Township of Union Public Schools
Administration Building

K - 5
CURRICULUM GUIDE APPROVAL REQUEST FORM

Please present the attached guide to the Board of Education for approval. The guide has been reviewed by all involved parties and is aligned with the New Jersey Core Curriculum Content Standards.

Title: Science

Department/Grade: Kindergarten

Supervisor: Maureen Corbett

Submission Date: May 5, 2015

Board Approval Date: _____

TOWNSHIP OF UNION PUBLIC SCHOOLS

Kindergarten Science
Curriculum Guide
2015

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Kindergarten Science

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Mission Statement

The Township of Union Board of Education believes that every child is entitled to an education designed to meet his or her individual needs in an environment that is conducive to learning. State standards, federal and state mandates, and local goals and objectives, along with community input, must be reviewed and evaluated on a regular basis to ensure that an atmosphere of learning is both encouraged and implemented. Furthermore, any disruption to or interference with a healthy and safe educational environment must be addressed, corrected, or when necessary, removed in order for the district to maintain the appropriate educational setting.

Philosophy Statement

The Township of Union Public School District, as a societal agency, reflects democratic ideals and concepts through its educational practices. It is the belief of the Board of Education that a primary function of the Township of Union Public School System is to formulate a learning climate conducive to the needs of all students in general, providing therein for individual differences. The school operates as a partner with the home and community.

Statement of District Goals

- Develop reading, writing, speaking, listening, and mathematical skills.
- Develop a pride in work and a feeling of self-worth, self-reliance, and self discipline.
- Acquire and use the skills and habits involved in critical and constructive thinking.
- Develop a code of behavior based on moral and ethical principals.
- Work with others cooperatively.
- Acquire a knowledge and appreciation of the historical record of human achievement and failures and current societal issues.
- Acquire a knowledge and understanding of the physical and biological sciences.
- Participate effectively and efficiently in economic life and the development of skills to enter a specific field of work.
- Appreciate and understand literature, art, music, and other cultural activities.
- Develop an understanding of the historical and cultural heritage.
- Develop a concern for the proper use and/or preservation of natural resources.
- Develop basic skills in sports and other forms of recreation.

Course Description

The kindergarten standards stress the use of basic science skills to explore common materials, objects and living things. Emphasis is placed on using the senses to gather information. Students are expected to develop skills in posing questions, measuring, sorting, classifying, and communicating information about the natural world. The science skills are an important focus as students investigate the following content topics that are aligned with the New Jersey State Science Standards.

- ***Investigating Living Things (Plants & Animals)***
- ***Investigating the Human Body***
- ***Investigating Objects Around Us***
- ***Investigating Water***
- ***Investigating Motion & Forces***
- ***Investigating Seasons and Weather Patterns***
- ***Investigating Sunlight and Shadows***
- ***Protecting Our Planet***

Teachers will use an interdisciplinary approach to these content areas with emphasis on the process skills outlined in the New Jersey Core Curriculum Content Standards for Science and the 2011 Elementary Grades Science Practices (5.1) Clarifications.

Recommended Textbooks

Harcourt Science Program, 2009

Curriculum Units

Unit 1: Investigating Living Things (Plants & Animals)

Unit 2: Investigating the Human Body

Unit 3: Investigating Objects Around Us

Unit 4: Investigating Water

Unit 5: Investigating Motion and Forces Patterns

Unit 6: Seasons and Weather

Unit 7: Sunlight and Shadows

Unit 8: Protecting Our Planet

Pacing Guide- Course

Content	Number of Days
Introduction to Science and Beginning Objects Around Us	Complete during September/October
Objects Around Us	Complete by the end of October
Weathers and Seasons	Complete by the end of November
Shadows and Sunlight	Complete by the end of December
Investigating Water	Complete by the end of January
Motion and Forces	Complete by the end of February
Human Body (Five Senses-Food Pyramid)	Complete by the end of March
Protecting our Planet	Complete by the end of April
Living and Nonliving and Life Cycles	Complete during May/June
Living and Nonliving and Life Cycles	Complete by the end of June

