Barrington School District | Haddon Heights School District | Lawnside School District | Merchantville School District

Course Name: Science
Grade: Fourth Grade
Board Approved:

*All curriculum is aligned with the NJSLS in accordance with the Department's curriculum implementation timeline and includes all required components (NJ.A.C.6A:8).
**Resource and activity lists are compiled from all four districts and may not necessarily be reflected in each district or school.

Introduction

New Jersey Student Learning Standards for Science

Michael Heinz, Coordinator

Science, engineering, and technology influence and permeate every aspect of modern life. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions, such as selecting among alternative medical treatments or determining how to invest public funds for water supply options. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering.

Mission: Scientifically literate individuals possess the knowledge and understanding of scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

Vision: The science standards are designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, actively engage in scientific and engineering practices and apply crosscutting concepts to deepen their understanding of the core ideas in these fields. The learning experiences provided for students should engage them with fundamental questions about the world and with how scientists have investigated and found answers to those questions. Throughout grades K-12, students should have the opportunity to carry out scientific investigations and engineering design projects related to the disciplinary core ideas (pp. 8-9, NRC, 2012).

STANDARD:
4-ESS2-2 - Earth's Systems
4-ESS3-2 - Earth and Human Activity
3-5-ETS1 - Engineering Design

Unit 2: Earth Processes

ESTABLISHED GOALS (INDICATOR #)	TRANSFER (How will this apply to their lives?)	
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.**	*Students will be able to independently use their knowledge to…* ● Identify patterns in the Earth's surface from maps. ● Research natural disaster impact on humans. ● Develop a possible solution to reduce the impact of natural disasters on human life.	
	MEANING	
	UNDERSTANDINGS: ● Patterns can be used as evidence to support an explanation. ● Maps can help locate the different land and water features of Earth. ● 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. ● Cause-and-effect relationships are routinely identified, tested, and used to explain change. ● Engineers improve existing technologies or develop new ones to increase benefits, decrease known risks, and meet societal demands. ● A variety of hazards result from natural processes (e.g., earthquakes, floods, tsunamis, volcanic	ESSENTIAL QUESTIONS: ● What can maps tell us about the features of the world? ● In what ways can the impacts of natural Earth processes on humans be reduced?

	eruptions). ● Humans cannot eliminate the hazards, but they can take steps to reduce their impacts. ● 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	

Unit 2: Grade 4 - Lessons

In this unit of study, students analyze and interpret data from maps to describe patterns of Earth's features. Students can use topographic maps of Earth's land and ocean floor in order to locate features such as mountains, mountain ranges, deep ocean trenches, and other ocean floor structures. As students analyze and interpret these types of maps, they begin to notice patterns in the types of structures and where these structures are found. Students learn that major mountain chains often form along or near the edge of continents. Once students locate continental boundaries, a further analysis of data can show students that there is a noticeable pattern of earth events, including volcanoes and earthquakes, which occur along these boundaries.

During this unit, students also learn that engineers develop or improve technologies to solve societal problems. A variety of hazards result from natural processes (e.g. earthquakes, floods, tsunamis, volcanic eruptions). Although we cannot eliminate the hazards, we can take steps to reduce their impacts. Students must have the opportunity to engage in the engineering design process in order to generate and compare multiple solutions that reduce the impacts of natural Earth processes on humans. This process should include the following steps:

- ✓ Students brainstorm possible problems that Earth processes can cause for humans. (Earth processes should be limited to earthquakes, volcanic eruptions, tsunamis, and floods.)
- ✓ Either as a class or in small groups, have students select one problem (such as the effects of volcanic eruptions on humans) to research.
- ✓ Small groups conduct research to determine possible solutions (such as consistent monitoring of volcanic activity and the use of early warning systems) that reduce the impacts of the chosen Earth process on humans.
- ✓ As a class, determine criteria and possible constraints on the design solutions. Criteria might include: saving lives and/or reducing property loss.
- ✓ Small groups investigate how well the solutions perform under a range of likely conditions. This may involve additional research and analysis of available data or planning and conducting investigations to produce data that will serve as the basis for evidence. During this process, students should plan and carry out fair tests in which variables are controlled and failure points are considered in order to identify elements of the design solution that do and do not meet criteria.
- ✓ Students compare the solutions based on how well they meet criteria and constraints, using data as evidence to support their thinking. At every stage, communicating with peers is an important part of the design process, because shared ideas can lead to improved designs. Students should routinely identify and test cause-and-effect relationships and use these relationships to explain the changes that they observe as they test design solutions.

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Engineering design performance expectations are an integral part of this unit of study. Students are expected to research a problem, generate and compare

possible design solutions, and test the design solutions to determine how well each performs under a range of likely conditions. Using data as evidence, students identify elements of each design that need improvement and determine which design solution best solves the problem, given the criteria and the constraints. This process is outlined in greater detail in the previous section.

Mystery Science Suggested Lessons:

The Birth of Rocks: Rock Cycle and Earth's Processes

Unit Starter: Fossils and Constructing Explanations: Fossil Finds

Mystery 1: Volcanoes, Rock Cycle and Earth's Surface: Could a volcano pop up where you live?

Mystery 2: Volcanoes, Rock Cycle and Earth's Surface: Why do some volcanoes explode?

Mystery 3: Weathering and Destructive Forces: Will a mountain last forever?

Mystery 4: Erosion, Natural Hazards and Engineering: How could you survive a landslide?

