School District of Springfield Township
Montgomery County, PA

PLANNED COURSE OF STUDY

Course Title	First Grade Science
Grade Level	1
Content Area / Dept.	Science
Length of Course	September- June
Author(s)	Adeola Oyemola

Course Description:
The first-grade science curriculum provides students with opportunities to observe, describe, predict, compare, and articulate properties of solids and liquids. Students also investigate concepts related to the life cycle of an insect and plant. These investigations provide opportunities for students to create and observe changes with solid and liquid mixtures, meet the needs of an insect and plant while predicting and recording the outcomes of various investigations.

Course Rationale:
This course enables students to receive opportunities to engage in scientific processes and investigations related to engineering and the life cycle of insects and plants. It also provides first graders with an opportunity for students to generalize skills utilized in various curricula including, but not limited to, compare and contrast, patterns, cause and effect, and quantity and proportion, while exploring new concepts and vocabulary related to states of matter and insects and plants.

Curriculum Map (Year Long Course)

Month	Typical # of Weeks	Topics Covered this Month
September	4 weeks	Investigation 1 Solids
October	4 weeks	Investigation 1: Solids
November	3 weeks	Investigation 2: Liquids
December	3 weeks	Investigation 3: Bits and Pieces
January	4 weeks	Investigation 4: Solids, Liquids, and Water
February	4 weeks	Investigation 1: Mealworms
March	4 weeks	Investigation 1 & 2: Mealworms and Brassica Plants
April	3 weeks	Investigation 4 & 5: Silkworms/Butterflies
May	4 weeks	Investigation 4 & 5: Silkworms/Butterflies
June	2 weeks	Investigation 4 & 5: Silkworms/Butterflies

Unit Title	Solids and Liquids
Unit Description	In this unit, students explore, investigate, and develop vocabulary through hands-on experiences with two states of matter. The young scientists learn to identify properties related to two states of matter; they utilize and develop their understanding of the properties of matter as they construct, combine, and/or compare solids and liquids.
Essential Questions & Enduring Understandings	How can solid objects be described? What are solid objects made of? Can two or more objects have the same property? What are the properties of successful towers? Are there solid objects outdoors? How are liquids different from each other? How can liquids be described? How do liquids change in containers? Where are liquids outdoors? Are these materials solid or liquid? How can mixtures of particles be separated? How do particles of solids move in bottles? What is a general rule for using screens to separate a mixture of small objects? Are there little pieces of solid material outdoors? What happens when solids are mixed with water? What happens when liquids are mixed with water? Is toothpaste a solid or liquid? How do properties of materials change when they are heated or cooled? What happens when you mix water with solid plant material collected outdoors?

PA Core Standards	Assessment Anchors
3.1.1.A9 3.2.1.A1, 3-6 3.2.1.B7 3.3.1.A7 3.3.1.B3 3.2.2.A.4 & 5	No assessment Anchors at this grade level

3.3.2.A4 4.1.2.D & E 4.4.1.C 4.4.2.C 4.5.1.A	

Key Unit Vocabulary	Solid Objects: *cylinder, engineer, flat, flexible, gas, hard, liquids, material, matter, metal, natural, object, observe, pointed, properties, property, rigid, smooth, soft, solid, sort, texture, tower, and wood* Liquids: *bubble, colorless, dish soap, fabric softener, flow, foam, gravity, hand soap, has color, level, oil, pour, prediction, shake, starch, surface, syrup, thick, translucent, transparent, viscous* Bits and Pieces: *cornmeal, different, funnel, grain, largest, lima bean, mix, mixture, model, mung bean, particle, pile, pinto bean, powder, rice, scoop, screen, separate, size, smallest* Solids, Liquids, and Water: *bigger, change, cold, crystal, dark, disappear, dissolve, evaporate, float, freeze, heat, hot, layer, melt, reversible, sink*

Learning Objectives – *The student will…*	Assessment Opportunities
observe and identify three states of matter, explain their observations, and acquire new vocabulary to describe their observations about solids.	Science notebook entry Student's use of vocabulary Participation in investigation through discussion and exploration
observe materials to determine what solid objects are made of.	Science notebook entry Student's use of vocabulary Participation in investigation through discussion and exploration
identify and compare objects with the same property, and observe that different objects can be made of the same material.	Performance assessment Student's use of vocabulary Participation in investigation through

