From Seed to Plant

Connecting Learning and Standards

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Introduction to the Draft New York State P-12 Science Learning Standards[1]

In January 2015, the New York State Board of Regents approved a proposed plan to develop new draft New York State P-12 Science Learning Standards (NYSSLS). Using the Next Generation Science Standards (NGSS) as a starting point, the Education Department utilized the expertise of many science education stakeholders including those on the Preliminary Draft Writing Team, the Science Standards' Writing Team, and Science Education Steering Committee to draft a set of science learning standards. This draft incorporates feedback the Department has received over the past few years and maintains the general tenets of the National Research Council's *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*.

The alignments presented here provide a way to connect the New York State Elementary Science Core Curriculum with the New York State Science Learning Standards (Draft NYSSLS), Next Generation Science Standards (NGSS) and Common Core State Standards (CCSS).

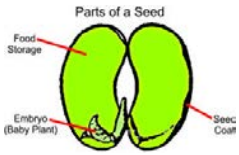
It is important to keep in mind that the draft NYSSLS are standards, not curriculum. While standards are learning goals that outline what a student should know and be able to do, curriculum is what students do in the classroom, and the various ways teachers carefully select the activities to increase each student's learning.

The draft NYSSLS include engineering design performance expectations, as well as performance expectations that integrate traditional science content with engineering. The intent of these performance expectations is to engage students in science content using engineering principles and is not intended to supplant technology education instruction aligned to Standard 5 of the New York State Learning Standards for Mathematics, Science, and Technology.

[1] http://www.p12.nysed.gov/ciai/mst/sci/nys-p12-science-ls-intro.html Accessed December 2015

From Seed to Plant

Students explore the growth process of plants through hands-on activities as they are introduced to ten different types of plants. Working with both collective and individual planters, students observe the parts of a seed and, over time, the parts of a plant. As vegetables, beans, grasses, and flowers develop shoots and roots, then stems and leaves, students discover the link between structure and function. They learn what plants need to grow and, as pods and seeds appear, how the life cycle continues.



Students read about the parts of seeds and how seeds develop into plants. They learn about gardening and the role of a gardener in the process and the fascinating ways seeds travel from place to place.[2]

Plants are everywhere, ranging in size from the 367-foot sequoia to microscopic duckweed. While all plants fall into two basic categories of nonflowering (mosses, ferns, and conifers) and flowering plants, all the plants studied in this unit are flowering plants.

Fertilization of plants produces seeds. Seeds are formed in the flowers of plants and the flowering plants produce seeds in fruit. These seeds may remain inactive for weeks, months, or even years, waiting for growing conditions to be right before sprouting. When a seed sprouts, or begins to grow, it is because moisture has penetrated the seed coat and the surrounding temperature is warm enough. Seeds do not need to be in contact with soil in order to grow. However, soil holds water that keeps the seed moist, acts as insulation to moderate temperature fluctuations, and provides a foundation for the growth of roots.

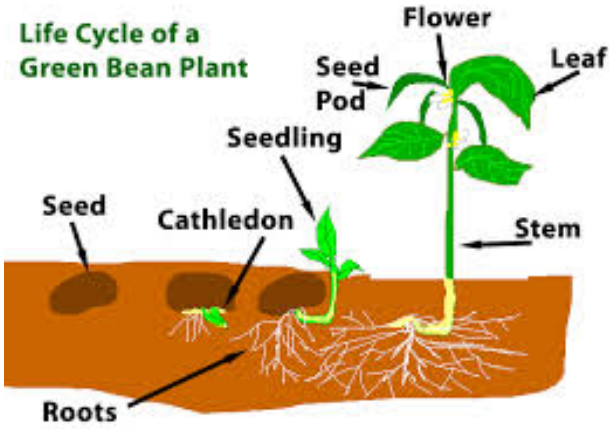
Photosynthesis is the process by which plants use sunlight to make food. The food made in the leaves is transported throughout the plant to feed all its cells. The sugar reserves are stored in the roots, so that when we eat plants, we are eating the nutritious food created and stored in plants. We eat foods produced by all parts of the plant. Rice, wheat, and corn, which provide the staple diet for most of the world's people, are the seeds of three members of the grass family. Sweet potatoes, beets, and carrots are the roots of plants. Asparagus and celery are the stems of plants, while lettuce and spinach are the leaves. Even the flowers of some plants, are edible.