Science Practices - To be integrated across the K to 4 curriculum as appropriate

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do scientists think and work? How do people learn about the physical world? How do we build and refine models that describe and explain the natural and designed world?	**5.1A** Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.**(5.1.4.A.1)** • Learn fundamental concepts, principles, theories, and models. • Then, build organized and meaningful understandings of the big picture (conceptual framework) that incorporate these concepts, principles and theories. • Then, use these relationships to	• Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. • Determine the main idea of a text and explain how it is supported by key details; summarize the text. • Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. • Use stated assumptions, definitions, and previously established results in constructing arguments.	Observe and record what they see when they stick part of their arm into a clear tube of water and answer the following question: Does your arm in the water appear to be aligned with the part of your arm exposed to the air? In whole class discussion, try to provide explanations. Make ray diagrams to explain what happens when light from the sun travels from air into a window and into a room of a house. Compare to diagrams where light from the sun travels from air into a clear pool. Share diagrams as a whole class.

	interpret, understand and predict other natural phenomenon. Use outcomes of investigations to build and refine questions, models, and explanations. **(5.1.4.A.2)** • Develop models, from evidence obtained, to explain the relationships between fundamental concepts and principles. • Construct and refine explanations, arguments or models as new evidence becomes available. Use scientific facts, measurements, observations, and patterns in nature to build and critique	• Make conjectures and build a logical progression of statements to explore the truth of their conjectures. • Justify their conclusions, communicate them to others, and respond to the arguments of others. • Reason inductively about data, making plausible arguments that take into account the context from which the data arose. • Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. • Construct arguments using concrete referents such as objects, drawings, diagrams, and actions. • Listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. • Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express	Conduct an investigation with motion and forces. Using a ramp, toy car, meter stick and stopwatch, record the time it takes for the car to travel down the ramp. Discuss the forces at work on the car and predict ways to make the car travel farther, slower and faster. Generate explanations based on evidence. Your younger brother is convinced that a car is a living thing. He explains the evidence for his claim to you, providing evidence that it moves, eats gas, makes noise, and releases gas waste. He thinks the car's engine is the heart, the battery is the nervous system, the hoses and tubes are the circulatory system, and the gas tank is the stomach. At recess, he explained this idea to his friends in his class, and half the class agrees with him. While these ideas make some sense, you claim that a car is not a living thing. You think that more students have the same idea, so you decide to explain the essential characteristics of life. Create a presentation with visual aids to explain your thinking.

	scientific arguments. **(5.1.4.A.3)** • Use tools to observe, measure, and explain natural phenomena. • Evaluate the strengths of arguments based on the evidence presented. • Evaluate the quality of the evidence based on the logic and design of the experiment and the quality of the data collected.	measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs. • Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. • Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.	

How do scientists think and work? How do people learn about the physical world? How do we build and refine models that describe and explain the natural and designed world?	**5.1A** Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.**(5.1.4.A.1)** • Learn fundamental concepts, principles, theories, and models. • Then, build organized and meaningful understandings of the big picture (conceptual framework) that incorporate these concepts, principles and theories. • Then, use these relationships to interpret, understand and predict other natural phenomenon.	• Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. • Determine the main idea of a text and explain how it is supported by key details; summarize the text. • Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. • Use stated assumptions, definitions, and previously established results in constructing arguments. • Make conjectures and build a logical progression of statements to explore the truth of their conjectures. • Justify their conclusions, communicate them to others, and respond to the arguments of	Observe and record what they see when they stick part of their arm into a clear tube of water and answer the following question: Does your arm in the water appear to be aligned with the part of your arm exposed to the air? In whole class discussion, try to provide explanations. Make ray diagrams to explain what happens when light from the sun travels from air into a window and into a room of a house. Compare to diagrams where light from the sun travels from air into a clear pool. Share diagrams as a whole class.

	Use outcomes of investigations to build and refine questions, models, and explanations. **(5.1.4.A.2)** • Develop models, from evidence obtained, to explain the relationships between fundamental concepts and principles. • Construct and refine explanations, arguments or models as new evidence becomes available. Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments. **(5.1.4.A.3)** • Use tools to observe, measure, and explain natural	others. • Reason inductively about data, making plausible arguments that take into account the context from which the data arose. • Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. • Construct arguments using concrete referents such as objects, drawings, diagrams, and actions. • Listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. • Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the	

	phenomena. • Evaluate the strengths of arguments based on the evidence presented. • Evaluate the quality of the evidence based on the logic and design of the experiment and the quality of the data collected.	number pairs. • Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. • Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.	

