

WEYMOUTH TOWNSHIP SCHOOL DISTRICT

**Science Curriculum
GRADE 4**

Content Area: SCIENCE

Course Title: Elementary

Grade Level: 4

UNIT 1 Weathering and Erosion	15 days
UNIT 2 Earth Processes	15 days
UNIT 3 Structures and Function	20 days
UNIT 4 How Organisms Process Information	20 days
UNIT 5 Transfer of Energy	20 days
UNIT 6 Force and Motion	20 days
UNIT 7 Using Engineering Design with Force & Motion Systems	20 days
UNIT 8 Waves and Information	20 days

Date Created: 08/18, Updated 07/22

Board Approved: 08/2023

**WEYMOUTH TOWNSHIP SCHOOL
DISTRICT
Grade 4 - Unit 1**

Content Area: Science

Unit Title: Weathering and Erosion

Target Course/Grade Level: 4

Unit Summary

In this unit of study, students develop understandings of the effects of weathering and the rate of erosion by water, ice, wind, or vegetation. The crosscutting concepts of *patterns* and *cause and effect* are called out as organizing concepts. Students demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *constructing explanations*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on 4-ESS2-1 and 4-ESS1-1.

Primary Interdisciplinary Connections:

ELA/Literacy

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS2-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS2-1)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS1-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS1-1)

Mathematics

MP.2 Reason abstractly and quantitatively. (4-ESS2-1)

MP.4 Model with mathematics. (4-ESS2-1)

MP.5 Use appropriate tools strategically. (4-ESS2-1)

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS2-1)

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1)

MP.2 Reason abstractly and quantitatively. (4-ESS1-1)

MP.4 Model with mathematics. (4-ESS1-1)

4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a

two-column table. (4-ESS1-1)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Essential Questions

- How can rocks give us clues to the the past?
- Why do some rock formations become smaller over time?

Disciplinary Core Ideas

ESS2.A: Earth Materials and Systems Rainfall helps to shape the land and affects the types of living things found in a region.

- Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)

ESS1.C: The History of Planet Earth

Local, regional, and global patterns of rock

	<p>formations reveal changes over time due to earth forces, such as earthquakes.</p> <ul style="list-style-type: none"> • The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)
<p style="text-align: center;">Science and Engineering Practices</p> <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.</p> <ul style="list-style-type: none"> • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3– 5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> • Identify the evidence that supports particular points in an explanation. (4-ESS1-1) 	<p style="text-align: center;">Crosscutting Concepts</p> <p>Cause and Effect</p> <ul style="list-style-type: none"> • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1) <p>Patterns</p> <ul style="list-style-type: none"> • Patterns can be used as evidence to support an explanation. (4-ESS1-1) <p style="text-align: center;">Connections to Nature of Science</p> <p>Scientific Knowledge Assumes an Order and Consistency in Natural Systems</p> <ul style="list-style-type: none"> • Science assumes consistent patterns in natural systems. (4-ESS1-1)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Changing Land
- Plants Effects on Regions
- Rock Patterns

Materials

Equipment

- Promethean Projection Board
- Chromebooks
- Document camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT

Grade 4 - Unit 2

Content Area: Science

Unit Title: Earth Processes

Target Course/Grade Level: 4

Unit Summary

In this unit of study, students apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps.

The crosscutting concepts of *patterns*, *cause and effect*, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on 4-ESS2-2, 4-ESS3-2, 3-5-ETS1-2, and 3-5-ETS1-3.

Primary Interdisciplinary Connections:

ELA/Literacy

RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)

Mathematics

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-2)

MP.2 Reason abstractly and quantitatively. (4-ESS3-2)

MP.4 Model with mathematics. (4-ESS3-2)

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-2)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth’s features. **4-ESS3-2.** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Essential Questions

- Why are there more earthquakes in certain places?
- How could an architect design a house to withstand earthquakes and flooding?

Disciplinary Core Ideas

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)

ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.)

