 Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
CPI: Use scientific principles and models to frame and synthesize scientific arguments and pose theories.
5.1.8.A.2 Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
CPI: Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
5.1.8.A.3 Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
CPI: Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.

5.1.8.B.1 Evidence is generated and evaluated as part of building and refining models and explanations.
CPI: Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
5.1.8.B.2 Mathematics and technology are used to gather, analyze, and communicate results.
CPI: Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
5.1.8.B.3 Carefully collected evidence is used to construct and defend arguments.
CPI: Use qualitative and quantitative evidence to develop evidence-based arguments.
5.1.8.B.4 Scientific reasoning is used to support scientific conclusions.
CPI: Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.

5.1.8.C.1 Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.
CPI: Monitor one's own thinking as understandings of scientific concepts are refined.
5.1.8.C.2 Predictions and explanations are revised to account more completely for available evidence.
CPI: Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.

5.1.8.C.3 Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
CPI: Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms..

5.1.8.D.1 Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.
CPI: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
5.1.8.D.2 In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
CPI: Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
5.1.8.D.3 Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
CPI: Demonstrate how to safely use tools, instruments, and supplies.

Flemington-Raritan Regional Schools
Science Curriculum
Grade 7

Matter & Energy

Essential Questions:
How is matter affected by composition, organization, and motion of its particles?
How and why is energy converted from one form to another?

Big Ideas:
All matter exists in three common states as defined by the motion and characteristics of the particles.
The motion and arrangement of the particles of matter are affected by external conditions such as temperature and pressure, causing phase changes.
Forms of energy can be described in different ways (sound, heat, gravitational, mechanical) and that all change in our universe is a result of the transformation of one form of energy to another.

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science
A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.

5.2.8.A.1 All matter is made of atoms. Matter made of only one type of atom is called an element.
CPI: Explain that all matter is made of atoms, and give examples of common elements.
5.2.8.A.2 All substances are composed of one or more of approximately 100 elements.
CPI: Analyze and explain the implications of the statement "all substances are composed of elements."
5.2.8.A.3 Properties of solids, liquids, and gases are explained by a model of matter as composed of tiny particles (atoms) in motion.
CPI: Use the kinetic molecular model to predict how solids, liquids, and gases would behave under various physical circumstances, such as heating or cooling.
5.2.8.A.4 The Periodic Table organizes the elements into families of elements with similar properties.
CPI: Predict the physical and chemical properties of elements based on their positions on the Periodic Table.
5.2.8.A.5 Elements are a class of substances composed of a single kind of atom. Compounds are substances that are chemically formed and have physical and chemical properties that differ from the reacting substances.
CPI: Identify unknown substances based on data regarding their physical and chemical properties.

B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.

5.2.8.B.2 Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances. The physical and chemical properties of the products are different from those of the reacting substances.
CPI: Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration.

C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.8.C.1 A tiny fraction of the light energy from the Sun reaches Earth. Light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms.
CPI: Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley."
5.2.8.C.2 Energy is transferred from place to place. Light energy can be thought of as traveling in rays. Thermal energy travels via conduction and convection.
CPI: Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy.

D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as They are transferred from one object to another.

5.2.8.D.1 When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. As an object falls, its potential energy decreases as its speed, and consequently its kinetic energy, increases. While an object is falling, some of the object's kinetic energy is transferred to the medium through which it falls, setting the medium into motion and heating it.
CPI: Relate the kinetic and potential energies of a roller coaster at various points on its path.
5.2.8.D.2 Nuclear reactions take place in the Sun. In plants, light energy from the Sun is transferred to oxygen and carbon compounds, which in combination, have chemical potential energy (photosynthesis).
CPI: Describe the flow of energy from the Sun to the fuel tank of an automobile.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Differentiate between matter, mass and volume. Explain that all matter is made up of atoms, of which there are different types or elements. Describe how molecules are comprised of atoms. Differentiate among mixtures, elements and compounds.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis through collaborative learning experiences	Modeling visual representations of atoms and molecules. Gas law activities (marshmallow & syringe, bottle in hot/cold water) Phase change demonstrations Forms of Energy graphic organizer	Media center videos on matter and energy McDougal Littell Textbook – Chapters 1 (Sections 1.3 and 1.4 only), 2, 3, 4. McDougal Littell resource manual McDougal Littell PowerPresentations

Differentiate between the states of matter using their characteristics. Describe how gases behave under changing physical conditions (i.e. the gas laws) Predict how changes in energy will affect matter and/or cause it to change state. Predict and observe chemical and physical changes. Demonstrate that heat is transferred through convection, conduction & radiation. Describe ways that energy causes change. Describe and give examples of common forms of energy. Understand that energy is never created or destroyed, but only changes forms. Describe a way that the potential energy of an object can convert to kinetic energy. Describe examples of how energy conversions are often inefficient. Evaluate the pros and cons of different energy resources available to humans (solar, wind, fossil fuels, etc). Understand that temperature depends on particle movement. Describe the kinetic theory of matter and how it relates to particle movement.	Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment and class discussion Unit benchmark – Rube Goldberg Project	Pouring a gas and observing a candle (physical vs. chemical change) Energy conversion/efficiency labs (Ball Drop vs. Bounce height) Rube Goldberg Device Heat transfer labs (convection, etc.) Temperature labs & demos (warm/cold syrup, hot/cold water demo with food coloring) Thermal expansion labs (i.e. Homemade thermometer, ball & ring demo, Hand boiler)	Online internet sources: referenced on teachers' web pages. Teacher & student-created study guides and graphic organizers Teacher designed Powerpoint lessons & activities Rube Goldberg online/Youtube example videos

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Grade 7

Motion & Forces

Essential Questions:
How do mass and forces affect moving objects?
How can we describe, predict and measure the motion of an object?

Big Ideas:
Everything is in motion.
All objects demonstrate inertia, the tendency of a body to remain in its current state of motion.
All changes in motion are the effect of forces.

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
E. Forces and Motion: It takes energy to change the motion of objects. The energy change is understood in terms of forces.

5.2.8.E.1 An object is in motion when its position is changing. The speed of an object is defined by how far it travels divided by the amount of time it took to travel that far.
CPI: Calculate the speed of an object when given distance and time.
5.2.8.E.2 Forces have magnitude and direction. Forces can be added. The net force on an object is the sum of all the forces acting on the object. An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion at constant velocity will continue at the same velocity unless acted on by an unbalanced force.
CPI: Compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces in a given specific scenario.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Describe object's motion and position. Predict how the view of an object's motion will change based on the observer's frame of reference. Measure the distance and time an object travels then calculate its	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis	Walk in The Park (Speed, Distance, Time) Ramp investigations – speed, acceleration, potential energy. Centripetal force demo or lab (bucket with water, marble on plate, etc.)	Media center videos on forces and motion McDougal Littell Motion & Forces – Chapters 1, 2 McDougal Littell resource manual McDougal Littell

speed. Calculate speed and read a distance-time graph. Differentiate between speed, velocity, and acceleration. Acceleration is dependent on change in velocity. Recognize different types of forces that may act on an object. Compare balanced and unbalanced forces, and how they affect motion. Explain how the inertia of an object affects its motion. Demonstrate that objects with different masses will travel at different speeds if the force applied is kept constant. Predict the impact of increasing and decreasing energy/force applied to an object (i.e. potential energy). Demonstrate that when objects collide, energy is conserved. Demonstrate how Newton's 1st, 2nd, and 3rd Laws of Motion affect moving objects, in a laboratory setting..	through collaborative learning experiences Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment and class discussion Unit benchmark – Newton's rockets to apply all 3 laws	Conservation of Momentum lab (marbles on a track) Labs involving Newton's 3 laws (Crash test dummies, application of f=ma)	PowerPresentations Online internet sources: referenced on teachers' web pages. Teacher & student-created study guides and graphic organizers Teacher designed Powerpoint lessons & activities

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Ecology

Essential Questions:
What roles do organisms play in their environment?
How do feeding relationships impact populations?
How is energy transferred through an ecosystem?