	discussion and exploration
utilize their understanding of the properties of solids to construct a tower and/or bridge.	Performance assessment Student's use of vocabulary Participation in investigation through discussion and exploration
explore solids within an outdoor environment and distinguish between natural and human-made solids.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration
explore the movement, sounds, and visual differences between seven different liquids.	Performance assessment Student's use of vocabulary Participation in investigation through discussion and exploration
articulate their observations about different liquids and acquire scientific vocabulary to describe properties of liquids.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration time
discover the changes that take place when a vial of water is added to containers of various sizes, show changes of liquid levels when rotating liquid in a bottle, and sequence the changes.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration
manipulate five different particulate solid materials in order to identify some properties related to each particulate solid.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration
utilize screens of different sizes to separate a mixture of five particulate solids.	Performance assessment Student's use of vocabulary Participation in investigation through discussion and exploration
employ the use of a funnel to distribute four particulate solids into bottles, observe and discuss the movement, sound, and appearance of the materials and compare them to liquids.	Performance assessment Student's use of vocabulary Participation in investigation through discussion and exploration
identify the correct screen(s) that a solid	Science notebook

material could pass through using a model of three different sized screens.	Student's use of vocabulary Participation in investigation through discussion and exploration
create mixtures of solids and water, examine and discuss changes while recording graphing, and/or drawing observations.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration
prepare bottles of various liquids with water; gently tip and shake the bottles; observe and discuss changes immediately and overnight.	Science notebook Student's use of vocabulary Participation in investigation through discussion and exploration
develop an investigation while utilizing knowledge of properties of solids and liquids; determine whether toothpaste is a solid or liquid.	Performance assessment Student's use of vocabulary Participation in investigation through discussion and exploration

Sequence of Teaching and Learning		
Number of Lessons/ Blocks	Lesson Topic	Lesson Activities
2	**Investigation 1:** Solid Objects	"After identifying states of matter, students observe a variety of solid objects. After a period of exploration, students describe properties of the objects and develop vocabulary in order to communicate their thinking about those properties. "
2	**Investigation 1:** Group Solid Objects	Observations of eight objects takes place. This includes fabric, a plastic tube, rubber, wood, metal, paper, leather, and ceramic. Observations of the objects takes place to identify the materials.
1-2	**Investigation 1:** Group Solid Objects	"Students group solid objects in a variety of ways to discover that many objects can have the same property and that different objects can be made of the same material. "

2-3	**Investigation 1:** Construct with Solids	Use understanding of the properties of solids to construct a tower and/or bridge. Participate in a reading in the Science Resources section and view a video entitled: *Properties of Matter.*
1-2	**Investigation 2:** Liquids in Bottles	Students observe different liquids in a center. They shake, turn, roll, and tip various liquids such as plain water, corn syrup, liquid dish soap, liquid hand soap, cooking oil, fabric softener, and water with color.
1-2	**Investigation 2:** Properties of Liquids	Students participate in a discussion where they share their observations about liquids in order to learn the vocabulary related to each liquid property. Students see posters, and utilize liquid property cards to develop vocabulary and familiarity with liquid properties.
2-3	**Investigation 2:** Liquid Level	Students add a vial of water to various containers, and make observations of how the liquids have filled each container differently. They discuss how liquids maintain a flat, level surface and take the shape of the container in which it is found. Students record their observation of a bottle falling on its side and participate in a sequencing activity as a bottle slowly falls on its side
1-2	**Investigation 3:** Solids in Containers	"Students work at learning centers with solid materials representing five particle sizes: cornmeal, rice, and three different kinds of beans. Students investigate the properties of the materials, one at a time, by pouring them from

		one container to another."
1-2	**Investigation 3:** Separating Soup Mix	"Students use screens of three sizes to separate a mixture of five particulate materials: cornmeal, rice, mung, beans, pinto beans, and lima beans."
1-2	**Investigation 3:** Solids in Bottles	Within this investigation, students will use a funnel to place particulate solids into bottles, observe the appearance and sounds of particulate solids, and compare and contrast the properties of particulate solids with liquids.
1-2	**Investigation 3:** Solids in Bottles	Students will be able to employ the use of a funnel to distribute four particulate solids into bottles, observe and discuss the movement, sound, and appearance of the materials and compare them to liquids.
1-2	**Investigation 3:** Beads and Screens	In beads and screens, students use a model of three different sized screens to identify the correct screen(s) that a solid material could pass through. Then students read *Pouring* in the Science Resources.
3-4	**Investigation 4:** Solids and Water	In solids and water, students create mixtures of solids and water, examine and discuss changes while recording, graphing, and/or drawing observable changes.
3-4	**Investigation 4:** Liquids and Water	In liquids and water, students prepare bottles of various liquids with water, observe and discuss changes immediately and overnight after gently tipping and shaking the bottles.
3	**Investigation 4:** Toothpaste	In the toothpaste investigation, students prepare an investigation while utilizing their knowledge of properties of solids and liquids to

	Investigation	help determine whether toothpaste is a solid or liquid.