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)

ETS1.B: Developing Possible Solutions

	<ul style="list-style-type: none"> • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) <p>ETS1.C: Optimizing the Design Solution Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)</p>
<p style="text-align: center;">Science and Engineering Practices</p> <p>Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.</p> <ul style="list-style-type: none"> • Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2) <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that</p>	<p style="text-align: center;">Crosscutting Concepts</p> <p>Patterns</p> <ul style="list-style-type: none"> • Patterns can be used as evidence to support an explanation. (4-ESS2-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2) <p style="text-align: center;">Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Science, Engineering and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2) <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.

(3-5-ETS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.

(3-5-ETS1-2)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Plate Tectonics
- Natural Processes
- Renewable and Non-Renewable Resources

Materials

Equipment

- Promethean Projection Board
- Chromebooks
- Document Camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT

Grade 4 - Unit 3

Content Area: Science

Unit Title: Structures and Function

Target Course/Grade Level: 4

Unit Summary

In this unit of study, students develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. The crosscutting concepts of *systems and system models* are called out as organizing concepts for

this disciplinary core idea. Students are expected to demonstrate grade-appropriate proficiency *in engaging in argument from evidence*. Students are also expected to use this practice to demonstrate understanding of the core idea.

This unit is based on 4-LS1-1.

Primary Interdisciplinary Connections:

ELA/Literacy

W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Mathematics

4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-LS1-1 Construct an argument that plants and animals have internal and external structures

that function to support survival, growth, behavior, and reproduction.

<p style="text-align: center;">Essential Questions</p> <ul style="list-style-type: none">• How do gills help a fish to survive?	<p style="text-align: center;">Disciplinary Core Ideas</p> <p>LS1.A: Structure and Function</p> <ul style="list-style-type: none">• Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)
<p style="text-align: center;">Science and Engineering Practices</p> <p>Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s).</p> <ul style="list-style-type: none">• Construct an argument with evidence, data, and/or a model. (4-LS1-1)	<p style="text-align: center;">Crosscutting Concepts</p> <p>Systems and System Models</p> <ul style="list-style-type: none">• A system can be described in terms of its components and their interactions. (4-LS1-1)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
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- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
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- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
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- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
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- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:

STEMScopes

- Plant and Animal Parts

Materials

Equipment

- Promethean Projection Board
- Chromebooks
- Document Camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT

Grade 4 - Unit 4

Content Area: Science

Unit Title: How Organisms Process Information

Target Course/Grade Level: 4

Unit Summary

In this unit of study, students are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. The crosscutting concepts of *cause and effect*, *systems and system models*, and *structure and function* are called out as organizing concepts for these

disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models*. Students are expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on 4-LS1-2 and 4-PS4-2.

Primary Interdisciplinary Connections:

ELA/Literacy

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2)

Mathematics

MP.4 Model with mathematics. (4-PS4-2)

4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.(4-PS4-2)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-LS1-2. Use a model to describe that animals receive different types of information through

their senses, process the information in their brain, and respond to the information in different ways.
4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen

<p style="text-align: center;">Essential Questions</p> <ul style="list-style-type: none"> ● How can animals use their senses for hunting? ● What is needed for a vision chart to be seen? 	<p style="text-align: center;">Disciplinary Core Ideas</p> <p>LS1.D: Information Processing</p> <ul style="list-style-type: none"> ● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal’s brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2) <p>PS4.B: Electromagnetic Radiation</p> <ul style="list-style-type: none"> ● An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2)
<p style="text-align: center;">Science and Engineering Practices</p> <p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> ● Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) <p>Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> ● Develop a model to describe phenomena. (4-PS4-2) 	<p style="text-align: center;">Crosscutting Concepts</p> <p>Systems and System Models</p> <ul style="list-style-type: none"> ● A system can be described in terms of its components and their interactions.(4-LS1-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> ● Cause and effect relationships are routinely identified. (4-PS4-2)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Reduce regular classroom work
- Accelerate or enrich content.
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:**STEMScopes**

- Sense Receptors
- Light Reflection

Materials**Equipment**

- Promethean Projection Board
- Chromebooks
- Document Camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT**Grade 4 - Unit 5****Content Area:** Science**Unit Title:** Transfer of Energy**Target Course/Grade Level:** 4**Unit Summary**

In this unit of study, fourth-grade students develop an understanding that energy can be transferred from place to place by sound, light, heat, and electrical currents. Students also obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. The crosscutting *concepts of cause and effect*,

energy and matter, and the interdependence of science, engineering, and technology, and influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on 4-PS3-2 and 4-ESS3-1.