From Seed to Plant - Fourteen hands-on activities introduce students to ten different types of flowering plants. Students discover the link between structure and function.
Suggested Grade Placement: K-1 Scheduling: 6-8 weeks

[2] http://www.delta-education.com/stem-solutions/supplemental-curriculum/delta-science-modules/from-seed-to-plant,-third-edition Accessed December 2015.

NYS P-12 Draft Science Learning Standards Kindergarten	NYS Elementary Science Core Curriculum
NYS Science Learning Standard K. Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment	**NYS Elementary Science Core Curriculum** Standard 4 – Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.
K-LS1-1 (Life Science) Use observations to describe patterns of what plants and animals (including humans) need to survive [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water and materials to live, grow, and thrive.]	**The Living Environment, Key Idea 2** Organisms inherit genetic information in a variety of wys that result in continuity of structure and function between parent and offspring.
K-ESS2-2 (Earth and Space Science) Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs	**The Living Environment, Key Idea 3** Individual organisms and species change over time.

in the ground to hide its food and tree roots can break concrete.]	
K-ESS3-1 (Earth and Space Science) Use a model to represent the needs of different plants or animals (including humans) and the places they live. [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas, and grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.	**The Living Environment, Key Idea 4** The continuity of life is sustained through reproduction and development.
K-ESS3-3 (Earth and Space Science) Communicate solutions that will reduce the impact of humans on living organisms and non-living things in the environment [Clarification Statement: Examples of human impact on the environment (land, water, air, plants, and animals) could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]	



NYS P-12 Draft Science Learning Standards Grade 1	NYS Elementary Science Core Curriculum
NYS Science Learning Standard 1. Structure, Function, and Processing	**NYS Elementary Science Core Curriculum** Standard 4 – Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.
1-LS1-1 (Life Science) Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and, detecting intruders by mimicking eyes and ears.]	**The Living Environment, Key Idea 2** Organisms inherit genetic information in a variety of wys that result in continuity of structure and function between paretn and offspring.
1-LS1-3 (Life Science) Make observations to construct an evidence-based account that some young plants and animals are similar to,	**The Living Environment, Key Idea 3** Individual organisms and species change over time.

but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks its parents but is not exactly the same.]	
	The Living Environment, Key Idea 4 The continuity of life is sustained through reproduction and development.

Common Core State Standards Connections Kindergarten

ELA / Literacy – Kindergarten		From Seed to Plant
RI.K.1	With prompting and support, ask and answer questions about key details in a text.	Share information or ideas orally, in writing, or using a graphic representation
W.K.1	Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., *My favorite book is...*).	Give specific information about based on one's observations and experiences Use questions as the basis for drawing, discussing, and writing an opinion or preference about the resource books
W.K.2	Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.	Use the senses in learning about a topic and convey a mental model in writing or the use of graphics
W.K.7	Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	Sketch, label, or write about hands-on activities and readings in an individual or group setting
SL.K.5	Add drawings or other visual displays to descriptions as desired to provide additional detail.	Group objects, information, or events using a system or method Interpret photographs and diagrams
K.MD.A.2	Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference.*)*	Identify and compare using observations and experiences

Common Core State Standards Connections Grade 1

ELA / Literacy – Grade 1		From Seed to Plant
RI.1.1	Ask and answer questions about key details in a text.	Read for information and review/assess students' understanding of the text Model nonfiction reading strategies for students: making personal connections, asking questions, visualizing, making inferences, self-correcting
RI.1.2	Identify the main topic and retell key details of a text.	Using a two-column chart (Questions/Answers), identify main ideas and relevant vocabulary. Review questions before reading and ask for any new ones after reading. Verify students are able to answer questions using the vocabulary terms
RI.1.10	With prompting and support, read informational texts appropriately complex for grade 1.	Use the student resources books to provide information and support the experiences of hands-on activities Recognize different parts of a book (table of contents, headings, glossary) and organize information
W.1.7	Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).	Collect, record, display, and interpret data As a group, make a chart of the proper care of plants

New York State Standards Connections
Elementary Science Core Curriculum

Key Idea 3: Individual organisms and species change over time.