What constitutes useful scientific evidence?	Design and follow simple plans using systematic observations to explore questions and predictions. (5.1.4.B.1) • Ask questions and decide what to measure in order to answer the questions. • Develop strategies for accurately measuring and collecting data. • Organize the data logically so that it may be used to answer questions or validate predictions. Measure, gather, evaluate, and share evidence using tools and technologies. (5.1.4.B.2) • Use age-appropriate tools with accuracy and confidence. • Use mathematics	• Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram. • Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).1 Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.	• Create organized data tables of long-term observations of the sky to build scientific arguments for general rules for describing when the Sun and Moon are visible. Present evidence, based on collected data, for general rules describing when the Sun and Moon are visible. • Create kinesthetic models using students to demonstrate how Earth's rotation causes day and night. • Collect data using classroom-developed weather instruments and compare the data collected from the classroom instruments to real-time weather data collected using professional instrumentation. www.weather.gov • Create and analyze graphs of the weather data in order to identify relationships among variables

	in the collection, organization and analysis of data. • Use tools of data analysis to organize and represent data. Formulate explanations from evidence.(5.1.4.B.3) • Make claims based on the available evidence. • Cite evidence and explain the reasoning for a claim. • Use data representations to communicate findings.	• Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters. • Students understand and use stated assumptions, definitions, and previously established results in constructing arguments. • They make conjectures and build a logical progression of statements to explore the truth of their conjectures. • They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. • They justify their conclusions, communicate them to others, and respond to the arguments of others. • They reason inductively about data, making plausible arguments that take into account the context from which the data arose. • Students are also able to	such as temperature, wind speed, wind direction, precipitation, and relative humidity. • Relate local weather to published weather maps, satellite imagery, and trends in student generated data. • Share weather findings with another classroom in the school, district, state, nation or another country. Compare how the weather is similar or different depending on the location • Grow plants in the classroom from seeds. Record all of their observations, including their verbal descriptions, as well as data about the height and number of leaves of each of the plants. Vary the conditions that the plants are grown under (water, light, fertilizer, etc.), and draw conclusions about the effects of these modifications based on their evidence.

How is scientific knowledge constructed?	Communicate and justify explanations with reasonable and logical arguments. (5.1.4.B.4) • Justify claims with connections to other fundamental concepts and principles. • Use evidence and data to support both a claim and the reasoning behind a scientific argument. Monitor and reflect on one's own knowledge regarding how ideas change over time.	compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. • Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. • Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.	• Consider the structures of each organism from biofacts or images of a large variety of living things provided by the teacher. Select two organisms that have similar structures. Point out how the structures are similar, and how the animal uses that structure. Explain if the similar structures have similar functions, using evidence and their own scientific reasoning.

	(5.1.4.C.1) • Monitor and reflect on their ideas as those ideas change over time. • Develop an understanding that "doing science" extends beyond experiments and includes modeling, organizing observations, and historical reconstructions. • Develop an awareness that science is about searching for core explanations and connections between fundamental concepts and principles. Revise predictions or explanations on the basis of learning new		

How does scientific knowledge benefit, deepen, and broaden from scientists sharing and debating ideas and information with peers?	information. (5.1.4.C.2) • Recognize that there may be multiple interpretations for the same phenomenon. • Recognize that explanations are increasingly valuable as they account for the available evidence more completely. Present evidence to interpret and/or predict cause-and-effect outcomes of investigations. (5.1.4.C.3) • Use evidence to uncover cause-and-effect relationships.		• Predict, with reasoning, which would land first, a

How does scientific knowledge benefit, deepen, and broaden from scientists sharing and debating ideas and information with peers?	• Create multiple representations of the results of an investigation. • Move confidently between multiple forms of representations (e.g., graph, chart, data table). Actively participate in discussions about student data, questions, and		feather or a hammer, if they were dropped at the same time. • Watch as Apollo 15 astronaut Dave Scott recreates Galileo's famous gravity experiment while on the surface of the moon. Then, using their conceptual understanding of gravity, explain the results of Dave Scott's experiment. (video available at: http://www.youtube.com/watch?v=4mTsrRZEMwA) • Look at various objects, make predictions about whether they were magnetic, and then test their predictions.

	understandings. (5.1.4.D.1) • Develop increasingly productive ways of representing ideas. • Develop appropriate norms for presenting scientific arguments and evidence. • Practice productive social interactions with peers in the context of science investigations Work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories. (5.1.4.D.2) • Demonstrate understanding of the difference between scientific		• Predict, investigate and describe what happens when an object of higher temperature is placed in direct contact with an object of lower temperature. Record data and use the data to describe which way the heat energy is moving between objects.

