Township of Ocean Schools

Assistant Superintendent
Office of Teaching and Learning

SPARTAN MISSION:
Meeting the needs of all students with a proud tradition of academic excellence.

DEPARTMENT: **Science** COURSE: **Science, Grade 8**

Curriculum Development Timeline

School: Township of Ocean Intermediate School

Course: Science, Grade 8

Department: Science

Board Approval	Supervisor	Notes
December 2008	Patrick Sullivan	Born Date
August 2011	Patrick Sullivan	Revisions
May 2016	Patrick Sullivan	Revisions
July 2017	Patrick Sullivan	Revisions
March 2019	Patrick Sullivan	Review
August 2022	Patrick Sullivan	Alignment to Standards

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Township of Ocean Pacing Guide			
Week	**Quarter 1**	**Week**	**Quarter 3**
1	Scientific Practice/ Engineering-Design	21	Physical Science: Project Lead The Way - Applied Physics
2	Scientific Practice/ Engineering-Design	22	Physical Science: Project Lead The Way - Applied Physics
3	Physical Science: Newton's Three Laws	23	Physical Science: Project Lead The Way - Applied Physics
4	Physical Science: Motion and Forces	24	Structure and Properties of Matter: Project Lead The Way - Nanotechnology
5	Physical Science: Motion and Forces	25	Structure and Properties of Matter: Project Lead The Way - Nanotechnology
6	Physical Science: Motion and Forces	26	Structure and Properties of Matter: Atomic Composition of Simple Molecules
7	Physical Science: Electric and Magnetic Forces/Gravitational Interactions	27	Structure and Properties of Matter: Atomic Composition of Extended Structures
8	Physical Science: Kinetic and Potential Energy	28	Structure and Properties of Matter: Synthetic Materials Functions
9	Physical Science: Kinetic and Potential Energy	29	Structure and Properties of Matter: Cause and Effect Relationships
10	Physical Science: Energy Transfer	30	Structure and Properties of Matter: Cause and Effect Relationships
Week	**Quarter 2**	**Week**	**Quarter 4**
11	Physical Science: Energy Transfer	31	Chemical Reactions: Project Lead The Way - Applied Chemistry
12	Physical Science: Energy in Waves	32	Chemical Reactions: Project Lead The Way - Applied Chemistry
13	Physical Science: Waves - Reflected, Absorbed, and Transmitted	33	Chemical Reactions: Physical and Chemical Properties
14	Physical Science: Engineering - Design Project: Roller Coasters	34	Chemical Reactions: Physical and Chemical Properties
15	Physical Science: Engineering - Design Project: Roller Coasters	35	Chemical Reactions: Macroscopic Patterns

Home of the Spartans!
#spartanlegacy

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16	Physical Science: Engineering - Design Project: Roller Coasters	36	Chemical Reactions: Conservation of Matter
17	Physical Science: Project Lead The Way - Physics	37	Chemical Reactions: Energy and Matter
18	Physical Science: Project Lead The Way - Physics	38	Chemical Reactions: Developing Possible Solutions
19	Physical Science: Project Lead The Way - Physics	39	Chemical Reactions: Optimizing the Design Solution
20	Physical Science: Project Lead The Way - Physics	40	Final Benchmark

Climate Change: Chemical Reactions (NJSLS-S: MS-ESS3-5)

Core Instructional & Supplemental Materials including various levels of Texts

No Text Used - All digital resources

Digital Resources Across All Levels: (D=differentiated)
Edpuzzle (D)
Gizmo (D)
Generation Genius
Science World Articles
YouTube Streaming Videos
PhET Interactive Simulations (D)
Ted Talks

Time Frame	**Unit 1-A (2 weeks)**

Topic

Science Practices:

- Understand Science Explanations
- Generate Scientific Evidence through Active Investigation
- Reflect on Scientific Knowledge
- Participate Productively in Science
- Students can articulate the importance of accurate data collection and record keeping in science.
- Students are able to demonstrate good practices for data collection and identify common sources of error.

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Alignment to Standards

MS-PS1-2:Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5:Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved
MS-PS1-6:Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Learning Objectives and Activities

Learning Objectives:

- How do we build and refine models that describe and explain the natural and designed world?
- What constitutes useful scientific evidence?
- How does scientific knowledge benefit, deepen and broaden from scientists sharing and debating ideas and information with peers?
- Measurement and observation tools are used to categorize, represent and interpret the natural world.
- Evidence is used for building, refining and/or critiquing scientific explanations.