Resources for this Unit

Lawrence Hall of Science Team, F. (Ed.). (2015). *Solids and Liquids Investigations Guide* (Next Generation ed.). CA: Delta Education.

Unit Title	**Insects and Plants**
Unit Description	This unit provides first graders with the opportunity to delve into concepts related to life science. While observing the life cycle of insects and a plant, students focus on structure, the function of living things, observe the development of plants and insects, discover the interactions of some insects with their environment, create models of their learning, and utilize cross-curricular concepts of cause and effect and structure and function.
Essential Questions & Enduring Understandings	<u>Essential Questions</u> What do mealworms need to live? How do mealworms grow and change? What are the stages of a beetle's life cycle? How did we plant the brassica seeds? How does a young plant change as it grows? What will happen to the flowers on the brassica plants? Where is a good outdoor place for growing young plants? What do silkworms need to live? How does a silkworm compare to a mealworm? What is the life cycle of the silkworm? What evidence is there that insects are eating plants in the schoolyard? What do caterpillars do? How is a painted lady pupa different from a silkworm pupa? What is the life cycle of a painted lady butterfly? What plants in our schoolyard have pollen? <u>Enduring Understandings</u> "In order to live, insects need air, food, water, and space." "Living organisms need to be treated with care and respect." "Mealworms resemble each other." "Insects have characteristic structures and behaviors." "The structures of some insects change as the insect grows." "As insects grow, they molt their hard, external covering." "Adult insects have a head, thorax, and abdomen." A beetle's life cycle includes the egg, larva, pupa, and adult; the adult produces eggs.

	"During different stages of development, insects have predictable characteristics." "Plants are living organisms that need water, air, nutrients, light, and space to grow." "Plants produce seeds that develop into new plants that look like the parent plant." Growing plants acquire roots, stems, leaves, buds, flowers. and seeds as it grows through the life cycle. Some insects such as butterflies, moths, and bees and birds assist in plant growth by transporting pollen from flowers; they assist in the process of producing seeds. The development of plants takes place in a sequence called the life cycle. A plant is a living organism; in order to grow, it needs air, water, light, nutrients, and space. Some animals disperse seeds from one location to another. Different insects have their needs for air, food, water, space, and shelter met in different ways. Insect structures change as insects grow. Insects molt their exoskeleton while growing. Insects go through a complete metamorphosis. A butterfly's life cycle includes a metamorphosis of egg, larva, pupa, adult, and produce eggs. Butterflies pupate and construct chrysalises during this stage. Living organisms experience different life cycles.

PA Core Standards	Assessment Anchors
3.1.1.A.1, 2 & 5 3.1.1.B1 3.2.1.B6 3.1.2.A3 & 5 3.1.2.C2 3.2.2.B, C 3.2.1.B5 3.2.2.B6	There are no assessment anchors at this grade level

Key Unit Vocabulary	Mealworms: *abdomen, adult, air, antenna, bran, darkling beetle, dead, dropping, egg, exoskeleton, food, habitat, head, insect, larva, leg, life cycle, living, mealworm, molt, molting, observe, organism, pupa, segment, space, stage, structure, thorax, water* Brassica Plants: *brassica, bud, fertilizer, flower, fruit, germinate, leaf, light, nutrient, plant, pollen, pollination, root, seed, seedling, seedpod, soil, sprout, stem* Silkworms: *clasper, cocoon, engineering, evidence, eyespot, metamorphosis, mulberry leaf, proleg, silk, silkworm, spinneret, spiracle* Butterflies: *butterfly, caterpillar, chrysalis, nectar, offspring, painted lady, predict, waste*

