SCIENCE Grades: Pre-K - K

Science instruction will most often be integrated with other subjects, for example, learning to distinguish between living and non-living things (I.1, I.2) while reading various stories. Art projects include the use of tools (like scissors) and the differences among materials. These activities along with the use of various manipulatives contribute to achieving age-appropriate technology/engineering standards. Emphasis is placed on encouraging children's natural curiosity while developing their scientific inquiry skills such as making observations and sharing them with others, asking questions, and finding patterns.

As were the original guidelines released in 2006, the following revised Diocesan Science Curriculum Guidelines reflect primarily content standards drawn from the *National Science Education Standards* (NSES), the *Benchmarks for Science Literacy* and the Massachusetts *Science and Technology/ Engineering Curriculum Framework*. The outcomes have been left in grade-bands to give a school maximum flexibility when designing its individual science curriculum: allowing it to take advantage of local assets and/or programs or activities already in place; or to seek out and exploit the links to its existing curricula. The outcomes are generally the same as in the original guidelines but have been re-ordered and grouped around essential questions that a school may, or may not, choose to use when mapping its Science curriculum. A school should also look to include the NSES "Science as Inquiry" standards as it designs its curriculum and develops its teaching/learning strategies. These inquiry standards should not be viewed as secondary to the content standards, but rather, collectively, as a primary goal of science education with the content being the context within which these skills are learned.

NSES: Abilities Necessary to Do Scientific Inquiry

Grades K–4

- Ask a question about objects, organisms, and events in the environment
- Plan and conduct a simple investigation
- Employ simple equipment and tools to gather data and extend the senses
- Use data to construct a reasonable explanation
- Communicate investigations and explanations

Grades 5–8

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Develop descriptions, explanations, predictions, and models using evidence.
- Think critically and logically to make relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.
- Use mathematics in all aspects of scientific inquiry.

NSES Changing Emphases to Promote Inquiry

LESS EMPHASIS ON	MORE EMPHASIS ON
Activities that demonstrate and verify science content	Activities that investigate and analyze science questions
Investigations confined to one class period	Investigations over extended periods of time
Process skills out of context	Process skills in context
Emphasis on individual process skills such as observation or inference	Using multiple process skills— manipulation, cognitive, procedural
Getting an answer	Using evidence and strategies for developing or revising an explanation
Science as exploration and experiment	Science as argument and explanation

Providing answers to questions about science content	Communicating science explanations
Individuals and groups of students analyzing and synthesizing data without defending a conclusion	Groups of students often analyzing and synthesizing data after defending conclusions
Doing few investigations in order to leave time to cover large amounts of content	Doing more investigations in order to develop understanding, ability, values of inquiry and knowledge of science content
Concluding inquiries with the result of the experiment	Applying the results of experiments to scientific arguments and explanations
Management of materials and equipment	Management of ideas and information
Private communication of student ideas and conclusions to teacher	Public communication of student ideas and work to classmates

Although the Massachusetts Technology/Engineering standards are not explicitly included in the Diocesan outcomes, some are integrated within Suggested Teaching/Learning Strategies. Schools are encouraged to include as many of the Technology/Engineering standards as possible.

As has been more consistently recognized in subjects other than K-8 science, it is not possible to learn, beyond a mere recitation of facts and "factoids", without "doing." For example, no one would consider a mathematics class satisfactory if it consisted solely of students reading about other people "doing" math and watching the teacher "doing" math. We fully accept that students must be given the opportunity to "do" math. So too, it is with science. Students must be given the opportunity to "do" science. While gaining a better understanding of the workings of the world around them, students will be able to more fully appreciate the wonders of creation as well as their role as stewards.

Learning Outcomes	**Teaching / Learning Strategies & Assessments**
Additional outcomes from the Diocesan Health Curriculum Guidelines will also be included unless they are addressed elsewhere. ***I. How are living things the same or different ?*** **The student can** (in words and/or pictures): I.1. Identify things as living or nonliving I.2. Discuss the differences between living and nonliving things I.3. Identify different kinds of living things (such as humans, mammals, birds, fish, reptiles, insects, plants) & group like things together I.4. State the basic survival needs of plants: such as water, soil, sunlight I.5. Name the basic survival needs of animals: food, water, shelter	➢ In a teacher led discussion, have students provide ideas of what people, pets, and other animals need to live. Broaden the discussion with trees and other types of plants. Students will then cut pictures from magazines of people, plants, and different types of animals. Divide students into pairs/groups and have them sort the pictures further. Make a classroom chart of different kinds of living things the students found, allowing each student to paste at least one picture to the chart. Student must specify why or where their living thing should go on the chart. ➢ Take the discussion further, asking what is needed to live and grow. After the discussion students will draw, or cut from magazines, the basic survival needs of all living things. These can be then added to the previously made chart. ✓ Given several pictured index cards, student(s) sort cards into two piles: living and nonliving. Student then use the cards in the living pile and again sort them into specific groups of living things. On a separate piece of paper, student will draw some of the basic needs of survival for both plants and animals (one side plants – the other, animals).

II. How do living things change over time ? II.1. Name and illustrate the 4 seasons II.2. Observe and describe how plants grow and change, especially over seasons II.3. Observe and describe how animals grow and change	➢ Using a popcorn kernel, dried bean or other type of seed, students place seed in a small ziploc bag filled with soil, add water, and tape to the classroom window and at least one planted seed in a closet or other dark location. Students observe the seeds every couple of days, measure the growth (keep a height chart?), and draw their observations of both each time. Students predict how tall the plants will be the next time. ➢ Create a small book with the children. Provide them with bare trees/tree branches to color. Have students decorate each for the appropriate season. This could be as simple as gluing on small pieces of torn construction paper or tissues paper (pink for Spring, green for Summer, orange/yellow, red, etc. for Fall, white or nothing at all for winter.) Students should also label each paper with the appropriate season.
III. How are non-living things the same or different ? III.1. Examine & sort objects with similar and/or different properties, such as by their size, color, shape, weight, texture. III.2. Sort objects or materials according to their state of matter (liquid, solid, gas).	➢ Provide a variety of objects to examine (crayons, blocks, boxes, etc.). Then have students sort the objects. Have small groups work together and try to decide how they are going to sort the objects. Be sure to have each group explain their sorting process. Now add containers of milk, juice, and water along with the previous items. Assist the students in now sorting solids and liquids.
IV. Why do things move ? IV.1. Discuss the different ways objects can move: in a straight line, back and forth, in a circular motion, up and down, fast or slow. IV.2. Demonstrate how the motion of an object can be changed by applying a force such as push or pull, for example, giving a ball a gentle push versus a hard push	➢ Have students sit in a large circle. Using a ball, students take turns passing the ball to another classmate. Students should be encourages to roll it, toss it, etc. Demonstrate passing the ball with a soft, gentle push and then a harder, more forceful push. Point out how the ball moves differently with each. Have the students try to vary the force used. Try this sitting on a hardwood floor, rug, or the grass. Ask students what differences they found and give some reasons why

Resources

(Additional resources are listed in the Grades 1-2 Curriculum Guidelines)

The Usborne Big Book of Experiments *Scholastic 5 to 10 minute Science Activities for Young Learners* *Butterfly Magic*, Melissa Getzoff
The Very Hungry Caterpillar, The Mixed-Up Chameleon, The Tiny Seed, Eric Carle
www.reachoutmichigan.org
NSTA Elementary Resources: http://www.nsta.org/elementaryschool/?lid=hp including a link to "The Early Years" blog

Suppliers to consider:
hatchearlychildhood.com lakeshorelearning.com deltaeducation.com scientificsonline.com YoungExplorers.com