Big Ideas:
Living things within an ecosystem interact with each other and the environment.

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science
D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.

5.2.8.D.2 Nuclear reactions take place in the Sun. In plants, light energy from the Sun is transferred to oxygen and carbon compounds, which in combination, have chemical potential energy (photosynthesis).
CPI: Describe the flow of energy from the Sun to the fuel tank of an automobile.

STANDARD 5.3 Life Science: All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.
5.3.8.B.2 All animals, including humans, are consumers that meet their energy needs by eating other organisms or their products.

C. Interdependence: All animals and most plants depend on both other organisms and their environment to meet their basic needs.

5.3.8.C.1 Symbiotic interactions among organisms of different species can be classified as:
- Producer/consumer
- Predator/prey
- Parasite/host
- Scavenger/prey
- Decomposer/prey

CPI: Model the effect of positive and negative changes in population size on a symbiotic pairing.

STANDARD 5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe

G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.8.G.2: Investigations of environmental issues address underlying scientific causes and may inform possible solutions.
CPI: Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Discuss the energy transformations that occur in a food web beginning with photosynthesis (producers) Discuss food webs and determine cause and effect of changes that might occur in the interrelationships of organisms Explain how living organisms transfer energy through an ecosystem via food webs, and how the amount of energy is affected as this happens. Analyze a graph depicting the rise and fall of organisms in a food web over time. Explain how feeding relationships are important in an ecosystem. Describe the different types of interactions between organisms in an ecosystem. Recognize how an organism is an	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis through collaborative learning experiences Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment and class discussion Environmental Project (Benchmark)	Food web research and modeling (i.e. food web model with yarn) Class energy pyramid activity. Design a model to determine how changes in the environment cause a response by living organisms. Predator-Prey modeling activity (i.e predator and prey card tossing game p.57) Fruit flies overpopulation activity Graph of population trends over time	Media center videos on ecology McDougal Littell Ecology– Chapters 1 (1.3 only), 2 McDougal Littell resource manual McDougal Littell PowerPresentations Online internet sources: referenced on teachers' web pages. Teacher & student-created study guides and graphic organizers Teacher designed Powerpoint lessons & activities

integral part of environment at different levels of organization (e.g. niches, habitats, populations, communities, ecosystems, biomes, etc.) Describe the 5 symbiotic relationships and how each species is affected.			

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Evolution

Essential Questions:
How are living things classified?
How do scientists use fossil evidence over time to develop theories of evolution?
How do a species' unique traits affect its survival overtime?

Big Ideas:
Fossil, geological and biological evidence supports the theory of evolution.
Scientists use characteristics of organisms to develop a classification system.

New Jersey Core Curriculum Content Standards:

STANDARD 5.3 Life Science: All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
E. Evolution and Diversity: Sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. These selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time.

5.3.8.E.1 Individual organisms with certain traits are more likely than others to survive and have offspring in particular environments. The advantages or disadvantages of specific characteristics can change when the environment in which they exist changes. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival.
CPI: Organize and present evidence to show how the extinction of a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data.

5.3.8.E.2 Anatomical evidence supports evolution and provides additional detail about the sequence of branching of various lines of descent.
CPI: Compare the anatomical structures of a living species with fossil records to derive a line of descent

STANDARD 5.4 Earth Systems Science: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
B. History of Earth: From the time that Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.

5.4.8.B.1: Today's planet is very different than early Earth. Evidence for one-celled forms of life (bacteria) extends back more than 3.5 billion years.
CPI: Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Demonstrate that all living things share common characteristics and functions. Describe characteristics that scientists use to classify organisms. Differentiate living things into groups and describe the importance of a classification system. Develop a taxonomy for classifying a group of objects based on characteristics. Know the seven levels of classification. Relate the conditions of the early earth to the development of unicellular and then multicellular organisms. Explain how scientists use clues and patterns from fossil records to collect evidence about the history of life. Suggest possible causes and examples of mass extinctions. Model the analysis of fossil records and draw conclusions. Describe ways that new species arise from older species.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis through collaborative learning experiences Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment and class discussion Environmental Project (Benchmark)	Button/bean classification lab. Using/creating a dichotomous key for classifying items. Cooperative learning activity to analyze possible reasons for groupings within the seven levels of classification. Spooner/grabber, camouflage, giraffe characteristics or similar activity for modeling natural selection. Virtual fossil hunt activity. Debate possible causes of mass extinctions.	Media center videos on evolution and diversity McDougal Littell Life Over Time – Chapters 1 (1.1 & 1.2 only) and 2 (2.1 & 2.2 only) McDougal Littell resource manual McDougal Littell PowerPresentations Online internet sources: referenced on teachers' web pages. Teacher & student-created study guides and graphic organizers Teacher designed Powerpoint lessons & activities

Model the effects of natural selection in a population. Describe evidence that both Darwin and modern scientists used to support evolution.			

Flemington-Raritan Regional Schools
Science Curriculum
Grade 7

Geology

Essential Questions:
What processes and events shape land?
How was soil formed and what does it contain?
What evidence do we have of geological change?
How do the movement of the earth's plates cause major geological events?

Big Ideas:
The movement of the tectonic plates causes geologic changes on Earth.
Natural forces break rocks apart and form soil, which supports life.

New Jersey Core Curriculum Content Standards:

STANDARD 5.4 Earth Systems Science: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
C. Properties of Earth Materials: Earth's composition is unique, is related to the origin of our solar system, and provides us with the raw resources needed to sustain life.

5.4.8.C.1 Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, each having a different chemical composition and texture.
CPI: Determine the chemical properties of soil samples in order to select an appropriate location for a community garden.

5.4.8.C.2 Physical and chemical changes take place in Earth materials when Earth features are modified through weathering and erosion.
CPI: Explain how chemical and physical mechanisms (changes) are responsible for creating a variety of landforms.

5.4.8.C.3 Earth's atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has a different physical and chemical composition at different elevations.
CPI: Model the vertical structure of the atmosphere using information from active and passive remote-sensing tools (e.g., satellites, balloons, and/or ground-based sensors) in the analysis.

D. Tectonics: The theory of plate tectonics provides a framework for understanding the dynamic processes within and on Earth.

5.4.8.D.1 Earth is layered with a lithosphere, a hot, convecting mantle, and a dense, metallic core.
CPI: Model the interactions between the layers of Earth.