Learning Activities:

- Lab Safety Activity
- Pendulum lab
- Claim Evidence Reasoning Introductory Activity
- Claim Evidence Reasoning Checks Lab
- Reading and Creating graphs
- Engaging in arguments from evidence - Escape Room
- Planning and carrying out investigations - Toxic Popcorn Challenge
- Developing and refining models
    - Sink or Float Challenge
    - Google Mini Project
- Generate, discuss, analyze and interpret data
- Reading the Meniscus Station Lab Activity
- Metric Measurement Lab

Assessments

Formative:

- Reading the Meniscus Station Lab Activity
- Claim, Evidence, Reasoning exit slips

- Analyze and interpret data to determine similarities and differences in findings
- Engage in both spoken and written explanations and argumentation

Summative:

- Analyze and interpret data to provide evidence for phenomena
- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Benchmark:

- Science reasoning skills (interpreting graphics)

Alternative:

- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

Interdisciplinary Connections

- Recognize and represent proportional relationships between quantities
- Reason abstractly and quantitatively
- MP.4 Model with mathematics

ELA:

- Cite specific textual evidence to support analysis of science and technical text
- Draw evidence from informational texts to support analysis reflection, and research
- **RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts.
- **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.

Mathematics: N/A

Career Readiness, Life Literacies, and Key Skills

Technology Integration

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Career Education
CRP-2: Students use knowledge and skills through their lab work. **CRP-12:** Students work productively in collaborative groups using culturally global competence. **CRP11:** Use technology to enhance productivity. **9.4.8.GCA.2:** Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

Time Frame	**Unit 1-B (21 weeks)**

Topic
Physical Science: ● Forces and Interactions, Energy, Waves and Electromagnetic Radiation ● Engineering - Design Project ● Project Lead The Way - Applied Physics Science Practices: ● Students are able to describe how science and engineering involve creative processes that include generating and testing ideas, making observations and formulating explanations; and can apply these processes in their own investigations.

Alignment to Standards
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-PS3-1**:Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. **MS-PS3-2:**Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system

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MS-PS3-5:Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object
MS-PS4-1:Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave
MS-PS4-2: Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
MS-PS4-3:Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals

Learning Objectives and Activities

Learning Objectives:

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's Third Law).
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion.
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.
- Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object or a ball, respectively).
- Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass, e.g., Earth and the Sun.

Learning Activities:

- Forces and Motion Activities
- Photogate labs using a car and ramp
- Constructing Explanations
- Engaging in argument from evidence
- Planning and carrying out investigations
- Analyze and interpret data
- Developing models
- Refining models
- Generate, discuss, and analyze data
- Engage in both spoken and written explanations and argumentation

- Reflect on their own understanding
- Project Lead The Way
  - Simple Machines Scavenger Hunt
  - Rollback Toy - Elastic Potential Energy
  - Green Car Lab
  - Rube Goldberg Activity
  - Dragster Lab
- Energy Photogate Lab Data including line graph
- Friction Lab - Bar Graph

Assessments

Formative:

- Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
- Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
- Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
- Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

Summative:

- Rollercoaster Challenge
  - Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
  - Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

Benchmark: N/A

Alternative:

- Project Lead The Way - Rollback Toy Final Product, Green Car Final Product, Rube Goldberg Video and labels of final product.

Interdisciplinary Connections

ELA:

DEPARTMENT: **Science** COURSE: **Science, Grade 8**

- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- **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.
- **WHST.6-8.9:** Draw evidence from informational texts to support analysis, reflection, and research.

Mathematics:

- Engineering/Math: Rollercoaster Challenge
- Math: Multiple Labs (Speed & Momentum)
- Reason abstractly and quantitatively
- MP.4 Model with mathematics
- **8.EE.A.3:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- **8.EE.A.4:** Recognize and represent proportional relationships between quantities.

Computer Science & Design Thinking:

- **8.1.8.DA.1:** Organize and transform data collected using computational tools to make it usable for a specific purpose.

Career Readiness, Life Literacies, and Key Skills

Technology Integration

Career Education
CRP-2: Students use knowledge and skills through their lab work. **CRP-12:** Students work productively in collaborative groups using culturally global competence. **CRP-4:** Communicate clearly and effectively and with reason.

