Englewood Public School District
Science
Grade 8
Fourth Marking Period

Unit 7: Types of Interactions

Overview: Students use *cause and effect*; *system and system models*; and *stability and change* to understand ideas that explain why some materials are attracted to each other while others are not. Students apply ideas about electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while others repel. In particular, students develop understandings that electrical and magnetic forces can be both attractive and negative. Students also develop ideas that objects can exert forces on each other even though the objects are not in contact, through fields. Students are expected to consider the influence of science, engineering, and technology on society and the natural world. Students are expected to demonstrate proficiency in *asking questions*, *planning and carrying out investigations*, *designing solutions*, and *engaging in argument*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 25 to 30 Days

Enduring Understandings:
Fields exist between objects that exert forces on each other even though the objects are not in contact.
Cause-and-effect relationships may be used to predict the factors that affect the strength of electrical and magnetic forces

Essential Questions:
Is it possible to exert on an object without touching it?
How does a Maglev train work?

Standards	Topics and Objectives	Activities	Resources	Assessments
(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-PS2-3)** **Ask questions about data to**	**Topics** Magnetism Electricity Electromagnetism Twenty-First Century Themes and Skills include: • The Four C's • Life and Career Skills • Information and Media literacy	Students will complete the text activities: 1. Discover Activity (p6) What Do All Magnets Have in Common? 2. Lab Activity (p8) Observing 3. Lab (p12) Detecting Fake Coins 4. Discover Activity (p14) How Can Materials Become Magnetic? 5. Lab (p20) Design and Build a Magnetic Paper Clip	**Text:** Prentice Hall Science Explorer: Electricity and Magnetism **Materials:** For Discover Activity (p6) What Do All Magnets Have in Common? • Bar Magnet • Horseshoe magnet • Paper clips For Lab Activity (p8) Observing • Pencil	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions • Students' learning needs will be assessed based on responses to Discover Activity discussion questions.

determine the factors that affect the strength of electric and magnetic forces.	**Objectives** Students will: Identify the cause-and-effect relationships between fields that exist between objects and the behavior of the objects. Ask questions about data to determine the effect of the strength of electric and magnetic forces.	Holder 6. Discover Activity (p22) Can You Use a Needle to Make a Compass? 7. Discover Activity (p34) Can You Move a Can Without Touching It? 8. Lab Activity (p38) Sparks are Flying 9. Lab (p42) The Versorium 10. Discover Activity (p44) How Can Current Be Measured? 11. Lab (p52) Constructing a Dimmer Switch 12. Discover Activity (p54) Can You Make Electricity Using A Penny? 13. Discover Activity (p80) Are Magnetic Fields Limited to Magnets 14. Lab Activity (p83) On/Off 15. Discover Activity (p85) How Does a Magnet Move a Wire? 16. Lab (p92) Building an Electric Motor 17. Discover Activity (pg94) Can You Produce Current Without a Battery? Student will watch the video How Do Birds Know Where to Go When They Migrate and Maglev Train to introduce the concept of magnetic fields. (MS-PS2-3, WHST.6-8.8) Students will interact with simulations for Electricity, Magnets, and Circuits. Students will design an alarm system in Chapter Project (p33)	• Foam cup • 2 circular magnets For Lab (p12) Detecting Fake Coins • Various coins • Craft stick • Tape • Metric ruler • Pencil • Protractor • Coin-size steel washers • Small bar magnet, 2cm wide • Thin, stiff cardboard, about 25 cm X 30cm For Discover Activity (p14) How Can Materials Become Magnetic? • Clear plastic tube • Iron filings • Strong magnet For Lab (p20) Design and Build a Magnetic Paper Clip Holder • 2 bar magnets • Masking tape • Container of 150 regular size paper clips and assortment of other types of magnets • Modeling clay • String For Discover Activity (p22) Can You Use a Needle to Make a Compass? • Large needle • Ball of foam or cork • Strong bar magnet • Dishwashing soap • Bowl	**Summative Assessments:** Unit quizzes and test Students will receive a grade for answers to analysis questions for the following labs: *Lab (p12) Detecting Fake Coins, Lab (p20) Design and Build a Magnetic Paper Clip Holder, Lab (p42) The Versorium, Lab (p52) Constructing a Dimmer Switch,* and *Lab (p92) Building an Electric Motor*. Student designs for the *Chapter Project (p33) Cause for Alarm* will be evaluated using a rubric. Students will model the cause effect relationship between electric and magnetic field strengths in the Electromagnetic Power! Activity. Graphic Organizers, Simulations **Benchmark Assessment:** Exact Path **Alternative Assessments:** Students construct and present oral and written arguments supported by empirical evidence. Presentations, Rubric, Checklist, Journals Students will ask questions about data to determine the