5.4.8.D.2 Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from the motion of plates. Sea floor spreading, revealed in mapping of the Mid-Atlantic Ridge, and subduction zones are evidence for the theory of plate tectonics.
CPI: Present evidence to support arguments for the theory of plate motion.

5.4.8.D.3: Earth's magnetic field has north and south poles and lines of force that are used for navigation.
CPI: Explain why geomagnetic north and geographic north are at different locations.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
Explain the factors affecting the rate of weathering of different landforms. Explain how the source of soil and its environment affect its composition. Describe the composition and characteristics of Earth's layers. Describe the plates that make up the Earth's outermost layers. Analyze evidence of plate boundaries and formation (i.e. continental drift). Identify the 3 types of plate boundaries and their common characteristics. Describe the effects of tectonic plate collisions and subductions. Explain how and why most earthquakes occur. Explain how movement along faults can form mountains and volcanoes.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis through collaborative learning experiences Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment and class discussion Geology Unit Project (Benchmark)	Modeling a cloud (transfer or water into and out of the atmosphere) Discovery Lab: Analyze data (earthquake, volcano etc, maps) to suggest the boundaries of the earth's plates. LAB: Colliding plates	Media center videos on weather and geology. McDougal Littell Textbook (Chapters …) McDougal Littell resource manual McDougal Littell PowerPresentations Online internet sources: referenced on teachers' web pages. Teacher & student-created study guides and graphic organizers Teacher designed Powerpoint lessons & activities The Changing Earth – Chapter 1 Earth's Atmosphere 1.1 & 1.2

Flemington-Raritan Regional Schools
Science Curriculum
Grade 7

Weather

Essential Questions:
How can we differentiate climate and weather?
How does the transfer of energy into and throughout our atmosphere affect weather?
What global and local factors are used to predict weather patterns?

Big Ideas:
Uneven heating of the earth's surface by the sun causes short and long term weather patterns
Earth's atmosphere is a blanket of gases that supports and protects life.
Some features of weather have predictable patterns.
The interaction of air masses causes changes in weather.
Climates are long-term weather patterns that may change over time.

New Jersey Core Curriculum Content Standards:

STANDARD 5.2 Physical Science: All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.

5.2.8.C.1 A tiny fraction of the light energy from the Sun reaches Earth. Light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms.
CPI: Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley."

STANDARD 5.4 Earth Systems Science: All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
E. Energy in Earth Systems: Internal and external sources of energy drive Earth systems.

5.4.8.E.1 The Sun provides energy for plants to grow and drives convection within the atmosphere and oceans, producing winds, ocean currents, and the water cycle.
CPI: Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle.

F. Climate and Weather: Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

5.4.8.F.1 Global patterns of atmospheric movement influence local weather.

CPI: Determine the origin of local weather by exploring national and international weather maps.
5.4.8.F.2 Climate is influenced locally and globally by atmospheric interactions with land masses and bodies of water.
CPI: Explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country.
5.4.8.F.3 Weather (in the short term) and climate (in the long term) involve the transfer of energy and water in and out of the atmosphere.
CPI: Create a model of the hydrologic cycle that focuses on the transfer of water in and out of the atmosphere. Apply the model to different climates around the world.

G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

5.4.8.G.1 : Water in the oceans holds a large amount of heat, and therefore significantly affects the global climate system.
CPI: Represent and explain, using sea surface temperature maps, how ocean currents impact the climate of coastal communities.

Knowledge/Skills/Understanding	**Assessment Evidence**	**Learning Experiences**	**Resources**
Describe the composition of the earth's atmosphere and how it differs in each layer. Explain why air pressure and temperature changes with altitude. Demonstrated how energy from the sun affects the earth's surface and atmosphere. Explain how energy is transferred into and throughout the atmosphere. Explain how the chemical composition of the atmosphere can affect radiation (i.e. greenhouse gases). Describe how humans have impacted the chemical composition of our atmosphere, and its consequences (i.e. global warming, climate change). Explain factors affecting local weather, including global winds, uneven heating of the	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Evaluation of cooperative learning activities Peer critique and analysis through collaborative learning experiences Chapter tests and section quizzes Section review questions Graded independent practice such as exit tickets, do nows, and concluding questions Daily informal assessment	LAB: How density affects colliding air masses LAB: How soil and water retain heat PROJECT: Climate zones Cloud activity	Earth's Atmosphere Chapters 2-4

earth's surface, and the rotation of the earth. Describe ways that water is transferred into and out of the atmosphere, including cloud formation and precipitation. Describe the types of air masses and their interactions (fronts). Explain factors that contribute to various storms (hurricanes, tornadoes, etc.) Compare and contrast climate and weather, and identify factors that affect them. Describe the various climate zones and how they are affected by environment and human activity.	and class discussion Weather Project (Benchmark)		

Flemington-Raritan Regional Schools
Science Curriculum
Grade 8

Year at a Glance

The following is an example of appropriate pacing for the eighth grade science units. The units do not have to be taught in this exact order. Teachers sharing science materials and lab rooms should plan collaboratively to determine the optimal schedule for that team.

Chemistry	12 weeks
Environment	6 weeks
Microbiology	8 weeks
Genetics	6 weeks
Electricity	4 weeks
Astronomy	4 weeks

Flemington-Raritan Regional Schools
Science Curriculum
Grade 8

Chemistry Unit

Essential Questions:
How do we discover what matter is made of?
How do we know that there are different types of matter?
How do we know what an atom looks like?
Can you identify the different parts of an atom and explain how they interact?
How was the Periodic Table of Elements created; why was it such a powerful break through?
Based on what you know, how would you explain the patterns of properties of atoms?
Using what you know, can you compare and contrast the characteristic properties of acids and bases?
What tools do scientists use to test for acids and bases?
Why is it important to know the difference between acids and bases?
In what ways do we encounter acids and bases in our daily life?
What is pH?
Can we find chemical patterns by studying the characteristic properties of acids and bases?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
By the end of Grade 8
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
By the end of Grade 8
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
Content: Carefully collected evidence is used to construct and defend arguments.
5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.
Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

STANDARD 5.2 Physical Science All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.
Content: All matter is made of atoms. Matter made of only one type of atom is called an element.

5.2.8.A.1 Explain that all matter is made of atoms, and give examples of common elements.
Content: All substances are composed of one or more of approximately 100 elements.
5.2.8.A.2 Analyze and explain the implications of the statement "all substances are composed of elements."
Content: Properties of solids, liquids, and gases are explained by a model of matter as composed of tiny particles (atoms) in motion.
5.2.8.A.3 Use the kinetic molecular model to predict how solids, liquids, and gases would behave under various physical circumstances, such as heating or cooling.
Content: The Periodic Table organizes the elements into families of elements with similar properties.
5.2.8.A.4 Predict the physical and chemical properties of elements based on their positions on the Periodic Table.
Content: Elements are a class of substances composed of a single kind of atom. Compounds are substances that are chemically formed and have physical and chemical properties that differ from the reacting substances.
5.2.8.A.5 Identify unknown substances based on data regarding their physical and chemical properties.
Content: Substances are classified according to their physical and chemical properties. Metals are a class of elements that exhibit physical properties, such as conductivity, and chemical properties, such as producing salts when combined with nonmetals.
5.2.8.A.6 Determine whether a substance is a metal or nonmetal through student-designed investigations.
Content: Substances are classified according to their physical and chemical properties. Acids are a class of compounds that exhibit common chemical properties, including a sour taste, characteristic color changes with litmus and other acid/base indicators, and the tendency to react with bases to produce a salt and water.
5.2.8.A.7 Determine the relative acidity and reactivity of common acids, such as vinegar or cream of tartar, through a variety of student-designed investigations.

