COURSE TITLE

Science 5

LENGTH

Full Year

DEPARTMENT

STEM Department

SCHOOL

Pierrepont Elementary School

DATE

July 15, 2019

Initial BOE Approval Date (Born on): 6/15/2015

Science 5

I. Introduction/Overview/Philosophy

The best way for students to appreciate the scientific enterprise, learn important scientific concepts, and develop the ability to think well is to actively construct ideas through their own inquiries, investigations, and analyses. Science is an active enterprise, made active by our human capacity to think. Scientific knowledge advances when scientists observe objects and events, think about how they relate to what is known, test their ideas in logical ways, and generate explanations that integrate the new information into the established order. Thus the scientific enterprise is both what we know (content) and how we come to know it (process).

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" (NGSS).

II. Objectives

Course Outline:

1. Scientific Method
    a. Steps
    b. Applications
2. Matter
    a. Background Concepts
    b. Law of Conservation of Mass
3. Chemical Magic
    a. Gases and Particulate Nature of Matter
    b. Chemical Reactions
    c. Acids, Reactions, & Properties of Matter
    d. Introduction to Chemistry
4. Web of Life
    a. Food Chains, Predators, Herbivores & Carnivores
    b. Matter Cycle,
    c. Food Chain
    d. Decomposers & Matter Cycle
5. Spaceship Earth
    a. Gravity
    b. The Phases of the Moon
    c. The Four Seasons
    d. The Sun
    e. The Planets

6. Gravity
7. Watery Planet
    a. Water on Earth's Surface
    b. Water as a Natural Resource
    c. Water Cycle
    d. Natural Disasters and Engineering

Student Outcomes:

After successfully completing this course, the student will:

- Develop a model to describe that matter is made of particles too small to be seen.
- Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.
- Make observations and measurements to identify materials based on their properties
- Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
- Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun
- Support an argument that plants get the materials they need for growth chiefly from air and water.
- Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
- Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment
- Support an argument that the gravitational force exerted by Earth on objects is directed down.
- Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
- Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

New Jersey Student Learning Standards

CAREER READY PRACTICES

CRP1 Act as a responsible and contributing citizen and employee.

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2 Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world

applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

CRP4 Communicate clearly and effectively and with reason.
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.
Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.
Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

TECHNOLOGY

Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate

knowledge.

Strand A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.5.A.1- Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

8.1.5.A.3- Use a graphic organizer to organize information about problem or issue.

Strand E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.

8.1.8.E.1- Use digital tools to research and evaluate the accuracy of, relevance to and appropriateness of using print and non-print electronic information sources to complete a variety of tasks

Strand F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.5.F.1- Apply digital tools to collect, organize, and analyze data that support a scientific finding.

Standard 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

8.2.5.B.4- Research technologies that have changed due to society's changing needs and wants.

8.2.5.B.6- Compare and discuss how technologies have influenced history in the past century.

Strand C. Design: The design process is a systematic approach to solving problems.

8.2.5.C.1- Collaborate with peers to illustrate components of a designed system.

8.2.5.C.4- Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

Strand D. Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.

8.2.5.D.3- Follow step by step directions to assemble a product or solve a problem.

21ST CENTURY LIFE AND CAREERS

9.2 Career Awareness, Exploration, and Preparation

Strand B: Career Exploration

9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

NEW JERSEY STUDENT LEARNING STANDARDS- SCIENCE

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.

5-PS1-3. Make observations and measurements to identify materials based on their properties.

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.

5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

5-ESS1-1. Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
5-ESS2-2. Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

III. Proficiency Levels

This is a full year course for Grade 5 students.

IV. Methods of Assessment

Student Assessment
Assessment will fall into two categories: formative and summative. Formative assessments include teacher observation, lab work, and performance assessment tasks. Summative assessments demonstrate the extent and depth of learning. End of the unit assessments and portfolios of accumulated work may serve as tools for this type of evaluation.

Curriculum/Teacher Assessment
The teacher will provide the subject area supervisor with suggestions for changes on an ongoing basis.

