New York Science

NY Grade 4 Science Learning Standards

NY State State Grade 4 Science Standards

I **3-5. Engineering Design** 3-5.ETS1

A Performance Expectations 3-5.ETS1.ED

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.ETS1.1

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.ETS1.2

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. 3-5.ETS1.3

B Science and Engineering Practices 3-5.ED.SEP

1 Asking Questions and Defining Problems 3-5.ED.SEP.1

a 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) 3-5.ED.SEP.1A

2 Planning and Carrying Out Investigations 3-5.ED.SEP.2

a 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) 3-5.ED.SEP.2A

3 Constructing Explanations and Designing Solutions 3-5.ED.SEP.3

a 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) 3-5.ED.SEP.3A

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- C Disciplinary Core Ideas 3-5.ED.DCI
  - 1 ETS1.A: Defining and Delimiting Engineering Problems 3-5.ED.DCI.ETS1.A
    - a 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) 3-5.ED.DCI.ETS1.A.1
  - 2 ETS1.B: Developing Possible Solutions 3-5.ED.DCI.ETS1.B
    - a 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) 3-5.ED.DCI.ETS1.B.1
    - b 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) 3-5.ED.DCI.ETS1.B.2
    - c 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) 3-5.ED.DCI.ETS1.B.3
  - 3 ETS1.C: Optimizing the Design Solution 3-5.ED.DCI.ETS1.C
    - a 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) 3-5.ED.DCI.ETS1.C.1
- D Crosscutting Concepts 3-5.ED.CC
  - 1 Influence of Science, Engineering, and Technology on Society and the Natural World 3-5.ED.CC.1
    - a People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1) 3-5.ED.CC.1A
    - b Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2) 3-5.ED.CC.1B

- I **4. Energy** 4.PS3

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A Performance Expectations 4.PS3.E

1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. 4.PS3.1

2 Make observations to provide evidence that energy is conserved as it is transferred and/or converted from one form to another. 4.PS3.2

3 Ask questions and predict outcomes about the changes in energy that occur when objects collide 4.PS3.3

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

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

B Science and Engineering Practices 4.E.SEP

1 Asking Questions and Defining Problems 4.E.SEP.1

a Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) 4.E.SEP.1A

2 Planning and Carrying Out Investigations 4.E.SEP.2

a 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) 4.E.SEP.2A

3 Constructing Explanations and Designing Solutions 4.E.SEP.3

a Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) 4.E.SEP.3A

b Apply scientific ideas to solve design problems. (4-PS3-4) 4.E.SEP.3B

4 Obtaining, Evaluating, and Communicating Information 4.E.SEP.4

a Obtain and combine information from books and other reliable media to explain phenomena. (4- ESS3-1) 4.E.SEP.4A

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C Disciplinary Core Ideas 4.E.DCI

1 PS3.A: Definitions of Energy 4.E.DCI.PS3.A

a (NYSED) A given object possesses more energy of motion when it is moving faster. (4-PS3-1) 4.E.DCI.PS3.A.1

b (NYSED) Energy can be transferred by moving objects or by sound, light, heat, or electric currents. (4-PS3-2), (4-PS3-3) 4.E.DCI.PS3.A.2

2 PS3.B: Conservation of Energy and Energy Transfer 4.E.DCI.PS3.B

a 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),(4-PS3-3) 4.E.DCI.PS3.B.1

b (NYSED) Energy can also be transferred 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),(4-PS3-4) 4.E.DCI.PS3.B.2

3 PS3.C: Relationship Between Energy and Forces 4.E.DCI.PS3.C

a When objects collide, the contact forces transfer energy so as to change the objects' motions.(4-PS3-3) 4.E.DCI.PS3.C.1

4 PS3.D: Energy in Chemical Processes and Everyday Life 4.E.DCI.PS3.D

a The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) 4.E.DCI.PS3.D.1

5 ESS3.A: Natural Resources 4.E.DCI.ESS3.A

a 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) 4.E.DCI.ESS3.A.1

6 ETS1.A: Defining Engineering Problems 4.E.DCI.ETS1.A

a 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) 4.E.DCI.ETS1.A.1

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D Crosscutting Concepts 4.E.CC

1 Cause and Effect 4.E.CC.1

a Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) 4.E.CC.1A

2 Energy and Matter 4.E.CC.2

a Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4- PS3-3),(4-PS3-4) 4.E.CC.2A

3 Interdependence of Science, Engineering, and Technology 4.E.CC.3

a Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3- 1) 4.E.CC.3A

4 Influence of Engineering, Technology, and Science on Society and the Natural World 4.E.CC.4

a Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3- 1) 4.E.CC.4A

b Engineers improve existing technologies or develop new ones. (4-PS3-4) 4.E.CC.4B

5 Science is a Human Endeavor 4.E.CC.5

a Most scientists and engineers work in teams. (4-PS3-4) 4.E.CC.5A

b Science affects everyday life. (4-PS3-4) 4.E.CC.5B

I **4. Waves: Waves and Information** 4.PS4

A Performance Expectations 4.PS4.WER

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

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

B Science and Engineering Practices 4.WER.SEP

1 Developing and Using Models 4.WER.SEP.1

a Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) 4.WER.SEP.1A

2 Constructing Explanations and Designing Solutions 4.WER.SEP.2

a Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3) 4.WER.SEP.2A

3 Scientific Knowledge is Based on Empirical Evidence 4.WER.SEP.3

a Science findings are based on recognizing patterns. (4-PS4-1) 4.WER.SEP.3A

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C Disciplinary Core Ideas 4.WER.DCI