B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.
Content: When a new substance is made by combining two or more substances, it has properties that are different from the original substances.

5.2.6.B.1 Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically.
Content: When substances undergo chemical change, the number and kinds of atoms in the reactants are the same as the number and kinds of atoms in the products. The mass of the reactants is the same as the mass of the products.
5.2.8.B.1 Explain, using an understanding of the concept of chemical change, why the mass of reactants and the mass of products remain constant.
Content: Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances. The physical and chemical properties of the products are different from those of the reacting substances.
5.2.8.B.2 Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration.

Students will understand
- that matter is made of atoms which are far too small to see.
- what a model of an atom looks like.
- that an atom is an organized system based on interacting parts

- how the periodic table of elements was created and that different arrangements of atoms compose all substances.
- certain elements exhibit commonalities which can be categorized into an organized system.
- the structure and function of the atom help us to explain and predict a large variety of phenomena about our world.
- that all matter is composed of atoms that may join together to form molecules.

Students will also understand
- the difference between an acid and a base in order to analyze their use in our daily lives.
- there is a mathematical system to the properties of acids and bases and those we can safely encounter acids and bases in our daily lives
- the concept of neutralization.
- that various indicators can be used as tools to help us understand some of the chemical properties of matter.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Recognize that the phase of matter is determined by the arrangement and motion of atoms and molecules and that the motion of these particles is related to the energy of the system.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "Modeling Atomic Masses" Lab to construct a model atom	Chemical Interactions – McDougal Littell
		Students complete the "Investigate the Unseen" Lab using tools to infer the structure of an atom	Chemical Interactions – McDougal Littell
	Evaluation and discussion of in-class individual/group projects	Students construct and discuss model atoms using a variety of manipulatives/resources	Teacher constructed lab manual, investigations, and materials
		Modeling atoms, molecules, ions, and isotopes activity	Atom Modeling Activity Set
	Discussion based upon interactive online activities	Students have the opportunity to explore and discuss early and current models of the atom	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
		Students will discuss the history of the model of the atom	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science

		Students will use internet applications to construct and model atoms during discussion of atomic particles	Links Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Know that there are groups of elements that have similar properties, including highly reactive metals, less reactive metals, highly reactive non-metals, and some almost completely non-reactive gases.	Evaluation and discussion of in-class individual/group projects	Students will individually research a particular element and create a card that can be used as part of a team Periodic Table of Elements	
	In class discussions correlating previously learned knowledge with current objective	Students will discuss the relevance of atomic structure to the data provided on the Periodic Table of Elements	
	Optional teacher assigned activities	Periodic Table of Elements Scavenger Hunt in order to locate elements and identify the atomic structure of an element	
	Quizzes/Tests		McDougall-Littell Test Generator and Teacher Selected Assessments
• Show how substances can chemically react with each other to form new substances having properties different from those of the original substances.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "Modeling Chemical Reactions" Lab Students complete "A Rocky Problem Lab" focusing on the particle theory Students complete the "What's	<u>Chemical Interactions</u> – McDougal Littell "The Natural World" - ISCS

		the Matter with Bubbles" Lab to produce a gas when combining a solid and liquid Students complete the "Putting Bubbles to the Test" Lab to observe evidence of chemical reactions Students complete the "Reaction in a Bag" Lab to find evidence of chemical reactions occurring	"The Natural World" - ISCS "The Natural World" - ISCS GEMS Kit
	Class Discussions Teacher Demonstration Quizzes/Tests	Classroom discussion will be based on evidence drawn from the labs above Chemical Reactions will be demonstrated to the class to allow for class discussion	"Yellow and Blue Switcheroo" Lab Demonstration Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Show that, in most chemical reactions, energy is transferred into or out of a system.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Quizzes/Tests	Students complete an Exothermic and Endothermic Reaction Lab to display heat gain or loss as an energy transformation	<u>Chemical Interactions</u> – McDougal Littell
• Demonstrate that regardless how substances within a simple closed system interact, the total mass of the system remains the same.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "What's the Matter with Bubbles" Lab to produce a gas when combining a solid and liquid and then collect quantitative data to observe conservation of mass	McDougall-Littell Test Generator "The Natural World" - ISCS

		Students will use models (i.e.: nuts and bolts) to demonstrate the Law of Conservation of Mass when balancing the equation for a chemical reaction	"The Natural World" - ISCS
	Class discussion based upon individual practice	Students will balance a series of chemical equations and class discussion can be facilitated to aid in understanding	Teacher prepared/selected resources
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Illustrate how atoms are rearranged when substances react, but that the total number of atoms and the total mass of the products remain the same as the original substances.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "What's the Matter with Bubbles" Lab to produce a gas when combining a solid and liquid and then collect quantitative data to observe conservation of mass	"The Natural World" - ISCS
		Students complete long term data collection during the "Oxidation of Iron" Lab	
	Quizzes/Tests		Chemical Interactions – McDougal Littell
			Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Recognize that a mixture often can be separated into the original substances using one or more of their characteristic	Evaluation of labs and demonstrations for accurate data analysis & summarization of evidence through	Students will complete lab experiences to demonstrate composition of solutions and mixtures	Teacher prepared/selected

physical properties.	appropriate conclusions In class discussions correlating previously learned knowledge from laboratory experiences	Students complete the "Crime Lab Chemistry" Experiment Classroom discussion will be based on evidence drawn from the labs above	materials and/or McDougal-Litell Lab Generator GEMS Kit

Flemington-Raritan Regional Schools
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Grade 8

Electricity Unit: Transformation of Energy

Essential Questions:
How is energy transferred in an electrical system?
What are the various sources of electricity?
How do batteries and electronics affect our daily lives?
What are the component parts of a battery system and how do they interact?
Can you explain a relationship between electric circuits and heat, light and sounds?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
By the end of Grade 8
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
By the end of Grade 8
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
Content: Carefully collected evidence is used to construct and defend arguments.

5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.
Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
By the end of Grade 8
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

STANDARD 5.2 Physical Science All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.

A. Properties of Matter: All objects and substances in the natural world are composed of matter. Matter has two fundamental properties: matter takes up space, and matter has inertia.
Content: Substances are classified according to their physical and chemical properties. Metals are a class of elements that exhibit physical properties, such as conductivity, and chemical properties, such as producing salts when combined with nonmetals.

5.2.8.A.6 Determine whether a substance is a metal or nonmetal through student-designed investigations.