	argument, which rests on plausibility and evidence and has the goal of shared understanding, and everyday arguments. • Learn appropriate norms and language of scientific argumentation. • Persuade peers of the validity of one's own ideas and the ideas of others. Demonstrate how to safely use tools, instruments, and supplies. (5.1.4.D.3) • Evaluate risks and benefits of decision. • Minimize the probability of	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions and carry out assigned roles. c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others. d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion. • They justify their conclusions, communicate them to others,	• Use actual sky observation data, collected over a long period of time, to describe the patterns of the Moon's appearance. As a class, explore and discuss questions such as: When is the Moon visible? Is the shape predictable? How can we answer these questions using observations? • Use published lunar phase data to make predictions on what the moon will look like on subsequent nights and days. Working in a small group, develop a lunar calendar of the predictions and compare with the entire class. What do the calendars have in common? How are they different? Should they be different? Explore these questions as a class.

	harm by taking appropriate precautions. • Develop an individual sense of responsibility and good habits for safety. Handle and treat organisms humanely, responsibly, and ethically. (5.1.4.D.4) • Become knowledgeable about the care of animals so that both students and the animals stay safe and healthy during all activities. • Follow local, state, and national laws, policies, and regulations when live organisms are included in the classroom.	and respond to the arguments of others. • They reason inductively about data, making plausible arguments that take into account the context from which the data arose. • Students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. • Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. • Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments Interpret information presented visually, orally, or quantitatively	• On a class field trip to the Jersey shore, you notice many small crabs in the rocky, intertidal habitat. You notice that they are everywhere, and they are very aggressive towards other crabs. At first, you think that they may be blue crabs, which are native to NJ. After comparing your pictures with a field guide, however, you determine that these crabs are Japanese shore crabs Hemigrapsus sanguineus. Develop questions about these crabs, including how you might determine their native habitat, their range, their diet, etc. Think about the interactions that they might have with the other species in the intertidal zone. Plan an investigation that you can conduct to determine how and why the Japanese shore crab became a dominant intertidal species in NJ.

	• Discuss the importance of not conducting experimental procedures if such procedures are likely to cause pain, induce nutritional deficiencies, or expose animals to parasites, hazardous/toxic chemicals, or radiation.	(e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. • Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. • Determine the main idea of a text and explain how it is supported by key details; summarize the text. • Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.	• Contact students in Japan to learn about their intertidal zone and their Japanese crab population. Are they the dominant intertidal crab species in Japan? What other species live in this habitat? Are there any species found in NJ that are found in Japan? What is the water temperature and other shore conditions? Would this impact the health or success of the crab population? Share data and draw conclusions together. • Design an investigation where a variety of solids are heated to the melting point. Collect and analyze data, and evaluate evidence. Be sure to follow appropriate safety procedures • After being presented with a number of different objects, some living, some non-living, and some once-living, engage in class discussion, building claims about the objects (This object was once living because...), and critiquing claims made by other students.

Unit 1: Life Science- Investigating Living Things: Plants & Animals

All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

Standards: 5.1, 5.3, 5.5, 5.10

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What are living things? What are animals and plants like? What do animals and plants need? How do animals and plants grow and change?	The students will be able to: • Classify things as living and nonliving. • Describe characteristics of living and nonliving things. • Compare animals by size, shape or body coverings. • Identify and name body parts of animals. • Observe and describe similarities and differences in the appearance and behavior of animals. • Describe/recognize the life need of animals and plants • (food, water, air, and shelter). • Predict what will happen if life needs are not met. • Describe some simple changes animals and plants undergo during the life cycle. • Compare and contrast young plants and animals	Activities may include: Planting seeds with the students to show each step of the plant growth cycle Planting seeds and comparing the ways to take care of a plant: water, sunlight, air versus not properly taking care of a plant: no water, sunlight, etc. using two different plants to show growth changes. Record daily/weekly changes in a journal using pictures/words for both plants. Life cycle of a pumpkin, apple, etc. using real seeds, apples, and pumpkins in the classroom for the students to gain visual knowledge of the growth cycle. Life cycle of a butterfly using crafts to show the growth cycle of a butterfly.	Activities may include: Planting seeds with the students to show each step of the plant growth cycle Life cycle of a pumpkin, apple, etc. using real seeds, apples, and pumpkins in the classroom for the students to gain visual knowledge of the growth cycle. Life cycle of a butterfly using crafts to show the growth cycle of a butterfly

	with their parents. • Identify trees, grass, and shrubs as kinds of plants. • Observe and identify the parts of a plant. • Describe how plant parts help a plant live. • Explore how living things grow and change	Using stations around the classrooms with a respective written log, students can observe and record which is living and which is non-living (examples: pictures of animals, classroom plant, rock, toy, etc). Compare the needs between plants and animals (humans included) and how they are similar and different. Use a graph or venn diagram to sort information.	