Key Idea 4: The continuity of life is sustained through reproduction and development.

NYS Science Standard		From Seed to Plant
<u>Performance Indicator 3.1</u> Describe how the structures of plants and animals complement the environment of the plant or animal.	3.1b Each plant has different structure that serves different functions in growth, survival, and reproduction. • roots help support the plant and take in water and nutrients • leaves help plants utilize sunlight to make food for the plant • stems, stalks, trunks, and other similar structures provide support for the plant • some plants have flowers • flowers are reproductive structures of plants that produce fruit which contains seeds • seeds contain stored food that aids in germination and the growth of young plants 3.1c In order to survive in their environment, plants and animals must be adapted to that environment. • Leaf, flower, stem, and root adaptations may include variations in size, shape, thickness, color, smell, and texture	Observe that colored water travels up plant stems and conclude that stems carry water up to the leaves Examine the roots of several plants and discuss their function Observe flowers and seed pods on pea plants Compare the roots of several plants and predict what the roots of larger plants will look like
<u>Performance Indicator 4.1</u> Describe the major stages in the life cycle of selected plants and animals.	4.1a Plants and animals have life cycles. These may include beginning of a life, development into an adult, reproduction as an adult, and eventually death. 4.1b Each kind of plant goes through its own stages of growth and development that may include seed, young plant, and mature plant. 4.1c The length of time from beginning of development to death of the plant is called its life span.	Examine and compare the leaves of several sprouts Identify the first four stages in the life cycle of a pea plant Diagram the

	Life cycles of some plants include changes from seed to mature plant.	complete life cycle of a pea plant
<u>Performance Indicator 5.2</u> Describe some survival behaviors of common living specimens.	5.2a Plants respond to changes in their environment. For example, the leaves of some green plants change position as the direction of light changes; the parts of some plants undergo seasonal changes that enable the plant to grow; seeds germinate, and leaves form and grow.	Examine the roots of sprouts and determine the direction in which they are growing Determine whether roots are able to grow upward or downward Place plants so that they receive light from only one direction. Observe the response of the plants and conclude plants turn towards the light Learn the functions of a leaf

Scheduling and Contact Information

BoSAT Elementary Science is a resource for the classroom teacher to aid in the implementation of a "hands on" approach to teaching elementary science. BoSAT provides staff development, classroom support, science kits and materials for grades K-6. Kits are available in the areas of life, earth and physical science.

The BOCES #1 Science and Technology (BoSAT) Center provides subscribing districts with an interdisciplinary science curriculum that emphasizes the process skills of:

- Observing
- Classifying
- Measuring
- Collecting and Processing Data
- Predicting and Inferring
- Experimenting
- Creating Models
- Making Decisions
- Replicating
- Manipulating Materials

In addition, our resources include

- teacher in-service programs where teachers are provided learning theory, teaching strategies, classroom management and assessment
- flexible program for elementary science where each school district selects the science kits and programs that best fit their curriculum, including science kits, video conferencing, and mobile science lab.
- student centered programs where students are active learners and are provided opportunities to design experiments of their own choosing

Give us a call for further information or to ship a kit of hand-on experiments to you.

To view kit descriptions and order go to: http://www.bosat.org/

Please contact Debra Croce at debra_croce@boces.monroe.edu or 585-249-7063 for pricing and scheduling information.

Contact Steve Orcutt at steve_orcutt@boces.monroe.edu or (585) 249-7890 for more information about programs and curriculum.

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