C. Forms of Energy: Knowing the characteristics of familiar forms of energy, including potential and kinetic energy, is useful in coming to the understanding that, for the most part, the natural world can be explained and is predictable.
Content: Energy is transferred from place to place. Light energy can be thought of as traveling in rays. Thermal energy travels via conduction and convection.

5.2.8.C.2 Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy.

D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.
Content: When energy is transferred from one system to another, the quantity of energy before transfer equals the quantity of energy after transfer. As an object falls, its potential energy decreases as its speed, and consequently its kinetic energy, increases. While an object is falling, some of the object's kinetic energy is transferred to the medium through which it falls, setting the medium into motion and heating it.

5.2.8.D.1 Relate the kinetic and potential energies of a roller coaster at various points on its path.
Content: Nuclear reactions take place in the Sun. In plants, light energy from the Sun is transferred to oxygen and carbon compounds, which in combination, have chemical potential energy (photosynthesis).
5.2.8.D.2 Describe the flow of energy from the Sun to the fuel tank of an automobile.

Students will understand
- how scientists do not completely understand the relationship between magnetism and electricity.
- how batteries and electronics affect our daily lives.
- sunlight is the ultimate source of most of the energy we use.
- how an electronic circuit is a system composed of interacting parts.
- the powerful impact of harnessing and using electricity as an energy source.
- energy is a characteristic of matter.
- energy can transform into electrical energy from other forms of energy

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Students will know that the total amount of energy in a closed system does not change	Informal evaluation based on class discussion of class activities Evaluation of labs for accurate data analysis & summarization	Students will complete a guided video notes sheet on electricity media video, giving students an introduction to electricity and batteries Students will complete Inquiry based labs to examine the evidence of energy	"Electricity" video – Bill Nye the Science Guy Series; Electricity and Magnetism – McDougall-Littell; Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links Electrical Systems and Circuit Design – STC Unit

	of evidence through appropriate conclusions	transformations into electrical energy (Inquiry Investigations 1.1-1.5)	
• Students will know how electricity is generated and how electrical energy can transform from one form to another.	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will know how batteries product energy.	Informal evaluation based on class discussion of class activities	Students will complete a guided media notes on electricity and batteries, which helps give students an introduction to electricity and batteries	"Electricity" video – Bill Nye the Science Guy Series; Electricity and Magnetism – McDougall-Littell; Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will construct wet-cell and dry-cell batteries to use during development of circuitry in upcoming lab activities	Teacher selected lab materials/PASCO Dry cell battery design kits
	Informal evaluation based on class discussion of previous lab activities	Students will complete an inquiry based lab to determine which electrodes they should use to build a battery.	Applicable teacher selected lab materials
		Students will use wet and dry cell battery data in order to discuss the differences in operation and function of the two types of batteries	Teacher selected lab materials/PASCO Dry cell battery design kits
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-

			Litell Test Generator
• Students will be able to explain energy conversions from one form to another.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will complete Inquiry based labs to examine the evidence of energy transformations into electrical energy (Inquiry Investigations 1.1-1.5)	Electricity and Magnetism – McDougall-Littell; Electrical Systems and Circuit Design – STC Unit; teacher selected lab materials
	Informal evaluation based on class discussion of previous lab activities	Students will complete an independent mini-research activity to explore the various sources of electricity, the energy conversion involved in them, and their affect in daily human life	Teacher selected research based articles
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will be able to design and explain the system and components of a parallel circuit and a series circuit.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will use their previously prepared wet and dry cell batteries to form both series and parallel circuits	Electricity and Magnetism – McDougall-Littell Lab Generator; Electrical Systems and Circuit Design – STC Unit; teacher selected lab materials
		Students will complete the "Wire a Room" lab to investigate how to wire several devices together and how to build wiring for a room	Electricity and Magnetism – McDougall-Littell Lab Generator
		Students will complete inquiry investigations to wire series and parallel circuits while investigating the relationship between current, voltage, and resistance (Inquiries 5-11)	Electrical Systems and Circuit Design – STC Unit
	Informal evaluation based on	Students will work in groups and	Electricity and Magnetism – McDougall-Littell Lab Generator;

	class discussion of previous lab activities	as a class to discuss the concepts that create the basis for the aforementioned lab and work	Electrical Systems and Circuit Design – STC Unit; teacher selected lab materials
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will be able to wire circuits in order to create an electronic device.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will use the EKI interactive computer simulation program and accompanying lab book to complete a series of lesion and labs in order to create circuits on the solder-less circuit boards (Various experimental designs will be assigned as well as optional activities)	EKI Lab workbooks, computer program, and circuit board kits
	Evaluation of lab simulations for accurate completion, analysis, & summarization of evidence through appropriate conclusions	Students will complete mini-quizzes for each of the theory lessons and lab simulations	EKI Lab workbooks, computer program, and circuit board kits Electrical Systems and Circuit Design – STC Unit
	Informal evaluation based on class discussion of previous lab activities	Students will complete inquiry investigations to wire circuits that perform specialized functions In groups, pairs, and as a class	Electricity and Magnetism – McDougall-Littell Lab Generator; Electrical Systems and Circuit Design – STC Unit; teacher selected lab materials

.	Quizzes/Tests Unit Benchmark Assessment	as a whole, students will discuss the theory behind the development of the circuits developed in the aforementioned lab work	Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator

Flemington-Raritan Regional Schools
Science Curriculum
Grade 8

Genetics Unit

Essential Questions:
What are genetically inherited traits?
How are they determined?
How did we learn about genetically inherited traits (re: Gregor Mendel)?
What if Mendel never "wondered" about plants?
How might our continued understanding of genetically inherited traits affect the future of humankind?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
Content: Carefully collected evidence is used to construct and defend arguments.

5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.

Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
By the end of Grade 8
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

STANDARD 5.3 Life Science All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
D. Heredity and Reproduction: Organisms reproduce, develop, and have predictable life cycles. Organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction.
Content: Some organisms reproduce asexually. In these organisms, all genetic information comes from a single parent. Some organisms reproduce sexually, through which half of the genetic information comes from each parent.

5.3.8.D.1 Defend the principle that, through reproduction, genetic traits are passed from one generation to the next, using evidence collected from observations of inherited traits.
Content: The unique combination of genetic material from each parent in sexually reproducing organisms results in the potential for variation.

5.3.8.D.2 Explain the source of variation among siblings.
Content: Characteristics of organisms are influenced by heredity and/or their environment.
5.3.8.D.3 Describe the environmental conditions or factors that may lead to a change in a cell's genetic information or to an organism's development, and how these changes are passed on.

Students will understand
- that technology continually advances and enhances our understanding of human genetics.
- that social decision making is a very complex endeavor.
- that reproduction is a characteristic of all living things and is essential for the continuation of every species.

