COURSE TITLE

Science 6

LENGTH

Full Year

DEPARTMENT

STEM Department

SCHOOL

Pierrepont Elementary School

DATE

July 15, 2019

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

Science 6

I. Introduction/Overview/Philosophy

Our sixth grade science program reflects a comprehensive, integrated, thematic approach to the study of the field of science which supports the philosophy of the NJSLS-S. Over the course of three years, students will develop an understanding of the core middle school principals of physical, earth, space, and life science while engaging in engineering and technology through exposure to rich, non-fiction text and a rich application of mathematical skills through data analysis and problem solving.

II. Objectives

Course Outline:

1. Astronomy/Weather and Climate
    a. Scale in the solar system
    b. Sun-earth, system & solar, system gravity
    c. Weather
    d. The Water Cycle
    e. Ocean and Climate
2. Matter and Energy in Organisms and Ecosystems/ Interdependent Relationships in Ecosystems
    a. Food Webs
    b. Interactions of Organisms
    c. Biodiversity
3. Growth, Development, and Reproduction of Organisms
    a. Genetic Variation
    b. Genetics vs. Environment
4. Forces and Motion/ Types of Interactions
    a. Forces & Motion
    b. System Models
    c. Attract and Repel
    d. Electricity

Student Outcomes:

After successfully completing this course, the student will:

- Use argument based on empirical evidence and scientific reasoning
- Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms
- Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

- Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- Conduct an investigation and evaluate the experimental design
- Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- Analyze and interpret data to determine scale properties of objects in the solar system.
- Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

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.
8.1.8.A.3- Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
Strand E: Research and Information Fluency: Students apply digital tools to gather, evaluate, and use information.
8.1.8.E.1- Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.

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.
Strand A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

8.2.8.A.2- Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
Strand C. Design: The design process is a systematic approach to solving problems.
8.2.8.C.1- Explain how different teams/groups can contribute to the overall design of a product.
8.2.8.C.4- Identify the steps in the design process that would be used to solve a designated problem.
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.
8.2.8.D.3- Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

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.

COMPANION STANDARDS FOR SCIENCE AND TECHNICAL SUBJECTS
RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.
RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.
RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
WHST.6-8.6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
WHST.6-8.8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
WHST.6-8.10. Write routinely over extended time frames (time for research, reflection, metacognition/self-correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

NEW JERSEY STUDENT LEARNING STANDARDS- SCIENCE
MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms
MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.
MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.
MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

III. Proficiency Levels

This is a full year course for Grade 6.

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 module assessments and portfolios of accumulated work 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 6 full year course.

VI. Articulation/Scope & Sequence/Time Frame

Course length is one year.

VII. Resources

Texts/Supplemental Reading/References

1. Mosa Mack Science
2. Science World
3. Rocketlit

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**
Astronomy/Weather and Climate • Scale in the solar system • Sun-earth, system & solar, system gravity • Weather • The Water Cycle • Ocean and Climate	16 weeks	*For Support:* Revisit the basics of weather and online videos to support to learning of a particular topic. *For Enhancement:* -Use various online tools to help enhance a topic. - Rocketlit Articles	MS-ESS1-1 MS-ESS1-2 MS-ESS1-3 MS-ESS2-4 MS-ESS2-5 MS-ESS2-6 CRP1,2,4,6,7,8,11,12 8.1.8.A.3, 8.1.8.E.1 8.2.8.A.2, 8.2.8.C.1, 8.2.8.C.4, 8.2.8.D.3 9.2.8.B.3 RST.6-8.1,2,4,9,10 WHST.6-8.6,7,8,10	*Formative Assessments:* Discussions, Teacher observations, Exit tickets, Homework, Vocabulary Mind Map, Lab Investigations, Graphic Organizers, *Summative Assessments:* Quizzes, Constellation project, Unit Tests, Gravity Model, Meteorologist Project
Matter and Energy in Organisms and Ecosystems/ Interdependent Relationships in Ecosystems • Food Webs • Interactions of Organisms • Biodiversity	6 weeks	*For Support:* Revisit the basics of matter and energy and online videos to support to learning of a particular topic. *For Enhancement:* -Use various online tools to help enhance a topic. - Rocketlit Articles	MS-LS2-1 MS-LS2-2 MS-LS2-3 MS-ETS1-1 MS-ETS1-3 MS-LS2-5 MS-LS2-4 CRP1,2,4,6,7,8,11,12 8.1.8.A.3, 8.1.8.E.1 8.2.8.A.2, 8.2.8.C.1, 8.2.8.C.4, 8.2.8.D.3	*Formative Assessments:* Discussions, Teacher observations, Exit tickets, Homework, Vocabulary Mind Map, Episode Questions *Summative Assessments:* Quizzes, Food Web Project, Ecosystem Presentation, Waste in the Cafeteria Project, Invasive Species Project, Unit Test

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
			9.2.8.B.3 RST.6-8.1,2,4,9,10 WHST.6-8.6,7,8,10	
Growth, Development, and Reproduction of Organisms • Genetic Variation • Genetics vs. Environment	7 weeks	*For Support:* Revisit the basics of genetics and online videos to support to learning of a particular topic. *For Enhancement:* -Use various online tools to help enhance a topic. -Rocketlit Articles	MS-LS1-4 MS-LS1-5 CRP1,2,4,6,7,8,11,12 8.1.8.A.3, 8.1.8.E.1 8.2.8.A.2, 8.2.8.C.1, 8.2.8.C.4, 8.2.8.D.3 9.2.8.B.3 RST.6-8.1,2,4,9,10 WHST.6-8.6,7,8,10	*Formative Assessments:* Discussions, Teacher observations, Exit tickets, Homework, Vocabulary Mind Map, Episode Questions *Summative Assessments:* Quizzes, Tests, Genetics Activity, Alien Project
Forces and Motion/ Types of Interactions • Forces & Motion • System Models • Attract and Repel • Electricity	9 weeks	*For Support:* Revisit the basics of forces and motion and online videos to support to learning of a particular topic. *For Enhancement:* -Use various online tools to help enhance a topic. - Rocketlit Articles	MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4 MS-PS2-1 MS-PS2-2 MS-PS2-3 MS-PS2-4 MS-PS2-5 CRP1,2,4,6,7,8,11,12 8.1.8.A.3, 8.1.8.E.1 8.2.8.A.2, 8.2.8.C.1, 8.2.8.C.4, 8.2.8.D.3 9.2.8.B.3 RST.6-8.1,2,4,9,10 WHST.6-8.6,7,8,10	*Formative Assessments:* Discussions, Teacher observations, Exit tickets, Homework, Vocabulary Mind Map, Episode Questions *Summative Assessments:* Quizzes, Tests, Newton's Laws Project, Collision Project, Electricity Project