		Cause for Alarm. (WHST.6-8.7, CRP4, 8.EE.A.4) Students will watch the video Static Electricity and explain why static electricity is useful in everyday life. (WHST.6-8.9, CRP6) Students investigate the characteristics of electromagnetism and then use what they learn to plan and conduct an experiment on electromagnets in Electromagnetic Power! (MS-PS2-5, 8.G.A.1, 8.1.8.A.2) **Enrichment Activity:** Students use the engineering design process to design and build magnetic-field detectors in the Inspector Detector Challenge. (6.1.8.C.4.b, 9.2.8.B.3)	• Water For Discover Activity (p34) Can You Move a Can Without Touching It? • Empty aluminum can • Balloon For Lab Activity (p38) Sparks are Flying • 2 Foam plates • Tape • Aluminum pie plate For Lab (p42) The Versorium • Foam cup • Plastic foam plate • Pencil • Aluminum foil • Wool Fabric • Paper For Discover Activity (p44) How Can Current Be Measured? • 4 pieces of wire, insulation removed, 25cm long • Compass • Two bulbs • D-cell For Lab (p52) Constructing a Dimmer Switch • D-cell • Masking tape • Flashlight bulb in socket • Thick lead from mechanical pencil • Non-insulated copper wire, the same length as the pencil lead • Rubber tubing, the same length as the pencil lead	effect of the strength of electric and magnetic forces that can be investigated within the scope of the classroom, outdoor environment, museums and other public facilities. Written questions/Exercises Students will collect and analyze data that could include the effect of the number of turns of wire on the strength of an electromagnet. Graphs, Charts, Data Tables Students will conduct an investigation and evaluate an experimental design to produce data that can serve as the basis for evidence. Essay, Models, Journals, Discussions, Questioning

- 1 wire, 10-15 cm long
- 2 wires, 20-30 cm long
- 2 alligator clips

For Discover Activity (p54) Can You Make Electricity Using A Penny?

- Penny
- Vinegar
- Paper towel
- Aluminum foil
- Salt
- Warm water
- Glass

For Discover Activity (p80) Are Magnetic Fields Limited to Magnets

- Two wires, insulation removed from ends, 20-30 cm long
- Sock with light bulb
- D-cell
- 3 compasses

For Lab Activity (p83) On/Off

- Insulated copper wire
- Nail
- Battery
- Container of paper clips

For Discover Activity (p85) How Does a Magnet Move a Wire?

- Insulated copper wire
- Nail
- Battery
- Books
- Ruler
- Switch
- Horseshoe magnet

For Lab (p92) Building an Electric Motor

- D-Cell
- 2 large paper clips
- Permanent disk magnet
- 3 balls of clay
- Empty film canister
- Pliers
- Sandpaper
- 2 insulated wires, 15 cm each
- Enamel-coated wire, 22-24 gauge, 1 meter

For Discover Activity (pg94) Can You Produce Current Without a Battery?

- 1 meter wire
- Galvanometer or sensitive multimeter
- Strong horseshoe magnet
- Modeling clay

Websites:

- Electricity, Magnets, and Circuits

Videos:

- Static Electricity
- How Do Birds Know Where to Go When They Migrate
- Maglev Train

Enrichment Lesson Plans:

See Inspector Detector Challenge

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
This particular unit has limited language barriers due to the physical nature of the curriculum.

Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity in planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	**Special Education**	**At-Risk**	**Gifted and Talented**
● Speak and display terminology ● Teacher modeling ● Peer modeling ● Provide ELL students with multiple literacy strategies. ● Word walls ● Use peer readers ● Give page numbers to help the students find answers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides	● Provide highlighters to identify important directions ● Utilize modifications & accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Provide concrete examples ● Restructure lesson using UDL principals (http://www.cast.org/our-work/about-	● Provide opportunities for oral responses instead of written ● Using visual demonstrations, illustrations, and models ● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected to do ● Instructions may be printed out in large print and hung up for the student to see	● Create projects that can be presented to lower grade levels ● Choice boards ● Curriculum compacting ● Inquiry-based instruction ● Independent study ● Higher order thinking skills ● Adjusting the pace of lessons ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. ● Use project-based science learning to connect science