Students will also become aware of controversial topics in genetics.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Students will understand how genetic traits are inherited	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will complete a lab activity relating probability in the determination of genetic characteristics and then creating a model offspring	Teacher selected lab materials and/or Cells and Heredity – McDougall-Littell Lab Generator accompanied with visual and interactive resources
		Students will collect data based on the inherited characteristics of their classmates in order to examine the exhibition of dominant or recessive traits in a small population	Teacher selected lab materials and/or Cells and Heredity – McDougall-Littell Lab Generator
	Informal evaluation based on class discussion of independent practice activities	Class discussion will ensue based upon determination of genetic characteristics using basis of common, identifiable dominant and recessive characteristics.	Teacher selected materials and/or Cells and Heredity – McDougall-Littell accompanied by visual and interactive resources
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will use a simple Punnet Square to predict and determine inherited traits.	Informal evaluation based on class discussion of independent practice activities	Students will complete a number of Punnett Square problems to show possible gene	Teacher selected materials and/or Cells and Heredity – McDougall-Littell; Visual and Interactive Resources

	Quizzes/Tests	combinations through examples of complete dominance, incomplete dominance, and co-dominance	Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will know about various genetic disorders.	Informal evaluation based on class discussion of independent/group research activities	Students will research various gene-related disorders including sex-linked traits like hemophilia and color blindness	Cells and Heredity – McDougall-Littell and Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Evaluation and Analysis as well as evaluation of Oral Presentations based upon rubrics designed for such.	Students will research various gene-related disorders including sex-linked traits like hemophilia and color blindness	Teacher and student selected materials
• Students will describe with examples the term genetically inherited traits.	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will use research on current topics to form an opinion regarding modern genetics (Topics may include cloning, genetics engineering, stem cell research, etc…)	Informal evaluation based on class discussion of Interactive Online Activities	Students will use current research on modern topics in genetics in order to present, debate, and discuss factors involved in each of the topics selected.	Student and Teacher selected resources: Cells and Heredity – McDougall-Littell, and Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Evaluation and Analysis as well as evaluation of Oral Presentations based upon rubrics designed for such.	Students will use current research on current topics in	Cells and Heredity – McDougall-Littell and Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science

	Quizzes/Tests Unit Benchmark Assessment	genetics in order to present, debate, and discuss factors involved in each of the topics selected.	Links Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator

Flemington-Raritan Regional Schools
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Grade 8

Environment Unit

Essential Questions:
How do human activities and the introduction of harmful materials impact our environment?
Why should we be concerned about human impact on the environment?
How do natural events impact the environment and human activity?
What is an individual's role in positively impacting the environment?
How do changes in an environment affect the survival of individual organisms and entire species?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
By the end of Grade 8
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
By the end of Grade 8
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.

Content: Carefully collected evidence is used to construct and defend arguments.
5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.
Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
By the end of Grade 8
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

STANDARD 5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.

G. Biogeochemical Cycles: The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.
Content: Investigations of environmental issues address underlying scientific causes and may inform possible solutions.

5.4.8.G.2 Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions.

Students will understand
- how humans have impacted the environment in a cause and effect relationship.
- why we should be concerned about human impact on the environment.
- how the effects of human-produced pollutants on the environment impact the natural environment.
- the role that an individual may have in negatively or positively impacting the environment.
- how the natural and man-made causes acid rain impact earth and its natural systems
- there are always tradeoffs when making choices.
- thinking about things as a system means looking at how every part relates to another.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Compare and contrast practices that affect the use and management of natural resources.	Evaluation and discussion of individual/group projects	Students will complete a "Public Awareness Poster" in order to incorporate statistics and facts that would help draw the public's attention to environmental issues	Student and Teacher selected materials and research resources
	Discussion based upon interactive online activities	Students will examine the use of natural resources through guided internet activities	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
		Students will complete independent and group research in order to investigate and evaluate the use of alternative energy sources	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Quizzes/Tests		Teacher prepared/selected tests and quizzes
• Recognize that acid rain is an environmental hazard.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "Acid Rain" Lab Series that allows them to simulate acid rain and examine its effect on the environment	Acid Rain – GEMS, and teacher selected lab materials

	Class discussion to evaluate understanding of the specific topic	Classroom discussion will be based on evidence drawn from the lab above	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Discussion based upon interactive online activities	Students will examine the use of natural resources through guided internet activities	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links
	Quizzes/Tests		
• Identify factors that cause acid rain, water pollution, and global warming.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students complete the "Acid Rain" Lab Series that allows them to simulate acid rain and examine its effect on the environment	Teacher prepared/selected tests and quizzes Acid Rain Lab Materials – GEMS
		Students complete the "Global Warming" Lab series that allows them to simulate the factors that cause Global Warming and examine the effect on the environment	Global Warming Lab Materials – GEMS
		Students will collect water samples and perform a water quality analysis by testing factors such as pH, chlorides, and phosphates, etc.	
	Evaluation and discussion of individual/group projects	Students will complete a "Public Awareness Poster" in order to incorporate statistics and facts that would help draw the public's attention to environmental issues	Student and Teacher selected materials and research resources
	Cooperative group and class discussions	Students will have the opportunity to research current event articles, then discuss the	Selected articles for student use

		research in cooperative groups or as whole class discussion Students will participate in class discussions that help identify natural substances that pollute and how these substances impact an ecosystem as a whole Students will participate in class discussion that allows groups or the class as a whole to evaluate and remedy the effects of various air and water pollutants on man's health	
	Interactive Online Activities Discussion based on independent practice Quizzes/Tests	Students will examine the causes and effects of ozone depletion through a guided internet activity Students will complete a guided reading activity to examine environmental deterioration, air pollution, water pollution, and land and soil pollution	Visual and Interactive Media Resources including but not limited to United Streaming, Classzone, Eighth Grade Science Links Teacher selected articles that are research driven
• Students will identify and recognize human kind's impact on the environment	Evaluation and discussion of individual/group projects Cooperative group and class discussions	Students will complete a "Public Awareness Poster" in order to incorporate statistics and facts that would help draw the public's attention to environmental issues Students will have the opportunity to research current event articles, then discuss the research in cooperative groups or	Teacher prepared/selected tests and quizzes Teacher selected articles that are

		as whole class discussion Students will participate in class discussions that help identify natural substances that pollute and how these substances impact an ecosystem as a whole Students will participate in class discussion that allows groups or the class as a whole to evaluate and remedy the effects of various air and water pollutants on man's health Students will conduct an Environmental Town Meeting Activity to debate current environmental issues Students will examine the effect that humans have on the environment around them through current journal articles and research Students will complete a guided reading activity to examine human impact on the surrounding environment Students will complete a simulates lab, "Welcome to Fruitvale" to analyze water quality	research driven Teacher selected articles that are research driven Teacher selected articles that are research driven GEMS Kits (Acid Rain and Global Warming) and SEPUP Lab Kit (Welcome to Fruitvale); teacher selected/research driven articles Visual and Interactive Media Resources including but not limited to Classzone and Eighth Grade Science Links Teacher selected/research driven reading and journal article "Welcome to Fruitvale" Kit – SEPUP Labs Teacher selected and prepared assessments
	Interactive Online Activities Discussion based on independent practice Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions Quizzes/Tests		

	Unit Benchmark Assessment		

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Astronomy Unit

Essential Questions:
How do some of the parts of the "solar system" relate to each other?
How do we think the universe, galaxies, and solar system were formed? What evidence do we use?
Where is our place in our galaxy?
How old is the Universe, our galaxy, our solar system, and Earth?
Can you describe the regular, predictable motion of objects in our solar system?
What causes seasons on planet Earth?
What mechanism causes lunar phases and eclipses to be viewed from certain vantage points on Earth?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
By the end of Grade 8
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
By the end of Grade 8
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.
Content: Carefully collected evidence is used to construct and defend arguments.
5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.
Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
By the end of Grade 8
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.