Primary Interdisciplinary Connections:

ELA/Literacy

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-2)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1)

Mathematics

MP.2 Reason abstractly and quantitatively. (4-ESS3-1)

MP.4 Model with mathematics. (4-ESS3-1),

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Essential Questions

- Why do we hear a sound when something drops on the ground?
- Why has there been an increase in renewable resources in the recent years?
- How does energy travel from wind turbines to the toaster in my house?

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2)
- Light also transfers energy from place to place. (4-PS3-2)
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2)

ESS3.A: Natural Resources

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

<p style="text-align: center;">Science and Engineering Practices</p> <p>Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.</p> <ul style="list-style-type: none"> • Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) <p>Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.</p> <ul style="list-style-type: none"> • Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1) 	<p style="text-align: center;">Crosscutting Concepts</p> <p>Energy and Matter</p> <ul style="list-style-type: none"> • Energy can be transferred in various ways and between objects. (4-PS3-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> • Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) <p style="text-align: center;">Connections to Engineering, Technology, and Applications of Science</p> <p>Interdependence of Science, Engineering, and Technology</p> <ul style="list-style-type: none"> • Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1) <p>Influence of Science, Engineering and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> • Over time, people’s needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)
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Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:**STEMScopes**

- Transfer of Energy In a Collision
- Energy and Electrical Currents
- Renewable and Non-Renewable Resources

Materials**Equipment**

- Promethean Projection Board
- Chromebooks
- Document camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT**Grade 4 - Unit 6****Content Area:** Science**Unit Title:** Force and Motion**Target Course/Grade Level:** 4**Unit Summary**

In this unit of study, students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object, and are expected to develop an understanding that energy can be transferred from object to object through collisions.

The crosscutting concept of *energy and matter* is called out as an organizing concept. Students are expected to demonstrate grade-appropriate proficiency in *asking questions, defining problems, and constructing explanations, and designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on 4-PS3-1 and 4-PS3-3.

Primary Interdisciplinary Connections:

ELA/Literacy

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)

RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)

W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-3)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1)(4-PS3-3)

W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

- 8.1.5.E.1** Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
- 8.1.5.F.1** Apply digital tools to collect, organize, and analyze data that support a scientific finding.

Learning Targets

Performance Expectations

- 4-PS3-1.** Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- 4-PS3-3.** Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Essential Questions

- Why do we hear a sound when something drops on the ground?
- What happens when a bowling ball hits the bowling pins?

Disciplinary Core Ideas

PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4- PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-3)

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-3)

Science and Engineering Practices

Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

Crosscutting Concepts

Energy and Matter

- Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:**STEMScopes**

- Energy and Speed
- Energy and Collision

Materials**Equipment**

- Promethean Projection Board
- Chromebooks
- Document camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT**Grade 4 - Unit 7****Content Area:** Science**Unit Title:** Using Engineering Design with Force and Motion**Target Course/Grade Level:** 4**Unit Summary**

In this unit of study, students use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students develop an understanding that energy can be transferred from place to place by sound, light, heat, and electrical currents or from objects through collisions. They apply their understanding of energy to

design, test, and refine a device that converts energy from one form to another. The crosscutting concepts of *energy and matter* and the *influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *asking questions and defining problems, planning and carrying out investigations, constructing explanations, and designing solutions*. Students are also expected to use these practices to demonstrate their understanding of the core ideas.

This unit is based on 4-PS3-4, 3-5-ETS1-1, 3-5-ETS1-2, and 3-5-ETS1-3.

Primary Interdisciplinary Connections:

ELA/LITERACY

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-4)

W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-4) **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS1-2)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1),(3-5-ETS1-3)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-1),(3-5-ETS1-3)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-1),(3-5-ETS1-3)

Mathematics

4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity.

Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)

MP.2 Reason abstractly and quantitatively. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.4 Model with mathematics. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

MP.5 Use appropriate tools strategically. (3-5-ETS1-1),(3-5-ETS1-2),(3-5-ETS1-3)

3-5.OA Operations and Algebraic Thinking (3-5-ETS1-1),(3-5-ETS1-2)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Essential Questions

- How does energy travel from wind turbines to the toaster in my house?
- What happens to dry wood as it burns?