1 PS4.A: Wave Properties 4.WER.DCI.PS4.A

a 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. (Note: This gradebandendpoint was moved from K–2).(4-PS4-1) 4.WER.DCI.PS4.A.1

b Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) 4.WER.DCI.PS4.A.2

2 PS4.C: Information Technologies and Instrumentation 4.WER.DCI.PS4.C

a 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) 4.WER.DCI.PS4.C.1

3 ETS1.C: Optimizing The Design Solution 4.WER.DCI.ETS.1.C

a 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) 4.WER.DCI.ETS.1.C.1

D Crosscutting Concepts 4.WER.CC

1 Patterns 4.WER.CC.1

a Similarities and differences in patterns can used to sort and classify natural (4-PS4-1) 4.WER.CC.1A

b Similarities and differences in patterns can used to sort and classify designed products. (4-PS4-3 4.WER.CC.1B

2 Interdependence of Science, Engineering, and Technology 4.WER.CC.2

a Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3) 4.WER.CC.2A

I **4. Structure, Function, and Information Processing** 4.LS1

A Performance Expectations 4.LS1.SF

1 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. 4.PS4.2

2 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. 4.LS1.1

3 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.LS1.2

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- B Science and Engineering Practices 4.SF.SEP
  - 1 Developing and Using Models 4.SF.SEP.1
    - a Develop a model to describe phenomena. (4- PS4-2) 4.SF.SEP.1A
    - b Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) 4.SF.SEP.1B
  - 2 Engaging in Argument from Evidence 4.SF.SEP.2
    - a Construct an argument with evidence, data, and/or a model. (4-LS1-1) 4.SF.SEP.2A
- C Disciplinary Core Ideas 4.SF.DCI
  - 1 PS4.B: Electromagnetic Radiation 4.SF.DCI.PS4.B
    - a An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) 4.SF.DCI.PS4.B.1
  - 2 LS1.A: Structure and Function 4.SF.DCI.LS1.A
    - a Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) 4.SF.DCI.LS1.A.1
  - 3 LS1.D: Information Processing 4.SF.DCI.LS1.D
    - a 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) 4.SF.DCI.LS1.D.1
- D Crosscutting Concepts 4.SF.CC
  - 1 Cause and Effect 4.SF.CC.1
    - a Cause and effect relationships are routinely identified. (4-PS4 2) 4.SF.CC.1A
  - 2 Systems and System Models 4.SF.CC.2
    - a A system can be described in terms of its components and their interactions. (4- LS1-1), (LS1-2) 4.SF.CC.2A

- I **4. Earth's Systems: Processes that Shape the Earth** 4.ESS2
  - A Performance Expectations 4.ESS2.ES
    - 1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. 4.ESS1.1
    - 2 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.ESS2.1
    - 3 Analyze and interpret data from maps to describe patterns of Earth's features. 4.ESS2.2
    - 4 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. 4.ESS3.2

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B Science and Engineering Practices 4.ES.SEP

1 Planning and Carrying Out Investigations 4.ES.SEP.1

a Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) 4.ES.SEP.1A

2 Analyzing and Interpreting Data 4.ES.SEP.2

a Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) 4.ES.SEP.2A

3 Constructing Explanations and Designing Solutions 4.ES.SEP.3

a Identify the evidence that supports particular points in an explanation. (4-ESS1-1) 4.ES.SEP.3A

b 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) 4.ES.SEP.3B

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C Disciplinary Core Ideas 4.ES.DCI

1 ESS1.C: The History of Planet Earth 4.ES.DCI.ESS1.C

a Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) 4.ES.DCI.ESS1.C.1

2 ESS2.A: Earth Materials and Systems 4.ES.DCI.ESS2.A

a 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) 4.ES.DCI.ESS2.A.1

3 ESS2.B: Plate Tectonics and Large-Scale System Interactions 4.ES.DCI.ESS2.B

a 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) 4.ES.DCI.ESS2.B.1

4 ESS2.E: Biogeology 4.ES.DCI.ESS2.E

a Living things affect the physical characteristics of their regions. (4-ESS2-1) 4.ES.DCI.ESS2.E.1

5 ESS3.B: Natural Hazards 4.ES.DCI.ESS3.B

a 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 DisciplinaryCore Ideacanalsobefoundin 3.WC.) 4.ES.DCI.ESS3.B.1

6 ETS1.B: Designing Solutions to Engineering Problems 4.ES.DCI.ETS1.B

a Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2) 4.ES.DCI.ETS1.B.1

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D Crosscutting Concepts 4.ES.CC

1 Patterns 4.ES.CC.1

a Patterns can be used as evidence to support an explanation. (4-ESS1-1),(4-ESS2-2) 4.ES.CC.1A

2 Cause and Effect 4.ES.CC.2

a Cause and effect relationships are routinely identified, tested, and used to explain change. (4- ESS2-1),(4-ESS3-2) 4.ES.CC.2A

3 Influence of Science, Engineering, and Technology on Society and the Natural World 4.ES.CC.3

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

4 Scientific Knowledge Assumes an Order and Consistency in Natural Systems 4.ES.CC.4

a Science assumes consistent patterns in natural systems. (4- ESS1-1) 4.ES.CC.4A