5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

STANDARD 5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
A. Objects in the Universe: Our universe has been expanding and evolving for 13.7 billion years under the influence of gravitational and nuclear forces. As gravity governs its expansion, organizational patterns, and the movement of celestial bodies, nuclear forces within stars

govern its evolution through the processes of stellar birth and death. These same processes governed the formation of our solar system 4.6 billion years ago.
Content: The relative positions and motions of the Sun, Earth, and Moon result in the phases of the Moon, eclipses, and the daily and monthly cycle of tides.

5.4.8.A.1 Analyze moon-phase, eclipse, and tidal data to construct models that explain how the relative positions and motions of the Sun, Earth, and Moon cause these three phenomena.
Content: Earth's tilt, rotation, and revolution around the Sun cause changes in the height and duration of the Sun in the sky. These factors combine to explain the changes in the length of the day and seasons.
5.4.8.A.2 Use evidence of global variations in day length, temperature, and the amount of solar radiation striking Earth's surface to create models that explain these phenomena and seasons.
Content: Gravitation is a universal attractive force by which objects with mass attract one another. The gravitational force between two objects is proportional to their masses and inversely proportional to the square of the distance between the objects.
5.4.8.A.3 Predict how the gravitational force between two bodies would differ for bodies of different masses or bodies that are different distances apart.
Content: The regular and predictable motion of objects in the solar system (Kepler's Laws) is explained by gravitational forces.
5.4.8.A.4 Analyze data regarding the motion of comets, planets, and moons to find general patterns of orbital motion.

Students will understand:
- As scientists discover new confirmation old theories may be looked at in a new way
- Some scientific knowledge is very old and yet still applies today
- Choosing and using useful models, combined with creativity and imagination can lead to devising useful hypotheses and explanation to make sense of collected evidence
- The motion of an object is always judged with respect to some other object
- The sun is a star
- Technology is essential to our understanding of outer space
- Some distant galaxies are so far away that their light takes several billion years to reach the earth
- The mechanism that provides Earth with seasons
- The illumination of moon by the sun creates monthly lunar phases
- Why Earth can only view one side of the moon.
- Eclipses and the phenomena that allows them to be viewed from specific locations on planet Earth.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Explain how the tilt, rotation, and orbital pattern of the Earth, relative to the sun, produce seasons.	Discussion and informal evaluation based upon interactive online activities Evaluation of labs for accurate	Students will complete guided reading exercises and interactive media exercises that utilize and apply current research on space exploration.	Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links Teacher selected lab materials

	data analysis & summarization of evidence through appropriate conclusions		and procedures
• Describe the physical characteristics of the planets and other objects within the solar system and compare Earth to the rest of the planets.	Evaluation and Analysis as well as evaluation of Oral Presentations based upon rubrics designed for such.	Students will conduct independent research to create presentations on characteristic features of the solar system's contents	Teacher selected materials that may utilize Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links
		Students will complete cooperative group presentations for the planets in the solar system	Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links
	Discussion and informal evaluation based upon interactive online activities	Students will complete guided reading exercises and interactive media exercises that utilize and apply current research on space exploration.	Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links
	Tests/Quizzes		Teacher selected/prepared assessments
• Understand that the sun is a star and that it shares characteristics with other stars.	Discussion and informal evaluation based upon interactive online activities	Students will complete guided reading exercises and interactive media exercises that utilize and apply current research on space exploration.	Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links
	Tests/Quizzes		Teacher selected/prepared assessments
• Know that the universe consists of many billions of galaxies, each including billions of stars.	Discussion and informal evaluation based upon interactive online activities	Students will complete guided reading exercises and interactive media exercises that utilize current research on space	Visual and Interactive Media Resources including but not limited to Classzone, Eighth Grade Science Links
	Tests/quizzes		

		exploration.	Teacher selected/prepared assessments
Identify hours of daylight in relation to equinox and solstice dates as well as the Earth's position on its axis during its revolution around the Sun	Create models and/or posters to demonstrate understanding of Earth's seasons.	Reasons for Seasons Lab	GEMS kit Real Reasons for Seasons.
	Conduct an experiment observing and recording how the Sun's light strikes the Earth at various positions in its revolutionary path		MacDougall Littel Space Science and Earth's Waters Teacher designed Reasons for Seasons Lab
	Record the Sun rise and set times over a length of time and calculate the photoperiod for each day.	Sun rise and Sun set data table, MS Excel graph, Hours of Day and Night internet activity lab.	Various internet websites
Observe that the moon revolves and rotates causing changes in the sky, moon phases and eclipses.	Illustrate and label the eight phases of the moon.	Observe, draw and label the eight phases of the moon.	Teacher designed labs using information obtained from RVCC (Raritan Valley Community College)
Determine that the Sun illuminates the Moon	Observe and view the moon as it rotates and revolves simultaneously around earth.	Moving a penny around a quarter to show that the moon takes exactly one month to revolve and rotate.	Various internet websites
	Create a flipbook that thirty different illustrations of the on and place them in chronological order .	Making a flipbook showing the eight phases of the moon in order	The Moon in Motion Flipbook
	Visualize themselves as the earth and a Styrofoam ball as the moon, experiencing the visual effects of the moon phases.	Making a poster placing all thirty pictures of the moon in the correct order. Perform a lab demonstrating the rotation and revolution of the moon around the earth.	The Moon Phases Poster Teacher designed Moon Phases Lab: Visualizing the 8 Phases

	Reinforce the concepts of the moon phases and how half of the moon is always illuminated by the sun. Visualize and draw a lunar eclipse and analyze the conditions needed for a lunar eclipse. Unit Benchmark Assessment	To discover the celestial conditions needed for a lunar eclipse to occur. To discover the celestial conditions needed for a solar eclipse to occur.	GEMS kit Earth, Moon and Sun. Teacher designed Lunar and Solar Eclipse Lab T-Chart Graphic Organizer to compare Lunar and Solar Eclipses.

Flemington-Raritan Regional Schools
Science Curriculum
Grade 8

Microbiology Unit

Essential Questions:
How can we make the most accurate observations?
What does it mean to be "alive?" (What are the characteristics of living things?)
How are living things classified?
How do we know what living things are made of?
Are all living things made of the same types of cells?
How does cell structure and function differ from kingdom to kingdom?
How is a cell like a city?

New Jersey Core Curriculum Content Standards:

STANDARD 5.1 Science Practices All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
A. Understand Scientific Explanations: Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
By the end of Grade 8
Content: Core scientific concepts and principles represent the conceptual basis for model-building and facilitate the generation of new and productive questions.

5.1.8.A.1 Demonstrate understanding and use interrelationships among central scientific concepts to revise explanations and to consider alternative explanations.
Content: Results of observation and measurement can be used to build conceptual-based models and to search for core explanations.
5.1.8.A.2 Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.
Content: Predictions and explanations are revised based on systematic observations, accurate measurements, and structured data/evidence.
5.1.8.A.3 Use scientific principles and models to frame and synthesize scientific arguments and pose theories.