Disciplinary Core Ideas

PS3.B: Conservation of Energy and Energy Transfer

- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-4)

PS3.D: Energy in Chemical Processes and Everyday Life

- The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

ETS1.A: Defining Engineering Problems

	<ul style="list-style-type: none"> • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4) <p>ETS1.A: Defining and Delimiting Engineering Problems</p> <ul style="list-style-type: none"> • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5- ETS1-1) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) <p>ETS1.C: Optimizing the Design Solution</p> <ul style="list-style-type: none"> • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3) •
<p align="center">Science and Engineering Practices</p> <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences</p>	<p align="center">Crosscutting Concepts</p> <p>Energy and Matter</p> <ul style="list-style-type: none"> • Energy can be transferred in various ways and between objects. (4-PS3-4) <p>Connections to Engineering, Technology,</p>

and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Apply scientific ideas to solve design problems. (4- PS3-4)

Asking Questions and Defining Problems

Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-5-ETS1-3)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

and Applications of Science

Influence of Science, Engineering and Technology on Society and the Natural World

- Engineers improve existing technologies or develop new ones. (4-PS3-4)

Connections to Nature of Science

Science is a Human Endeavor

- Most scientists and engineers work in teams. (4-PS3-4)
- Science affects everyday life.(4-PS3-4)

Influence of Engineering, Technology, and Science on Society and the Natural World

- People’s needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

Evidence of Learning

Formative Assessments

- Activity: Hook
- Activity: Investigate
- Activity w/report: Engineering Design
- Activity w/report: Science/Literacy
- Quiz/STEMScopedia Activity - Vocabulary Quiz
- Quiz/Activity: Concept Review Game
- STEM Talk: View and discuss Content Connections Interactive Video(s):.
- Communicate/Drama Activity: Students use Science Rock “Movement” musical/video software platform where students sing standards-based science songs and dance to the tune.
- Quiz/Activity: Math Connections interactive practice/quiz that uses grade-level appropriate math activities to address the concept.
- STEM Talk: View and discuss Teacher-Guided Read Aloud
- Assessment Review: View and interact with “Science Today - Watch It!” by Associated Press

Summative Assessments

Argue: Claim-Evidence-Reasoning: student writes a scientific explanation to show their understanding of a science in a way that uses evidence.

Open-Ended Response: a short-answer and essay assessment to evaluate student mastery of the concept.

Multiple-Choice Assessment: a standards-based assessment designed to gauge students’ understanding of the science concept using their selections of the best possible answers from a list of choices

Modifications (ELLs, Special Education, Gifted and Talented) ELL

- Learn the backgrounds of LEP students
- Plan lessons that are both culturally and linguistically appropriate.
- Group students flexibly, in small groups based on individual or group interests as well as instructional need or ability.
- Give clear, simple directions
- Ask them to retell or restate, in their own words, the task.
- Reiterate, in the student’s native language or in simplified English, the key concepts learned in content areas.
- Paraphrase information and main ideas.
- Reorganize and reinforce information.
- Provide bilingual classroom resources, such as bilingual dictionaries, picture books and dictionaries, and English language encyclopedias for LEP students.

Special Education

- Provide Instructional Strategies and Techniques that Address Learning Style
- Utilize Techniques and Activities to Support Personal-Social Development
- Modify the Presentation of Materials
- Modify the Learning Environment
- Modify Assessments
- Modify Grading
- Facilitate Appropriate Behavior
- Limit/Reduce/Modify/Permit Alternate Class Work Curricular Procedures
- Provide Alternative Homework
- Provide Access to Special Equipment and Instructional Materials

Gifted and Talented

- Accelerate or enrich content.
- Reduce regular classroom work
- Providing alternate assignments
- Schedule opportunities to work individually through independent study
- Schedule opportunities to work in homogeneous groupings with peers of similar ability and interests
- Schedule opportunities to participate heterogeneous groupings of mixed-ability students.
- Stimulate higher order thinking skills and give students opportunities to consider and express personal opinions by asking open-ended questions.
- Scaffold investigations and reports to require thinking skills such as comparison, synthesis, insight, judgment, hypothesis, conjecture, and assimilation.
- Curriculum compact to allow student to skip standard assignments in order to acquire time to pursue alternate assignments or independent projects.
- Compact curriculum in areas that represent student strengths
- Create a plan outline and time frame for completion of assignments & alternate activities.
- Incorporate written independent study contracts to research topics of interest to become “resident experts.”
- Develop descriptions and the criteria for evaluating each project.
- Determine (jointly) deadline dates and work schedule.
- Provide complex, critical thinking tasks.