Unit 2: Life Science: Investigating the Human Body

All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

Standards: 5.1, 5.3, 5.5

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How do we use our senses to observe? How does my body work?	The students will be able to: • Identify and describe the five senses: taste, touch, smell, hearing, and sight. • Use the five senses to observe and learn about the world. • Identify the sensory organ associated with each sense. • Conduct simple experiments to discover how people use their senses to learn about their environment. • Identify major body systems and describe their functions. • Discuss nutrition using the food pyramid and good nutritional choices. Identify ways to keep teeth healthy.	Activities may include: Using objects in the classroom to describe which senses we use for each object. Example: seeing the computer, listening to music, tasting an apple, touching a stuffed animal, and smelling an air freshener. Investigating mystery items in the classroom. Using a blindfold, allow students to use their *other* four senses to guess what the mystery item is (touching, smelling, hearing, tasting if appropriate). Making an individualized food pyramid including favorite foods for each student in the different part of the pyramid. Discuss and "act out" how animals and humans move in similar and different ways.	Possible assessments: Create sentences to describe a person doing an activity and the student will be able to name the sensory organ associated with the sense. Example: The girl walked into the house and smelled apple pie baking in the oven (smell- nose). Identify healthy versus unhealthy foods.

		Record how animals and humans move using a graph or chart. Examples: walking gorilla and walking person, crawling cat and crawling baby, hopping frog and hopping child. Practicing the sequence of steps brushing our teeth to ensure good dental hygiene. Discuss taking care of ourselves as humans and brainstorm ways we can help keep our bodies fit and healthy. Students can use drawings/writings to share what forms of exercise, nutrition, etc. can help achieve these goals.	

Unit 3: Physical Science- Investigating Objects Around Us

All students will gain an understanding of the structure and behavior of matter.
Standards: 5.1, 5.3, 5.4, 5.6, 5.7

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What is matter? How can matter be sorted? How can matter be described?	The students will be able to: • Identify and name eight basic colors: red, orange, yellow, green, blue, purple, black, and brown. • Mix primary colors to create new colors. • Demonstrate that objects are made of parts. • Identify and name a circle, triangle, square, and rectangle. Compare and contrast objects that are flexible, stiff, • straight, and curved. • Compare and contrast objects that are rough, smooth, hard, and soft. • Compare objects using the concepts of heavy/light, long/short, wide/thin, big/little, and large/small.	Activities may include: Using paint to create colors in different ways. Use classroom objects to feel textures to distinguish between rough, smooth, hard, soft. Sort pictures of different solids, liquids, and gases. Using this information, brainstorm other kinds of matter and sort in the respective groups using an organized chart. Show students the difference between solids and liquids, using an ice cube to show solids and melting ice (water) to show liquids. Pause during the activity to allow students to draw pictures to describe the changing matter of the ice cube at the beginning, middle, and end. Use a hair dryer in a	Possible assessments: ▪ Assess the students on their color words, matching the colors to the words. ▪ Assess the students using pictures of objects to decide which is heavier or lighter of the two. ▪ Assess the students on identifying the four basic shapes: circle, triangle, square, rectangle.

	• Know that matter exists in different shapes. • Identify and describe solids and liquids. • Describe how matter can change from one state to another. • Measure objects, using nonstandard units. • Identify the position of an object, using position words over/under, in/out, above/below, left/right. • Group objects according to their speed-fast or slow. • Sort and classify common objects using identified properties. • Describe, compare, sort and group objects by property and the materials from which they are made.	second experiment to show heat speeding up the melting process. Use a balance to see the difference in weight between objects that are heavy and light and some that are equal weights. Use rulers in the classroom to measure students' books, desks, cubbies, etc. Students use ingredients to make play dough; understanding how parts combine to make a whole; creating a complex system. Analyze each step of the process, sharing what the dough feels like throughout. Compare the matter of the ingredients with the final product. <u>Activity to Introduce Properties of Solids</u> Provide students with various solid objects like books, boxes, pencils, and pebbles. Have them determine the shape of the object.	

		<u>Activity to Introduce Properties of Liquids</u> Give students glasses of water. Give them a square bowl, a circular bowl, and a cup. Let them pour the water from each container. Instruct them to pour the water onto the table or a tile floor. Have them determine the shape of the water and how it changes depending on the container. <u>Activity to Introduce Properties of Gases</u> Provide students with balloons Let them inflate the balloons. Tie them tightly. Now puncture the balloon with a needle. Let them feel the air that comes out through the small hole. <u>Changes in States of Matter</u> Provide each group with a large container. Instruct the students to rub their palms together and feel the heat of their palms. Then give each student an ice cube to hold in their hands. Direct them to place their hands over the container. Once all the ice cubes have melted from the heat of their hands, take the bowl and place it over a heater.	

		Heat until the water disappears. Now ask them the following questions: 1 What happened to ice cubes? 2 Why did the ice cubes melt? 3 What happened to water? 4 How did water change into steam? Finally, provide the students with some stones and let them examine the rocks. Direct the children to identify the state of matter (solid) and ask whether they can change it to liquid or a gas. <u>5 Sense Matter</u> Students will use their five senses to see (observe), to feel, to smell, to taste, to weigh to find out if they are heavy or light?) OBJECTS-Solids: ball, rock, board, books, yams, and apples. Liquids: water, milk, syrup, honey, and molasses .Gases: blown up balloons, alka-seltzer, <u>Black Magic</u> Use a clean, dry coffee filter circle. Use your marker to draw	

		a black spot in the center. Put the circle on a saucer, and put a few drops of water on the spot. In a few minutes you'll see rings of color that go out from the center of the circle to the edges. Our picture is in black and white, but when you do this, you'll see some amazing colors.	

Unit 4: Physical Science-Investigating Water:

All students will gain and understanding of the structure and behavior of the matter.
Standards: 5.1, 5.3, 5.4, 5.6

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What are some properties of water? What sinks and floats? How can matter be changed?	The students will be able to: • Know what objects can be described and sorted by observable properties. • Investigate an object's ability to sink or float in water. • Design a way to make something that sinks in water to float. • Know that materials can be changed by cutting, folding, tearing, bending and mixing. • Recognize physical changes of matter. • Conduct simple experiments to change the state of water by heating or cooling it. • Classify examples of the different states of water (solid, liquid, gas).	Activities may include: Use containers of water and different objects to experiment with which float and which sink. Use thermometers to measure the temperature of water and air and record the data. <u>Hershey Kiss Science</u> Illustrate phase change by having each student start by holding a Hershey Kiss in their hand. Wait about 10 minutes. Discuss the topic of Phase Change. After 10 minutes the chocolate has already melted and is oozing out in their hand. The topic of energy and phase change follows. <u>Froot Loops States of Matter</u> Matter can exist as a solid, a liquid, or a gas. Particles make	Possible assessments: Assess students' understanding of temperature using pictures for students to decide which would be matched with hot or cold. (example: sunny beach day-hot and winter snowy day-cold).

	• Explore and compare some of the ways water can move. • Use various size and shape containers to explore how water changes shape. • Understand that one form of water can change to another. • Know that water can change into a gas that cannot be seen. • Measure temperature using a thermometer	up all matter. A single particle is so tiny that you can't see it when you look at a solid, liquid, or gas. Use "Froot Loop" cereal to depict matter. Should the froot loops be glued really close together or far apart in a solid? Glue froot loops really close together for a solid. Spaced out for a liquid, and really far apart for gas. <u>Glow Stick Science</u> Molecules with a lot of energy move faster than molecules with a smaller amount of energy. In this activity, students will use heat as an energy source to illustrate this. When a glow stick is placed in hot water, the molecules inside the glow stick move faster, causing it to shine brightly. When the glow stick is placed in ice water, the molecules inside the glow stick move slower. This results in less illumination. Place hot water in one Styrofoam cup and ice water in another Styrofoam cup. Start with the cup containing the hot water. Test the temperature of the water by placing the thermometer in the water. Record the temperature. Next,	

		place the glow stick in the hot water. Record an observation. Now test the cup containing the ice water. Place the thermometer and the glow stick in the water. Record the temperature and an observation about the glow stick	

Unit 5: Physical Science- Investigating Motion and Forces:

All students will gain an understanding of natural laws as they apply to motion, forces, and energy transformations.
Standards: 5.1, 5.3, 5.4, 5.7

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How Do Things Move? How Can We Change Motion? What is Gravity? How Can Magnets Move Objects? What Are Vibrations?	The student will be able to: • recognize that different things move at different speeds • understand that the position and motion of objects can be changed by pushing or pulling; That the size of the change is related to the strength of the push or pull • recognize that gravity is a force that pulls things toward earth • understand that a push or a pull can hold an object up and that all things fall if no other push or pull holds them up	Predict and check how objects can be moved Construct a model of a boat and find ways to make it move Investigate how a push or pull changes the position of an object Examine motion as an object changes position and speed Recognize that things such as birds and airplanes go up into the sky and then return to Earth and that other things such as the sun and the moon stay in the sky Observe how magnets react to iron and steel Classify objects according to	▪ Formal: Assessment and Teaching Resources for Chapter 9 ▪ Informal: Activity Book for Chapter 8 ▪ Performance: Provide children with metallic and non-metallic objects of different shapes, small magnets, string, rulers. Have children use the magnets, strings and rulers to push and pull the objects. As they do, ask: What force did you use to move the object? How did the object move? Was the object attracted by a magnet?

	• understand that magnets attract and repel each other and certain kinds of other materials • understand that sound is produced by vibrating objects; That the pitch of the sound can be varied by changing the rate of vibration	their magnetic properties Evaluate ways magnets can be used as tools Demonstrate that vibrations can be felt Identify objects that make certain sounds Contrast types of sounds <u>Ways That Things Move</u> Students bring 1 toy with wheels to school. Experiment with pushes and pulls on their wheeled toy. Game: students, in pairs, push or pull their toy; partner needs to identify whether it was a push or pull. Introduce gravity concept and test it out on a slope (students build their own slope with blocks and books) with their toy (no pushes or pulls involved) – <u>Balls in Motion</u> Give each pair of students a small ball and have them sit across a desk or table from each other. Each child should roll the ball across the table to the other. They should try to roll it in different ways to	

		produce different paths of motion. They should record the different ways they rolled the ball and how the ball was pushed. They can record the data on paper like the chart below. They will come up with more ways than this. <u>Magnet Experiment</u> Make several stations around the room with an assortment of items placed on trays. Include both items that magnets will attract and items that magnets will not attract. Suggestions include paperclips, nails, washers, screws, buttons, rubber bands, pennies and marbles. Divide students into smaller groups and have the student groups stand around the stations. Lead a prediction activity in which students will predict whether the magnets will attract the items or not and list the items and the predictions on the board. Instruct students to take turns in their small groups trying to pick up each item with a magnet and to record the magnetic results beside the predictions on the chalkboard. Compare the predictions and	

		the actual results together.	

Unit 6: Earth Science- Investigating Weather and Seasons:

All students will gain an understanding of the structure, dynamics, and geophysical systems of the Earth.
Standards: 5.1, 5.3, 5.5, 5.7, 5.8, 5.9

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What is Weather? How Can We Measure Weather? How Does Weather Change with the Seasons?	The students will be able to: • understand that weather changes from day to day and over the seasons • understand that weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation	Observe and record weather that occurs in one week Use charts to describe weather Contrast types of weather in different seasons Use a thermometer to measure differences in temperature Recognize instruments used to observe weather Construct a seasons book Summarize the repeating patterns in nature's seasons Describe how seasons affect plants and animals Construct a pine cone weather station to predict when the	▪ Formal: Assessment and Teaching Resources for Chapter 5 ▪ Informal: Activity Book for Chapter 5 • Performance: Give each child a poster board circle divided into four parts with the name of one season in each part in the proper sequence. Then have children cut out or draw pictures of people wearing appropriate clothing and enjoying seasonal activities and glue each into the corresponding section. As children create these seasonal collages, ask: What clothing would you wear

		weather will change and how it will change. Record predictions in science journal. Construct a weather vane from a plastic cup, straw, pencil and pin to observe the wind. Record observations in science journal. Make rain by recreating the water cycle in a plastic zip top bag.	for each of the four seasons? What is the weather like for each season?

Unit 7: Astronomy and Space Science; Investigating Sunlight and Shadows

All students will gain an understanding of the origin, evolution, and the structure of the universe.
Standards: 5.1, 5.3, 5.4, 5.6, 5.9

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
What Can We See in the Day Sky? What Can We See in the Night Sky?	The students will be able to: • Understand that objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. • Understand that the sun, moon, stars, clouds, birds, and airplanes all have properties, locations and movements that can be observed and described. • Understand that the moon moves across the sky on a daily basis, much like the sun.	Observe differences in the daytime and nighttime skies Observe that the sun's position in the sky appears to change in a repeating pattern Demonstrate what the sky looks like in daytime and nighttime Identify objects in the nighttime sky Recognize that the moon appears to change shape Observe that change occurs gradually, repetitively, or randomly with the environment Make a Shadow Science Journal to record the length of students' shadows or the shadows of fixed objects (such	▪ Formal: Assessment and Teaching Resources for Chapter 6 ▪ Informal: Activity Book for Chapter 6 ▪ Performance: Pair children, and give them two shoe boxes taped back-to-back. Have them work together to make simple dioramas showing the same scene during the day and the night. Encourage them to draw backdrops the daytime and the nighttime skies. Ask: What can you see in the daytime sky? What can you see in the nighttime sky?

