

Maywood Public Schools

Science
Grade 6

Science 6

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).

Grade 6 Science will continue to develop understanding of four core ideas in the physical sciences. The grade 6 Science performance expectations in the physical science build on the K-5 ideas and capabilities to allow learners to explain phenomena central to the physical science, but also to the life sciences and earth and space sciences. The performance expectations in the physical sciences blend the core ideas with science and engineering practices by developing and using models, conducting investigations, analyzing data, using mathematical thinking, constructing explanations to demonstrate understanding of the core ideas.

Grade 6 Science will provide students with a detailed background into the area of physical science by exposure to the areas of the properties of matter, types of matter, energy, forces and interactions, and waves and electromagnetic radiation.

II. Objectives

Course Outline:

1. Structure and Properties of Matter
 - a. Phases of matter
2. Chemical Reactions
3. Forces of Interactions
4. Energy
 - a. Various types of energy
 - b. Kinetic and potential energy
5. Waves and Electromagnetic Radiation
 - a. Different types of waves

Student Outcomes:

After successfully completing this course, the student will:

- Develop a model that predicts and describes changes in particle motion, temperature, and states of pure substance when thermal energy is added or removed.
- Develop models to describe the atomic composition.
- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- Examine the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

- Identify that some chemical reactions release thermal energy or absorb thermal energy when it undergoes a chemical reaction.
- Create a graphical display of data to describe the relationships amongst kinetic energy, the mass of an object, and the speed of an object
- Determine the factors that affect magnetic forces through lab activities.
- Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other.
- 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.
- Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- Integrate qualitative scientific and technical information to support the basic understanding that waves can be used for communication purposes (radio waves, fiber optic cables, etc.)

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-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.

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-PS1-3. 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.

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-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.

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

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-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

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.

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. Bill Nye Videos
2. <https://newsela.com/>
3. www.brainpop.com

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

RL.6.1. Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

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
Structure and Properties of Matter <ul style="list-style-type: none"> Phases of matter Matter and Energy 	5 weeks	<p><i>For Support:</i> Revisit the basics of matter and online videos to support to learning of a particular topic.</p> <p><i>For Enhancement:</i> -Use various online tools to help enhance a topic. -Textbook supplemental materials (if applicable)</p>	MS-PS1 - 1 MS-PS1 - 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 9.2.8.B.3 RST.6-8.1,2,4,9,10 WHST.6-8.6,7,8,10	<p><i>Formative Assessments:</i> Teacher observations, class discussion, exit tickets, do now, classwork, homework, various classroom activities, real -world applications</p> <p><i>Summative Assessments:</i> Quizzes, Test on Matter, Projects on Phases of Matter</p>
Chemical Reactions <ul style="list-style-type: none"> Periodic Table 	5 weeks	<p><i>For Support:</i> Revisit the basics of chemical reactions and online videos to support to learning of a particular topic.</p> <p><i>For Enhancement:</i> -Use various online tools to help enhance a topic. -Textbook supplemental materials (if applicable)</p>	MS-PS2 - 2 MS-PS1 - 5 MS-PS1 - 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	<p><i>Formative Assessments:</i> Discussions, Teacher observations, exit tickets, warm ups, tiered questioning, classwork, homework, group work, real -world applications of chemical reactions</p> <p><i>Summative Assessments:</i> Quizzes, Project on Chemical Reactions, various labs on reactions, Test</p>
Forces of Interactions	5 weeks	<p><i>For Support:</i> Revisit the basics of interactions and online videos to support to learning</p>	MS-PS2-1 MS-PS2-2 MS-PS2-3	<p><i>Formative Assessments:</i> Teacher observations, class discussion, warm ups, classwork,</p>

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		<p>of a particular topic.</p> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> -Use various online tools to help enhance a topic. -Textbook supplemental materials (if applicable) 	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	<p>homework, various classroom activities, real -world applications on forces</p> <p><i>Summative Assessments:</i> Quizzes, Test on forces, Labs on Interactions</p>
Energy <ul style="list-style-type: none"> • Various types of energy • Kinetic and potential energy 	5 weeks	<p><i>For Support:</i></p> <p>Revisit the basics of energy and online videos to support to learning of a particular topic.</p> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> -Use various online tools to help enhance a topic. -Textbook supplemental materials (if applicable) 	MS-PS3-1 MS-PS3-2 MS-PS3-3 MS-PS3-4 MS-PS3-5 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	<p><i>Formative Assessments:</i></p> <p>Teacher observations, exit tickets, warm ups, do now, tiered questioning, homework, various classroom activities, real -world applications</p> <p><i>Summative Assessments:</i></p> <p>Quizzes on types of energy, tests and/or projects, various labs activities on types of energy</p>
Waves and Electromagnetic Radiation <ul style="list-style-type: none"> • Different types of waves • Properties of waves • Electromagnetic Waves 	5 weeks	<p><i>For Support:</i></p> <p>Revisit the basics of waves and online videos to support to learning of a particular topic.</p> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> -Use various online tools to help enhance a topic. -Textbook supplemental materials (if applicable) 	MS-PS4-1 MS-PS4-2 MS-PS4-3 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	<p><i>Formative Assessments:</i></p> <p>Class discussion, exit tickets, do now, tiered questioning, classwork, homework, various lab activities</p> <p><i>Summative Assessments:</i></p> <p>Quiz on Properties of Waves, Labs on Waves, Project, End of Unit Test</p>