• Provide additional time to complete a task • Use graphic organizers	udl.html#.VXmoXcfD_UA). • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	during the time of the lesson. • Review behavior expectations and make adjustments for personal space or other behaviors as needed. • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	with observable phenomena. • Structure the learning around explaining or solving a social or community-based issue. • Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:
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 authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. (HS-PS2-5)
WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. (HS-PS2-5)

Mathematics:
8.G.A.1: Verify experimentally the properties of rotations, reflections, and translations.
8.EE.A.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.1.8.A.2: Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

Social Studies:
6.1.8.C.4.b: Explain how major technological developments revolutionized land and water transportation, as well as the economy, in New Jersey and the nation.

Integration of 21st Century Standards NJSLS 9:
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.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Use mathematical representations of phenomena to describe explanations. (HS-PS2-4) **Constructing Explanations and Designing Solutions** • Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects. (HS-PS2-3) **Planning and Carrying Out Investigations** • Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS2-5)	**PS2.B: Types of Interactions** • Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-4) • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-4) **PS2.A: Forces and Motion** • If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system. (HS-PS2-3) **ETS1.A: Defining and Delimiting an**	**Patterns** • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS2-4) **Cause and Effect** • Systems can be designed to cause a desired effect. (HS-PS2-3) • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-PS2-5) ----------

	Engineering Problem • Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (secondary) (HS-PS2-3) **ETS1.C: Optimizing the Design Solution** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. *(secondary HS-PS2-3)* **PS2.B: Types of Interactions** • Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects. (HS-PS2-5) • Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields. (HS-PS2-5) **PS3.A: Definitions of Energy** • "Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents. *(secondary HS-PS2-5)*	***Connections to Nature of Science*** **Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena** • Theories and laws provide explanations in science. (HS-PS2-4) • Laws are statements or descriptions of the relationships among observable phenomena. (HS-PS2-4)

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Grade 8
Fourth Marking Period

Unit 8: The Electromagnetic Spectrum

Overview: In this unit of study, students *develop and use models, use mathematical thinking,* and *obtain, evaluate, and communicate information* in order to describe and predict characteristic properties and behaviors of waves. Students also apply their understanding of waves as a means of sending digital information. The crosscutting concepts of *patterns* and *structure and function* are used as organizing concepts for these disciplinary core ideas. Students *develop and use models, use mathematical thinking,* and *obtain, evaluate, and communicate information.* Students are also expected to use these practices to demonstrate understanding of the core ideas.

Time Frame: 15 to 20 Days

Enduring Understandings:
A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
Waves are reflected, absorbed, or transmitted through various materials.
A sound wave needs a medium through which it is transmitted.
Waves can be used for communication purposes.

Essential Questions:
Why do surfers love physicists?
How do the light and sound system in the auditorium work?
How do cell phones work?

Standards	Topics and Objectives	Activities	Resources	Assessments
(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**	**Topics** Waves Interactions of Waves Sound Light Electromagnetic Spectrum Twenty-First Century Themes	Students will complete the text activities: 1. Discover Activity (p6) How Do Waves Travel? 2. Discover Activity (p11) Can You Change a Wave? 3. Lab (p16) Wavy Motion 4. Discover Activity (p17) How Does a Ball Bounce 5. Lab Activity (p19) Observing 6. Lab (p24) Making Waves 7. Discover Activity (p36)	**Text:** Prentice Hall Science Explorer: Sound and Light **Materials:** For Discover Activity (p6) How Do Waves Travel? • Shallow pan • Water • Pencil • Cork • Paper towels	**Formative Assessments:** • Journals • Learning/Response Logs • Discussions • Students' learning needs will be assessed based on responses to Discover Activity and Sound and Wave Simulations

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.

and Skills include:

- The Four C's
- Life and Career Skills
- Information and Media literacy

Objectives

Students will:

Use mathematical representations to describe and/or support scientific conclusions about how the amplitude of a wave is related to the energy in a wave.

Develop and use models to describe the movement of waves in various materials.

Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims that digitized signals are a more reliable way to encode and transmit information than analog signals are.

What is Sound?