Curriculum Development Resources/Instructional Materials/Equipment Resources:**STEMScopes**

- Energy and Electrical Currents
- Chemical Processes

Materials**Equipment**

- Promethean Projection Board
- Chromebooks
- Document camera

WEYMOUTH TOWNSHIP SCHOOL DISTRICT**Grade 4 - Unit 8****Content Area:** Science**Unit Title:** Waves and Information**Target Course/Grade Level:** 4**Unit Summary**

In this unit of study, students use a model of waves to describe patterns of waves in terms of amplitude and wavelength and to show that waves can cause objects to move. The crosscutting concepts of *patterns; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world* are called out as

organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in developing and *using models, planning and carrying out investigations, and constructing explanations, and designing solutions*. Students are also expected to use these practices to demonstrate their understanding of the core ideas.

This unit is based on 4-PS4-1, 4-PS4-3, 3-5-ETS1-2, and 3-5-ETS1-3.

Primary Interdisciplinary Connections:

ELA/Literacy –

RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS4-3)

RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)

SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1)

Mathematics –

MP.4 Model with mathematics. (4-PS4-1)

RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2)

RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS1-2)

RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)

W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-3)

W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-3)

W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-3)

Mathematics

4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1)

MP.2 Reason abstractly and quantitatively. (3-5-ETS1-2), (3-5-ETS1-3)

MP.4 Model with mathematics. (3-5-ETS1-2), (3-5-ETS1-3)

MP.5 Use appropriate tools strategically. (3-5-ETS1-2), (3-5-ETS1-3)

3-5.OA Operations and Algebraic Thinking (3-5-ETS1-2)

21st Century Themes:

Career Ready Practices and Financial Literacy

CRP1. Act as a responsible and contributing citizen and employee.

CRP2. Apply appropriate academic and technical skills. **CRP4.**

Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP6. Demonstrate creativity and innovation.

CRP7. Employ valid and reliable research strategies.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

CRP11. Use technology to enhance productivity.

9.2.4.A.1 Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

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.

Technology Integration: 3-5

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

8.1.5.B.1 Collaborative to produce a digital story about a significant local event or issue based on first-person interviews.

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

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

Learning Targets

Performance Expectations

4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Essential Questions

- How can we predict where an earthquake will cause the most damage?
- What kind of communication technology would be best for a forest ranger fire outpost?

Disciplinary Core Ideas

PS4.A: Wave Properties

Waves, which are regular patterns of motion, can be made in water by disturbing the surface.

- When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).
(4-PS4-1)

PS4.C: Information Technologies and Instrumentation

Digitized information can be transmitted over long distances without significant degradation.

- High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.
(4-PS4-3)

ETS1.C: Optimizing The Design Solution

	<ul style="list-style-type: none"> • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3) <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"> • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) • Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) <p>ETS1.C: Optimizing the Design Solution</p> <ul style="list-style-type: none"> • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)
<p style="text-align: center;">Science and Engineering Practices</p> <p>Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.</p> <ul style="list-style-type: none"> • Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) <p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> • Generate and compare multiple solutions to a problem based on how well they meet the 	<p style="text-align: center;">Crosscutting Concepts</p> <p>Patterns</p> <ul style="list-style-type: none"> • Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1) • Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3) <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2) <p style="text-align: center;">Connections to Engineering, Technology, and Applications of Science</p> <p>Interdependence of Science, Engineering, and Technology</p>

<p>criteria and constraints of the design solution. (4-PS4-3)</p> <p>Connections to Nature of Science Scientific Knowledge is Based on Empirical Evidence</p> <ul style="list-style-type: none">• Science findings are based on recognizing patterns. (4-PS4-1)	<ul style="list-style-type: none">• Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)
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