		as fire hydrants) at different times of the day Measure shadows on the first day of fall and compare with the first day of spring Make a Cloud Observation Journal in which students draw the shapes and locations of clouds multiple times in a specific period. Determine why the clouds move and change shape.	

Unit 8: Astronomy and Space Science; Protecting Our Planet

All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.
Standards: 5.1, 5.3, 5.4, 5.8, 5.10

Essential Questions	Instructional Objectives/ Skills and Benchmarks *(CPIs)*	Activities	Assessments
How Does the Sun Help Earth? What Makes Shadows? How Do People Get Energy? How Does Energy Move?	The students will be able to: • Understand that the sun provides the light and heat necessary to maintain the temperature of earth • Recognize that light can only pass through some objects Understand that science and technology have greatly improved food quality and quantity, transportation, health, sanitation, and communication. These benefits are not available to all the	Observe how colored paper can be changed by the sun Recognize the effects of sun and shade on the same object Recognize the sun as the Earth's source of energy Observe that an object makes a shadow when it blocks light Investigate and describe which objects cause darker shadows Describe how shadows change throughout the day Sort foods by meals Understand that people need food to live	▪ Formal: Assessment and Teaching Resources for Chapter 8 ▪ Informal: Activity Book for Chapter 8 ▪ Performance: Have partners take turns making shadows with various objects. In addition to solid objects, provide some that are transparent, such as a clear plastic cup, and some that are translucent, such a colored plastic bottles. Ask: What makes a shadow? Why do objects make different kinds of shadows?

	people in the world • understand that heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another	Make and observe a terrarium or aquarium as a model of a system Investigate the power of the sun by making Sun Tea at different times during the school year. Record observations in Science Journal and compare results. Is the sun stronger at different times of the year, different times of the day? Investigate the power of the sun by cooking an egg using the sun's rays. Set up two stations, one in direct sunlight, and one in shade. Record results in Science Journal and compare. Using a timer and thermometer, record how long it takes for ice to melt at different temperatures. Record results in Science Journal.	

New Jersey Core Curriculum Content Standards
Kindergarten Science

New Jersey Core Curriculum Content Standards for Science

INTRODUCTION

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).

New Jersey Scoring Rubric

SCIENCE RUBRIC

Exceeds – must receive no more than one 3 and the rest 4s in the other areas of the rubric.
Meets – may receive no more than one 2 and a combination of 3s and 4s in the other areas of the rubric.
Approaches – may receive no more than one 1 and a combination of 2s, 3s, or 4s, in the other areas of the rubric.
Begins – must receive at least a 1 in all 3 areas of the rubric.

	KNOWLEDGE Knows and understands scientific terms, facts, concepts, principles, theories and methods	**APPLICATION** Applies scientific knowledge , skills and methods to manipulate, analyze, synthesize, create and evaluate	**COMMUNICATION** Communicates scientific knowledge and applications through writing, speech, and visual displays.
4	• Descriptions of scientific terms, facts, concepts, principles, theories and methods are complete and correct.	• Applications are thorough, appropriate, and accurate.	• Written, oral and/or visual communication is well-organized and effective.
3	• Descriptions of scientific terms, facts, concepts, principles, theories and methods are mostly complete and correct.	• Applications are mostly thorough, appropriate, and accurate.	• Most of the written, oral and/or visual communication is well-organized and effective.
2	• Descriptions of scientific terms, facts, concepts, principles, theories and methods are somewhat complete and correct.	• Applications are somewhat appropriate and accurate.	• Some of the written, oral and/or visual communication is organized and effective.
1	• Descriptions of scientific terms, facts, concepts, principles, theories and methods are minimally present or correct.	• Applications are minimally, appropriate and accurate.	• Little of the written, oral and/or visual communication is organized and effective.
0	• All descriptions of scientific terms, facts, concepts, principles, theories and methods are missing and/or incorrect.	• All applications are missing and/or incorrect.	• All of the written, oral or visual communication is missing and/or lacks organization.
Score			