V. Grouping

This is a required Grade 5 full year course.

VI. Articulation/Scope & Sequence/Time Frame

Course length is one year.

VII. Resources

Texts/Supplemental Reading/References

Resources may include but are not limited to:

1. www.mysteryscience.com

2. Bill Nye Videos
3. https://newsela.com/
4. www.brainpop.com
5. Science World Magazine

VIII. Suggested Activities

Appropriate activities are listed in the curriculum map.

IX. Methodologies

The following methods of instruction are suggested: lecture, group projects, demonstration, hands-on applications, and class presentations.

X. Interdisciplinary Connections

At this grade level, connections to many other disciplines are appropriate and natural. Reading and writing become an integral part of the science process. Connections with mathematics are frequent throughout both curricula. Technology plays an important process in learning science as well.

XI. Differentiating Instruction for Students with Special Needs: Students with Disabilities, Students at Risk, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students.

Differentiating in this course includes but is not limited to:

Differentiation for Support (ELL, Special Education, Students at Risk)

- Peer mentoring on problems
- Differentiated teacher feedback on assignments
- Modeling out problems on whiteboard
- Visual aids as we project problems on whiteboard
- Study guides
- Tiered assignments
- Scaffolding of materials and assignments
- Re-teaching and review
- Guided note taking
- Exemplars of varied performance levels
- Multi-media approach to accommodating various learning styles

Differentiation for Enrichment

- Supplemental reading material for independent study

- Flexible grouping
- Tiered assignments
- Topic selection by interest
- Enhanced expectations for independent study
- Elevated questioning techniques using Webb's Depth of Knowledge matrix

XII. Professional Development

The teacher will continue to improve expertise through participation in a variety of professional development opportunities.

XII. Curriculum Map/Pacing Guide

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Scientific Method • Steps of the Scientific Method • Application	3 weeks	*For Support:* • Guided notes • Modified assessments • Use of visual and multi-sensory formats *For Enhancement:* • Research based projects • Critical/Analytical thinking tasks • Real-world problems and scenarios	5-PS1-1 5-PS1-2 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Formative Assessment:* • Coke/Diet Coke Experiment • Paper Airplane Experiment *Summative Assessment:* • Create your own experiment
Matter • Background Information • Law of Conservation of Mass	3 weeks	*For Support:* • Modification of content and student products • Pre-teaching of vocabulary and concepts • Teacher modeling *For Enhancement:* • Inquiry-based instruction • Critical/Analytical thinking tasks • Curriculum compacting	5-PS1-1 5-PS1-2 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Formative Assessment:* • Class Discussions • Students will analyze an Interactive Periodic Table of Elements *Summative Assessment:* • Google Slide Presentation • Balloon-Powered Car Experiment

Unit Topic	**Time Allocated**	**Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students**	**Standards**	**Assessments**
Chemical Magic • Gases and Particulate Nature of Matter • Chemical Reactions • Acids, Reactions, & Properties of Matter • Introduction to Chemistry	6 weeks	*For Support:* • Guided notes • Modified assessments • Use of visual and multi-sensory formats *For Enhancement:* • Research based projects • Critical/Analytical thinking tasks • Real-world problems and scenarios	5-PS1-1 5-PS1-2 5-PS1-3 5-PS1-4 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Formative Assessment:* • Students plan and carry out an investigation to see which solution will turn a dull penny into a shiny penny. Students develop a conceptual model in order to construct an explanation for their test results. They revise their conceptual model as they develop a more sophisticated understanding of particles. • Students carry out an investigation to determine what happens when they place a steel object in the same solution that turned their pennies shiny in Mystery 1. Students construct an explanation by developing a conceptual model to show how the solution affects the steel nail. • Students conduct an investigation to discover if a reaction occurs when mixing two substances. Analyzing the data, students determine which substances react with acid. Next, students decide how to test unknown liquids to see if they are acids. *Summative Assessment* • Mystery 1 Quiz: Gases and Particulate Nature of Matter • Mystery 2 Quiz: Chemical Reactions • Mystery 3 Quiz: Acids, Reactions & Properties of Matter • Mystery 4 Quiz: Introduction to Chemistry
Web of Life • Food Chains, Predators, Herbivores & Carnivores • Matter Cycle, • Food Chain • Decomposers & Matter	8 weeks	*For Support:* • Guided notes • Modified assessments • Use of visual and multi-sensory formats	5-LS2-1 5-LS1-1 5-PS3-1 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6,	*Formative Assessment:* • Students construct models of different food chains by linking cards representing different organisms. The chains are used to explain the relationship between predators and prey. Students argue using evidence and reasoning about which organisms can be linked together and in what order