Time Frame	**Unit 2 (7 weeks)**

Topic
Chemistry:

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- Structure and Properties of Matter
- Project Lead The Way - Nanotechnology

Alignment to Standards

MS-PS1-1:Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-3:Gather and make sense of information to describe that synthetic materials come from natural resources and impact society
MS-PS1-4:Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

Learning Objectives and Activities

Learning Objectives:

- Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules and these new substances have different properties from those of the reactants.
- Cause and effect relationships may be used to predict phenomena in natural or designed systems.
- Structures can be designed to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.

Learning Activities:

- Molecules in Motion
- States of Matter Basics
- Build-a-Molecule
- Topic Activities
  - “Compounds vs. Mixtures”
  - “Classifying Matter”
  - “Phases of Matter Cartoon”
  - “Arranging the Elements”
  - “A World Famous Table”
- Project/Performance Assessments - “Elemental Superhero”
- Project Lead The Way -The Science of Technology
  - Nanotechnology - Fact or Myth?

- How Small is a Billionth?
- Build a Buckyball
- Exploring Nano Products
- Testing Nano-fabrics

Assessments

Formative:

- C-E-R exit slips
- Class Discussions: abstract vs. quantitative

Summative:

- Develop models to describe the atomic composition of simple molecules and extended structures.
- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- Develop a model that predicts and describes changes in particle motion, temperature and state of a pure substance when thermal energy is added or removed.

Benchmark: N/A

Alternative:

- Gather, read and synthesize information from multiple appropriate sources and assess the credibility, accuracy and possible bias of each publication and methods used and describe how they are supported or not supported by evidence.

Interdisciplinary Connections

ELA:

- **RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts.
- **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.
- **WHST.6-8.9:** Draw evidence from informational texts to support analysis, reflection and research.

Mathematics:

- MP.4 Model with mathematics.
- **8.EE.A.3:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

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- **8.EE.A.4:** Recognize and represent proportional relationships between quantities.

Career Readiness, Life Literacies, and Key Skills
Technology Integration
Career Education

Time Frame	**Unit 3 (9 weeks)**

Topic

Chemistry:
- Chemical Reactions
- Project Lead The Way - Applied Chemistry

Alignment to Standards

MS-PS1-2:Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
MS-PS1-5:Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
MS-PS1-6:Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused climate change over the past century.

Learning Objectives and Activities

Learning Objectives:
- How does the conservation of mass apply to the interaction of materials in a closed system?
- How do properties of materials determine their use?
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.

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- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules and these new substances have different properties from those of the reactants.
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.
- Diagram the workings of the carbon cycle.
- Discuss the relationship between the chemistry of the atmosphere and climate change.

Learning Activities:

- Molecules in Motion
- Physical & Chemical Changes Station Lab
- Gizmos Lab - pH analysis
- Gizmos Lab - Changes is States of Matter
- Combining Elements to Form a Compound
- Periodic Table Color Coding
- Generate, discuss and analyze data
- Examples of the Impacts of Climate Change on the Atmosphere
- Project Lead The Way
    - Let's Make Ice Cream
    - Let's Make Yogurt
    - Gluing it Together
    - Oil Spill Clean Up

Assessments

Formative:

- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- C-E-R exit slips

Summative:

- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- Undertake a design project to construct, test and modify a device that either releases or absorbs thermal energy by chemical processes.
- Project Lead the Way - Let's Make Ice Cream
- Project Lead the Way - Oil Spill Clean Up

Benchmark: N/A

Alternative:

- "The Right Stuff" Manufacturing Challenge
- Compound Illustrations; Chemical Changes Song

Interdisciplinary Connections

ELA:

- Follow precisely a multistep procedure when carrying out experiments, taking measurements or performing technical tasks.
- Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph or table).
- 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.
- **RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts.
- **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.
- **WHST.6-8.9:** Draw evidence from informational texts to support analysis, reflection and research.

Mathematics:

- Balancing equations, massing products and reactants and converting metric units
- Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams or equations.
- MP.4 Model with mathematics.
- **8.EE.A.3:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- **8.EE.A.4:** Recognize and represent proportional relationships between quantities.

Career Readiness, Life Literacies, and Key Skills

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short and long term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).

Technology Integration

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9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).

Career Education

CRP-2: Students use knowledge and skills through their lab work.
CRP-12: Students work productively in collaborative groups using culturally global competence.
CRP11: Use technology to enhance productivity..

Modifications (ELL, Special Education, At Risk Students, Gifted & Talented, & 504 Plans)

ELL:

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts

- Leveled texts according to ability

Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns