

# Grade 2 Science-Technology-Engineering

**Introduction:** The diocesan Science-Technology-Engineering curriculum guidelines are adapted from the *Next Generation Science Standards* (NGSS) <http://www.nextgenscience.org/> and are based on the *2016 MA Science & Technology/Engineering Framework* (MA STE) [available: <http://www.doe.mass.edu/frameworks/current.html> and in separate sections along with other resources at: <http://www.doe.mass.edu/stem/review.html>] These resources should be explored since they include a wealth of information beyond the standards. The diocesan guidelines use the same numbering system for the standards in order to facilitate searches for lessons and other resources. The order of the standards does not imply a recommended instructional sequence. “Common Core Connections” from NGSS are included for grades K-5 to suggest ways to include science in other subjects (and vice versa.) “Assessment boundaries” indicate what may be included on future MCAS tests and are included here since they frequently offer further clarification of the performance expectations at that level. “Not included from NGSS”, “Clarification statements” and the set of standards themselves are not intended to be restrictive in any way. A standard followed by an asterisk “\*” indicates an engineering design practice. mostly the same for all grades,

**Grades Pre-K–2: Overview of Science and Engineering Practices:** The development of science and engineering practices begins very early, even as babies and young children inquire about and explore how the world works. Formal education should advance students’ development of the skills necessary to engage in scientific inquiry and engineering design. These are the skills that provide the foundation for the scientific and technical reasoning that is so critical to success in civic life, postsecondary education, and careers. Inclusion of science and engineering practices in standards only speaks to the types of performances students should be able to demonstrate at the end of instruction at a particular grade; the standards do not limit what educators and students should or can be engaged in through a well-rounded curriculum.

Pre-K through grade 2 standards integrate all eight science and engineering practices. Pre-K standards ask students to demonstrate an ability to ask questions, set up simple investigations, analyze evidence, observations, and data for patterns, and use evidence to explain or develop ideas about how phenomena work. Kindergarten standards call for students to show further development of investigation and communication skills, as well as application of science concepts to designing solutions to problems, and to now use information obtained from text and media sources. Grade 1 standards call for students to continue developing investigation skills, including their ability to pose scientific questions as well as their ability to analyze observations and data and to effectively use informational sources. Grade 1 standards also call for students to demonstrate their ability to craft scientific explanations using evidence from a variety of sources. Grade 2 standards call for students to use models in a scientific context and further their skills in a number of the practices, including investigations, data analysis, designing solutions, argumentation, and use of informational sources.

Some examples of specific skills students should develop in these grades:

1. Raise questions about how different types of environments provide homes for living things; ask and/or identify questions that can be answered by an investigation.
2. Use a model to compare how plants and animals depend on their surroundings; develop and/or use a model to represent amounts, relationships, and/or patterns in the natural world; distinguish between a model and the actual object and/or process the model represents.
3. Conduct an investigation of light and shadows; plan and conduct an investigation collaboratively to produce data to answer a question; make observations and/or relative measurements to collect data that can be used to make comparisons.
4. Analyze data to identify relationships among seasonal patterns of change; use observations to describe patterns and/or relationships in the natural world and to answer scientific questions.
5. Decide when to use qualitative vs. quantitative information; use counting and numbers to describe patterns in the natural world.

6. Use information from observations to construct an evidence-based account of nature.
7. Construct an argument with evidence for how plants and animals can change the environment; distinguish between opinions and evidence in one's own explanations; listen actively to others to indicate agreement or disagreement based on evidence.
8. Obtain information to compare ways that parents and their offspring behave to survive; obtain information using various texts, text features, or other media to answer a question.

While presented as distinct skill sets, the eight practices intentionally overlap and interconnect. Skills such as those outlined above should be reflected in curricula and instruction that engage students in an integrated use of the practices.

**Grade 2 Focus - Wholes and Parts:** As students grow in their ability to speak, read, write, and reason mathematically, they also grow in their ability to grapple with larger systems and the parts that make them up. In grade 2, students start to look beyond the structures of individual plants and animals to looking at the environment in which the plants and animals live as a provider of the food, water, and shelter that the organisms need. They learn that water is found everywhere on Earth and takes different forms and shapes. They map landforms and bodies of water and observe that flowing water and wind shapes these landforms. Grade 2 students use their observation skills gained in earlier grades to classify materials based on similar properties and functions. They gain experience testing different materials to collect and then analyze data for the purpose of determining which materials are the best for a specific function. They construct large objects from smaller pieces and, conversely, learn that when materials are cut into the smallest possible pieces, they still exist as the same material that has weight. These investigations of how parts relate to the whole provide a key basis for understanding systems in later grades.

## Grade 2: Earth and Space Sciences

### ESS1. Earth's Place in the Universe

*Not included from NGSS 2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.*

### ESS2. Earth's Systems

**Students who demonstrate understanding can:**

2-ESS2-1. Investigate and compare the effectiveness of multiple solutions designed to slow or prevent wind or water from changing the shape of the land.\*

*Clarification Statements: Solutions to be compared could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land. Solutions can be generated or provided.*

2-ESS2-2. Map the shapes and types of landforms and bodies of water in an area.

*Clarification Statements: Examples of types of landforms can include hills, valleys, river banks, and dunes. Examples of water bodies can include streams, ponds, bays, and rivers. Quantitative scaling in models or contour mapping is not expected.*

2-ESS2-3. Use examples obtained from informational sources to explain that water is found in the ocean, rivers and streams, lakes and ponds, and may be solid or liquid.

2-ESS2-4(MA). Observe how blowing wind and flowing water can move Earth materials from one place to another and change the shape of a landform.

*Clarification Statement: Examples of types of landforms can include hills, valleys, river banks, and dunes.*

**Common Core Connections: ELA/Literacy – RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS2-1) **RI.2.9** Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1) **W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS2-3) **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-ESS2-3) **SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ESS2-2) **Mathematics – MP.2** Reason abstractly and quantitatively. (2-ESS2-1),(2-ESS2-2) **MP.4** Model with mathematics. (2-ESS2-1),(2-ESS2-2) **MP.5** Use appropriate tools strategically. (2-

ESS2-1) **2.NBT.A.3** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2-ESS2-2) **2.MD.B.5** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-1)

## Grade 2: Life Science

### LS2. Ecosystems: Interactions, Energy, and Dynamics

2-LS2-3(MA). Develop and use models to compare how plants and animals depend on their surroundings and other living things to meet their needs in the places they live.

*Clarification Statement: Animals need food, water, air, shelter, and favorable temperature; plants need sufficient light, water, minerals, favorable temperature, and animals or other mechanisms to disperse seeds.*

*Included in other standards (including K-LS1-1 and 2-LS2-3(MA)) 2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. Not included from NGSS 2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.\**

**Common Core Connections: ELA/Literacy – W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1) **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1) **SL.2.5** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2) **Mathematics – MP.2** Reason abstractly and quantitatively. (2-LS2-1) **MP.4** Model with mathematics. (2-LS2-1),(2-LS2-2) **MP.5** Use appropriate tools strategically. (2-LS2-1) **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2)

### LS4. Biological Evolution: Unity and Diversity

2-LS4-1. Use texts, media, or local environments to observe and compare (a) different kinds of living things in an area, and (b) differences in the kinds of living things living in different types of areas.

*Clarification Statements: Examples of areas to compare can include temperate forest, desert, tropical rain forest, grassland, arctic, and aquatic. Specific animal and plant names in specific areas are not expected.*

**Common Core Connections: ELA/Literacy – W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS4-1) **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-LS4-1) **Mathematics – MP.2** Reason abstractly and quantitatively. (2-LS4-1) **MP.4** Model with mathematics. (2-LS4-1) **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS4-1)

## Grade 2: Physical Science

### PS1. Matter and Its Interactions

2-PS1-1. Describe and classify different kinds of materials by observable properties of color, flexibility, hardness, texture, and absorbency.

2-PS1-2. Test different materials and analyze the data obtained to determine which materials have the properties that are best suited for an intended purpose.\*

*Clarification Statements: Examples of properties could include, color, flexibility, hardness, texture, and absorbency. Data should focus on qualitative and relative observations.*

2-PS1-3. Analyze a variety of evidence to conclude that when a chunk of material is cut or broken into pieces, each piece is still the same material and, however small each piece is, has weight. Show that the material properties of a small set of pieces do not change when the pieces are used to build larger objects.

*Clarification Statements: Materials should be pure substances or microscopic mixtures that appear contiguous at observable scales. Examples of pieces could include blocks, building bricks, and other assorted small objects.*

2-PS1-4. Construct an argument with evidence that some changes to materials caused by heating or cooling can be reversed and some cannot.

*Clarification Statements: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and burning paper.*

**Common Core Connections: ELA/Literacy – RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4) **RI.2.3** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4) **RI.2.8** Describe how reasons support specific points the author makes in a text. (2-PS1-2),(2-PS1-4) **W.2.1** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion,

supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4) **W.2.7** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1),(2-PS1-2),(2-PS1-3) **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-1),(2-PS1-2),(2-PS1-3) **Mathematics – MP.2** Reason abstractly and quantitatively. (2-PS1-2) **MP.4** Model with mathematics. (2-PS1-1),(2-PS1-2) **MP.5** Use appropriate tools strategically. (2-PS1-2) **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-PS1-1),(2-PS1-2)

### PS3. Energy

2-PS3-1(MA). Design and conduct an experiment to show the effects of friction on the relative temperature and speed of objects that rub against each other.

*Clarification Statements: Examples could include an object sliding on rough vs. smooth surfaces. Observations of temperature and speed should be qualitative.*

## Grade 2: Technology/Engineering

### ETS1. Engineering Design

2.K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same design problem to compare the strengths and weaknesses of how each object performs.\*

*Clarification Statements: Data can include observations and be either qualitative or quantitative. Examples can include how different objects insulate cold water or how different types of grocery bags perform.*

*Found in grade 1: K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.*

**Common Core Connections: ELA/Literacy – W.2.6** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-3) **W.2.8** Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-3) **Mathematics – MP.2** Reason abstractly and quantitatively.(K-2-ETS1-3) **MP.4** Model with mathematics. (K-2-ETS1-3) **MP.5** Use appropriate tools strategically. (K-2-ETS1-3) **2.MD.D.10** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-3)