8. Discover Activity (p42) How Does Amplitude Affect Loudness?
9. Lab Activity (p45) Predicting
10. Discover Activity (p48) How Can You Change a Pitch?
11. Lab (p52) Changing Pitch
12. Discover Activity (p70) How Does a Beam of Light Travel?
13. Discover Activity (p74) What is White Light?
14. Discover Activity (p90) How Can Radio Waves Change?
15. Lab (p97) Build a Crystal Radio

(RST.6-8.1)

Students will interact with online Sound and Wave Simulations to discover patterns and properties.
(MS-PS4-3, CRP4, 6.1.8.C.4.b)

Students will watch the videos How Tsunamis Work, Waves and Sound Physics Song, The Sound Of Vomit,
The Real Life Batman – Daniel Kish, This is Not Yellow, and Analog vs. Digital introduce and extend topics.
(MS-PS4-2, 8.1.8.A.2, RST.6-8.2)

Students will gain a fundamental understanding of the transition from analog television to digital with a

For Discover Activity (p11) Can You Change a Wave?

- 3m medium-weight rope

For Lab (p16) Wavy Motion

- Spring toy
- Meter stick

For Discover Activity (p17) How Does a Ball Bounce

- Ball
- Meter stick
- Water

For Lab Activity (p19) Observing

- Drinking straw
- Piece of terry cloth or paper towel

For Lab (p24) Making Waves

- Water
- Plastic dropper
- Metric ruler
- Paper towels
- Modeling clay
- Cork
- Ripple tank (aluminum foil lasagna pan with mirror at the bottom)

For Discover Activity (p36) What is Sound?

- Bowl
- Water
- Tuning fork

For Discover Activity (p42) How Does Amplitude Affect Loudness?

- Wooden board

discussion questions.

Summative Assessments:
Unit quizzes and test

Students will receive a grade for answers to analysis questions for the following labs: *Lab (p16) Wavy Motion, Lab (p24) Making Waves, Lab (p52) Changing Pitch,* and *Lab (p97) Build a Crystal Radio.*

Students will accurately present information about analog and digital signals in the lesson Transition to Digital Television.
Presentations, Rubric, Checklists, Reflection Log, Critique

Benchmark Assessment:
Exact Path

Alternative Assessments:
Students will use models to describe the movement of waves in various materials.
Models/Projects, Rubrics, Self-Assessment

Students will use mathematical representations to describe a simple model.
Model, Graphic Organizers, Journals, Projects

scientific and policy perspective. They will then develop a presentation to inform consumers of the upcoming digital TV transition in the lesson Transition to Digital Television.
(MS-PS4-1, SL.8.5, RST.6-8.9)

Enrichment Activity:
Students examine and discuss the simple mathematics behind light and other forms of electromagnetic energy including the properties of waves, wavelength, frequency, the Doppler shift, and the various ways that astronomers image the universe across the electromagnetic spectrum in the Electromagnetic Math activities.
(9.2.8.B.3, WHST.6-8.9, CRP6, 8.F.A.3)

- 2 nails
- Guitar string

For Lab Activity (p45) Predicting
- Drinking Straw
- Scissors

For Discover Activity (p48) How Can You Change a Pitch?
- 2 rubber bands of different thicknesses
- 30-cm ruler
- Pencil

For Lab (p52) Changing Pitch
- 1-L soda bottle
- 2-L soda bottle
- 250-mL graduated cylinder
- Metric ruler
- Straw
- Water

For Discover Activity (p70) How Does a Beam of Light Travel?
- 4 large index cards
- Hole punch
- Metric ruler
- Binder clips or modeling clay
- String
- Flashlight

For Discover Activity (p74) What is White Light?
- Cardboard box
- White paper
- Prism

- Colored pencil

For Discover Activity (p90) How Can Radio Waves Change?

- Tracing paper
- Flat piece of stretchable latex about 20 cm square

For Lab (p97) Build a Crystal Radio

- Cardboard tube
- 3 pieces enameled or insulated wire, 1 about 30 m long, 2 about 30 cm long
- Wire strippers or sandpaper
- 2 alligator clips
- Scissors
- Aluminum foil
- 2 pieces cardboard (from 12.5 cm x 20cm to 30 cm x 48 cm)
- Masking tape
- Crystal diode
- Ear phone
- 2 pieces insulated copper antenna wire, 1 about 30 m long, 1 about 0.5 m long

Websites:

- Sound and Wave Simulations

Videos:

- How Tsunamis Work
- Waves and Sound Physics Song
- The Sound Of Vomit
- The Real Life Batman –

Daniel Kish
- This is Not Yellow
- Analog vs Digital

Enrichment Lesson Plans:
See Electromagnetic Math

Accommodations and Modifications:

Students with special needs: Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

ELL/ESL students: Students will be supported according to the recommendations for "can do's" as outlined by WIDA – https://www.wida.us/standards/CAN_DOs/
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Students at risk of school failure: Formative and summative data will be used to monitor student success at first signs of failure student work will be Reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL, time may be a factor in overcoming developmental considerations. More time and will be made available with a certified instructor to aid students in reaching the standards.