B. Generate Scientific Evidence Through Active Investigations: Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
By the end of Grade 8
Content: Evidence is generated and evaluated as part of building and refining models and explanations.

5.1.8.B.1 Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.
Content: Mathematics and technology are used to gather, analyze, and communicate results.
5.1.8.B.2 Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.

Content: Carefully collected evidence is used to construct and defend arguments.
5.1.8.B.3 Use qualitative and quantitative evidence to develop evidence-based arguments.
Content: Scientific reasoning is used to support scientific conclusions.
5.1.8.B.4 Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

C. Reflect on Scientific Knowledge: Scientific knowledge builds on itself over time.
Content: Scientific models and understandings of fundamental concepts and principles are refined as new evidence is considered.

5.1.8.C.1 Monitor one's own thinking as understandings of scientific concepts are refined.
Content: Predictions and explanations are revised to account more completely for available evidence.
5.1.8.C.2 Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models.
Content: Science is a practice in which an established body of knowledge is continually revised, refined, and extended.
5.1.8.C.3 Generate new and productive questions to evaluate and refine core explanations.

D. Participate Productively in Science: The growth of scientific knowledge involves critique and communication, which aresocial practices that are governed by a core set of values and norms.
By the end of Grade 8
Content: Science involves practicing productive social interactions with peers, such as partner talk, whole-group discussions, and small-group work.

5.1.8.D.1 Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences.
Content: In order to determine which arguments and explanations are most persuasive, communities of learners work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories (e.g., argumentation, representation, visualization, etc.).
5.1.8.D.2 Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building.
Content: Instruments of measurement can be used to safely gather accurate information for making scientific comparisons of objects and events.
5.1.8.D.3 Demonstrate how to safely use tools, instruments, and supplies.
Content: Organisms are treated humanely, responsibly, and ethically.
5.1.8.D.4 Handle and treat organisms humanely, responsibly, and ethically.

5.2 Physical Science All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.
B. Changes in Matter: Substances can undergo physical or chemical changes to form new substances. Each change involves energy.
Content: Chemical changes can occur when two substances, elements, or compounds react and produce one or more different substances. The physical and chemical properties of the products are different from those of the reacting substances.

5.2.8.B.2 Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration.

D. Energy Transfer and Conservation: The conservation of energy can be demonstrated by keeping track of familiar forms of energy as they are transferred from one object to another.
Content: Nuclear reactions take place in the Sun. In plants, light energy from the Sun is transferred to oxygen and carbon compounds, which in combination, have chemical potential energy (photosynthesis).

5.2.8.D.2 Describe the flow of energy from the Sun to the fuel tank of an automobile.

STANDARD 5.3 Life Science All students will understand that life science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.
A. Organization and Development: Living organisms are composed of cellular units (structures) that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions.
Content: All organisms are composed of cell(s). In multicellular organisms, specialized cells perform specialized functions. Tissues, organs, and organ systems are composed of cells and function to serve the needs of cells for food, air, and waste removal.

5.3.8.A.1 Compare the benefits and limitations of existing as a single-celled organism and as a multicellular organism.
Content: During the early development of an organism, cells differentiate and multiply to form the many specialized cells, tissues, and organs that compose the final organism. Tissues grow through cell division.
5.3.8.A.2 Relate the structures of cells, tissues, organs, and systems to their functions in supporting life.

B. Matter and Energy Transformations: Food is required for energy and building cellular materials. Organisms in an ecosystem have different ways of obtaining food, and some organisms obtain their food directly from other organisms.
Content: Food is broken down to provide energy for the work that cells do, and is a source of the molecular building blocks from which needed materials are assembled.

5.3.8.B.1 Relate the energy and nutritional needs of organisms in a variety of life stages and situations, including stages of development and periods of maintenance.

STANDARD 5.4 Earth Systems Science All students will understand that Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.
B. History of Earth: From the time that Earth formed from a nebula 4.6 billion years ago, it has been evolving as a result of geologic, biological, physical, and chemical processes.
Content: Today's planet is very different than early Earth. Evidence for one-celled forms of life (bacteria) extends back more than 3.5 billion years.

5.4.8.B.1 Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time.

Students will learn how living things function at a micro level and a macro level.
Students will understand

- how structure of the micro organisms creates a system of interacting parts.

- how classifying living things helps us to understand our world.
- how structure and function of living things are inter-related and complement each other.

Knowledge/Skills/Understanding	Assessment Evidence	Learning Experiences	Resources
• Students will be able to use the microscope as a tool in the classroom and further develop their technique with the microscope	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will complete an introductory lab on the use of the microscope	Cells and Heredity – McDougall-Littell; "Tools of a Scientist" – Prentice Hall; teacher prepared lab materials
		Students will design their own slides of cells in "Design your own microscope slide" lab	Cells and Heredity – McDougall-Littell Lab Generator
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Compare and contrast kinds of organisms using their cellular characteristics.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will make microscopic observations of generalized cells that represent each of the teacher selected kingdoms of life	Teacher prepared lab materials
		Students will prepare wet mount slides of the Elodea or onion skin cells to observe cellular characteristics of the plant cell	Applicable teacher selected lab materials
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will classify various kingdoms based on their cellular structures.	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will make microscopic observations (observe, identify, draw, and label) of generalized cells that represent each of the selected kingdoms of life	Teacher prepared lab materials
	Quizzes/Tests		Teacher prepared/selected tests and quizzes

	Lab Practicum	Students will identify various organisms/kingdoms to which organisms belong through visual representation under the microscope	Teacher selected/prepared lab materials
• Students will be able to identify the major structures and functions of the generalized plant and animal cells in order to differentiate the two	Evaluation of labs for accurate data analysis & summarization of evidence through appropriate conclusions	Students will prepare wet mount slides of the Elodea or onion skin cells to observe cellular characteristics of the plant cell	Teacher selected/prepared lab materials (i.e.: Prentice Hall's "Plant and Animal Cell activity sheets)
		Students will complete the lab, "What Do Cells Need for Photosynthesis?" for students to examine the process by which plants obtain energy	Cells and Heredity – McDougall-Littell Lab Generator
	Evaluation and Analysis as well as evaluation of Oral Presentations based upon rubrics designed for such.	Students will work individually or in groups to prepare a representative model of the generalized plant or animal cell	Student/teacher selected materials
	Informal evaluation based on class discussion of independent practice activities	Students will label the structure and function of the generalized plant and animal cell	Cells and Heredity – McDougall Litell
		Students will conduct guided reading on cellular structure and function	Cells and Heredity – McDougall Litell
		Students will develop a diagram that will correlate the cell to a city in visual format	Cells and Heredity – McDougall Litell
	Quizzes/Tests		Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator
• Students will know that cells are the basic building blocks of all living system.	Informal evaluation based on class discussion of independent	Students will complete a guided reading assignment to examine	

	practice activities Quizzes/Tests Unit Benchmark Assessment	the cell theory	Teacher selected research/journal article Teacher prepared/selected tests and quizzes and/or McDougal-Litell Test Generator