Better Lesson Suggested Units:

Plotting Climate Data *SWBAT use climate data to create a key, plot data points, and interpolate data.*(This is a model of Arizona. It will have to be adapted for NJ)

Links:

Sample Article: Earthquakes

Sample Article: Tsunamis

Sample Article: Floods

Sample Article: Volcanoes

Building for the Big One

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting concepts
Analyzing and Interpreting Data ● Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) **Constructing Explanations and Designing**	**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	**Patterns** ● Patterns can be used as evidence to support an explanation. (4-ESS2-2) **Cause and Effect** ● Cause and effect relationships are routinely

Solutions

- 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),(3-5-ETS1-2)

Planning and Carrying Out Investigations

- 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)

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

- 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)

ETS1.C: Optimizing the Design Solution

- Different solutions need to be tested in order to identified, tested, and used to explain change. (4-ESS3-2)

Connections to Engineering, Technology, and Applications of Science

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

- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)
- Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

	determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)	

District/School Formative Assessment Plan	District/School Summative Assessment Plan
Students who understand the concepts are able to: ● Support an explanation using patterns as evidence. ● Analyze and interpret data to make sense of phenomena using logical reasoning. ● Analyze and interpret data from maps to describe patterns of Earth's features. Maps can include: ✓ Topographic maps of Earth's land ✓ Topographic maps of Earth's ocean floor ✓ Locations of mountains ✓ Locations of continental boundaries ✓ Locations of volcanoes and earthquakes ● Identify and test cause-and-effect relationships in order to explain change. ● Generate multiple solutions to a problem and compare them based on how well they meet the criteria and constraints of the design solution. ● Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans *(Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.)* Examples of solutions could include: ✓ Designing an earthquake-resistant building ✓ Improving monitoring of volcanic activity. ● Generate multiple possible solutions to a problem and compare them based on how well each is likely to meet the criteria and constraints of the problem. ● 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. ● 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.	*Summative assessment is an opportunity for students to demonstrate mastery of the skills taught during a particular unit.* **Mystery Science Assessments:** ***(all resources are accessible on google drive)*** The Birth of Rocks: Rock Cycle and Earth's Processes

The Birth of Rocks: Rock Cycle and Earth's Processes:

Mystery 1: Volcanoes, Rock Cycle and Earth's Surface

Mystery 2: Volcanoes, Rock Cycle and Earth's Surface

Mystery 3: Weathering and Destructive Forces

Mystery 4: Erosion, Natural Hazards and Engineering

Alternative Assessments

Evaluative Criteria

Suggested Performance Rubric: Use the following or similar rubric to evaluate students' performance on lesson assessments:

4 - Innovating:	Advanced understanding and application of the standard
3 - Applying:	Consistently applies skills independently
2 - Developing:	Progressing towards independent application of skills
1 - Beginning:	Early stages of development, need assistance

Assessment Evidence

Suggested Performance Tasks include but are not limited to:

Performance Task: Design a way to help protect humans from a specific natural disaster.

Is it possible to engineer ways to protect humans from natural Earth?
Open by connecting question with a real life situation involving a natural disaster (potential earthquakes, past problems with Tsunamis, Volcanoes, or Floods)

Summary:

- Students brainstorm possible problems the Earth can cause for humans
- Groups select problem
- Groups conduct research to determine possible solutions
- As a class, determine criteria and restraints
- Students design and test ideas

District/School Texts

Haddon Heights - Unit Kits for Science Labs and References

Lawnside - Houghton Mifflin Harcourt : Science Fusion

Merchantville- Exploring Science (National Geographic Learning)

District/School Supplementary Resources

-Scholastic News

-Brain POP

-NewsELA

-Read Works

Interdisciplinary Connections		
ELA 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.4.1** 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.4.7** 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) **W.4.7** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2) **RI.4.9** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2) **RI.5.1** 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.5.1** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.	**Math** 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) **4.MD.A.2** Reason abstractly and quantitatively. (4-ESS3-2), (3-5-ETS1-2),(3-5-ETS1-3) **MP.2** Model with mathematics. (4-ESS3-2), (3-5-ETS1-2),(3-5-ETS1-3) **MP.4** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 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) **4.OA.A.1** Use appropriate tools strategically. (3-5-ETS1-2),(3-5-ETS1-3) **MP.5** Operations and Algebraic Thinking (3-ETS1-2) **3-5.OA**	**21st Century Skills/Career Education** CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason CRP11. Use technology to enhance productivity.

(3-5-ETS1-2) **RI.5.9** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-3) **W.5.7** 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.5.8** Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-3) **W.5.9**		
Technology 8.1.5.F.1 - Apply digital tools to collect, organize, and analyze data that support a scientific finding.		
Modifications and Accommodations		
Special Education Students Small group Direct instruction restate/rephrase graphic organizers modified assignments chunking leveled text intentional grouping read text extended time breaks Teacher records/ student dictates	**English Language Learners** Labels word banks visuals student friendly definitions extended time chunking intentional grouping	**Students at Risk of School Failure** leveled text graphic organizers modified assignments kinesthetic activities restate/rephrase chunking intentional grouping
Gifted and Talented extension project leveled text leadership roles intentional grouping	**Students with 504 Plans** breaks chunking preferential seating visual reminders	

Targeted learning from assessment	restate/rephrase check-in/check-out system visual time Teacher records/ student dictates	
Unit Duration: 10 days		