Gifted and Talented Students: Students excelling in mastery of standards will be challenged with complex, high level challenges related to the complexity in planning and carrying out investigations and analyzing and interpreting data.

English Language Learners	Special Education	At-Risk	Gifted and Talented
● Provide additional time to complete a task ● Speak and display terminology ● Teacher modeling ● Peer modeling ● Provide ELL students with multiple literacy strategies. ● Word walls ● Use peer readers ● Give page numbers to	● Provide concrete examples ● Utilize modifications & accommodations delineated in the student's IEP ● Work with paraprofessional ● Use multi-sensory teaching approaches. ● Work with a partner ● Restructure lesson using UDL principals	● Provide additional time to complete a task ● Using visual demonstrations, illustrations, and models ● Give directions/instructions verbally and in simple written format. Oral prompts can be given. ● Peer Support ● Increase one on one time ● Teachers may modify instructions by modeling what the student is expected	● Increase the pace of lessons ● Curriculum compacting ● Inquiry-based instruction ● Independent study ● Higher order thinking skills ● Interest based content ● Real world scenarios ● Student Driven Instruction ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to

help the students find answers ● Provide a computer for written work ● Provide two sets of textbooks, one for home and one for school ● Provide visual aides ● Use graphic organizers	(http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA). ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).	to do ● Instructions may be printed out in large print and hung up for the student to see during the time of the lesson. ● Review behavior expectations and make adjustments for personal space or other behaviors as needed. ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).	demonstrate their understandings. ● Use project-based science learning to connect science with observable phenomena. ● Structure the learning around explaining or solving a social or community-based issue. ● Collaborate with after-school programs or clubs to extend learning opportunities.

Interdisciplinary Connections:

ELA-NJSLS/ELA:
RST.6-8.1: Cite specific textual evidence to support analysis of science and technical texts. (MS-PS4-3)
RST.6-8.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. (MS-PS4-3)
RST.6-8.9: Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on the same topic. (MS-PS4-3)
WHST.6-8.9: Draw evidence from informational texts to support analysis, reflection, and research. (MS-PS4-3)
SL.8.5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-PS4-

1),(MS-PS4-2)

Mathematics:
8.F.A.3: Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. (MS-PS4-1)

Career Ready Practices:
CRP4: Communicate clearly and effectively and with reason.
CRP6: Demonstrate creativity and innovation.

Integration of Technology Standards NJSLS 8:
8.1.8.A.2: Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

Social Studies:
6.1.8.C.4.b: Explain how major technological developments revolutionized land and water transportation, as well as the economy, in New Jersey and the nation.

Integration of 21st Century Standards NJSLS 9:
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**.**

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Using Mathematics and Computational Thinking • Use mathematical representations to describe and/or support scientific conclusions and design solutions. (MS-PS4-1) **Developing and Using Models** • Develop and use a model to describe phenomena. (MS-PS4-2) **Obtaining, Evaluating, and Communicating Information** • Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings. (MS-PS4-3)	**PS4.A: Wave Properties** • A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1) • A sound wave needs a medium through which it is transmitted. (MS-PS4-2) **PS4.B: Electromagnetic Radiation** • When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (MS-PS4-2) • The path that light travels can be traced as straight lines, except at surfaces between	**Patterns** • Graphs and charts can be used to identify patterns in data. (MS-PS4-1) **Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS4-2) • Structures can be designed to serve particular functions. (MS-PS4-3) - ***Connections to Engineering, Technology, and***

- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** • Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS4-1)	different transparent materials (e.g., air and water, air and glass) where the light path bends. (MS-PS4-2) • A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (MS-PS4-2) • However, because light can travel through space, it cannot be a matter wave, like sound or water waves. (MS-PS4-2) **PS4.C: Information Technologies and Instrumentation** • Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (MS-PS4-3)	***Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** • Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations. (MS-PS4-3) - ***Connections to Nature of Science*** **Science is a Human Endeavor** • Advances in technology influence the progress of science and science has influenced advances in technology. (MS-PS4-3)