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Cycle		*For Enhancement:* • Student-driven projects • Higher-order thinking skills • Critical/Analytical thinking tasks	8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Summative Assessment:* • Quiz: Food Chains & Web of Life (predators, carnivores, and herbivores.) • Quiz: Matter Cycle & Food Chain • Quiz: Decomposers & Matter Cycle
Spaceship Earth • Gravity • The Phases of the Moon • The Four Seasons • The Sun • The Planets	8 weeks	*For Support:* • Use of visual and multi-sensory formats • Teacher modeling • Visual learning, including graphic organizers *For Enhancement:* • Higher-order thinking skills • Interest-based content • Critical/Analytical thinking tasks	5-ESS1-2 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Formative Assessment:* • Students analyze and interpret data from photographs taken during different seasons and times of day, to determine how the sun's path affects Earth's surface to construct an argument as to which season it is. • Students develop a model of the sun and moon to carry out an investigation of the Moon's orbit and the different moon phases. • Students use a model of the solar system to learn the order of the planets and their relative distance from the sun, and each other. *Summative Assessment:* ● End of Unit Test and Quiz
Watery Planet ● Water on Earth's Surface ● Water as a Natural Resource ● Water Cycle ● Natural Disasters and Engineering	6 weeks	*For Support:* • Modification of content and student products • Pre-teaching of vocabulary and concepts • Teacher modeling *For Enhancement:* • Inquiry-based instruction	5-ESS2-1 5-ESS2-2 5-ESS3-1 3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4	*Formative Assessment:* ● Students analyze and interpret data from world maps to determine the relative amounts of fresh, salt and frozen water. Students use mathematics and computational thinking to calculate areas on a map and graph values to compare and graph quantities of fresh, salt and frozen water on Earth. ● Students are asked to determine where is the best place to settle a new town by considering features of the landscape and what they know about where to find water. Students obtain, evaluate and communicate

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		• Critical/Analytical thinking tasks • Curriculum compacting	9.2.8.B.3	information from different sources about topography, plants and soil to inform their decision. Students argue using evidence to justify where their town should be built. • Students create a model of the ocean and sky (hydrosphere and atmosphere). Students use the model to plan and carry out an investigation to determine how temperature influences evaporation and condensation. • Students define the problem that a town needs protection from flooding. They obtain and communicate information about different types of engineers and work as a team to design solutions using their different types of flood protection. Students use mathematics and computational thinking design a solution under budget. *Summative Assessment:* • Mystery 1 Quiz: Water on Earth's Surface • Mystery 2 Quiz: Water as a Natural Resource • Mystery 3 Quiz: Water Cycle
Project Based Learning Activities • Recycling Activity • Shark Tank • Famous Scientist Project	5 weeks	*For Support:* • Teacher modeling • Visual learning, including graphic organizers *For Enhancement:* • Interest-based content • Critical/Analytical thinking tasks	3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3 CRP1,2,4,6,7,8,11,12 8.1.5.A.1, 8.1.5.A.3, 8.1.5.E.1, 8.1.5.F.1 8.2.5.B.4, 8.2.5.B.6, 8.2.5.C.1, 8.2.5.C.4 9.2.8.B.3	*Formative Assessment:* • Students will work collaboratively with their group. • Students will define a problem and create models. *Summative Assessment:* • Shark Tank Presentations • Recycling Activity