Learning Objectives – *The student will…*	Assessment Opportunities
observe a mealworm's structure and its behaviors, attend to the needs of the mealworm by providing, air, space, food, water while monitoring its growth over a period of time.	Science Notebook Entry Participation in investigation through discussion and exploration
engage in mini lessons that include observations of new changes in the life cycle, observe and acquire new vocabulary related to changes in the life cycle such as: molting, pupation, adults, and mating, identify three body parts, and create models of the stages of a mealworm's life cycle.	Science Notebook Entry Performance Assessment Participation in investigation through discussion and exploration
witness small mealworm larvae in the class "adult" habitat.	Science Notebook Entry Investigation 1 I-Check
plant brassica seeds in soil, provide water	Science Notebook Entry

and continuous light.	Participation in investigation through discussion and exploration
identify different stages of the brassica plant life cycle including germination, growth, and flowering, view a video, and observe and record plant changes while gleaning the environmental aspects that promote plant growth.	Science Notebook Entry Performance Assessment Participation in investigation through discussion and exploration
identify the change of brassica flowers into a seed pods, harvest seeds, explore the importance of fruit, seeds, and flowers to a plant's life cycle.	Science Notebook Entry
identify outdoor locations where young plants can grow, plant and observe seeds and seedlings, identify flowers, seedpods and seeds on school property.	Investigation 2 I-Check
generate and share observations of silkworm eggs in vials, set up a habitat for silkworm larvae.	Science Notebook Entry Participation in investigation through discussion and exploration
construct a habitat for silkworm larvae, articulate observations during the course of the silkworm life cycle, illustrate drawings of silkworms and larval structures.	Science Notebook Entry Participation in investigation through discussion and exploration
investigate silkworms in the stages of the life cycle, perceive the different stages as they mature.	Science Notebook Entry Participation in investigation through discussion and exploration
observe, monitor, illustrate and describe a painted lady caterpillar as it eats, moves, and molts at the larval stage until it pupates.	Performance Assessment Participation in investigation through discussion and exploration
assist in transferring painted lady pupae into an enclosed net.	Science Notebook Entry Participation in investigation through discussion and exploration

witness butterflies feeding at a sugar water fountain", observe tiny larvae as the life cycle begins again, explore the life cycles of a frog, hear a nonfiction text regarding the life cycle of fish, frogs, ducks, and mice.	Science Notebook Entry
revisit and describe the important roles of some living organisms and how they contribute to cross-pollination. Search the schoolyard, observe changes (if any) in flowers planted in the school yard, and make and record observations.	Investigation 5 I-Check Performance Assessment Participation in investigation through discussion and exploration

Sequence of Teaching and Learning		
Number of Lessons/ Blocks	Lesson Topic	Lesson Activities
1-2	**Investigation 1:** Mealworms	Within this investigation, students observe the structures of a mealworm larvae, learn about and provide the necessary components that the mealworm larvae need to survive, and begin monitoring several mealworms
89\]8-9	**Investigation 1:** Larva, Pupa, Adult	During this investigation, students monitor and participate in several mini lessons as the mealworm larvae changes and grows; discussions and observations involve concepts related to molting, pupation, and adults. During the adult stage, students learn and label the three body parts of the insect: head, thorax, and abdomen. Observations, illustrations, and comparisons of the insect occur as it progresses through the life cycle.
3-4	**Investigation 1:** Life Cycle	Students watch tiny larvae from the class mealworm habitat.

1-2	**Investigation 2:** Planting Brassica	Students observe a brassica seed, plant two seeds in soil, provide the appropriate water, and place the planting cup under a light.
4-5	**Investigation 2:** Observing Brassica Growth	Observations related to germination, growth, and flowering of the brassica plant takes place. Students monitor and record observations and participate in discussions related to pollination and environmental conditions that support germination.
3	**Investigation 2:** Plant Life Cycle	Within this investigation, students observe that flowers on a brassica plant change and seedpods grow in their place; seeds become harvested from the seedpods and through text, students identify the importance that fruit, seeds, and flowers have towards a plant's life cycle.
1-2	**Investigation 2:** Planting Outdoors	Students identify places where seedlings can grow; they plant seeds and seedlings, and make observations of growth, flowers, seedpods, and seeds.
2-3	**Investigation 4:** Eggs and Larvae	During these investigations, students make observations of silkworm eggs and larvae. Silkworm larvae remain in a class habitat with their food.
4	**Investigation 4:** Silkworm Structures	Groups of students create a silkworm habitat for the purpose of making observations at a close proximity; students share and articulate their observations through detailed illustrations and labels of the larval stage.
4	**Investigation 4:** Pupae and Adults	Additional investigations allow for students to view silkworms as they mature and produce silk, spin cocoons, emerge as adults, and lay eggs; these observations help generate

		discussions that reinforce students' understanding of the life cycle.
2-3	**Investigation 4:** Plant Eaters	Students participate in a schoolyard search "for evidence that plants have been eaten by insects or small animals."
3-4	**Investigation 5:** Caterpillars	During these investigations, students see painted lady caterpillars at the larval stage, identify structures, and begin monitoring its behavior as it east, molts, and moves until the caterpillar pupates.
1	**Investigation 5:** Chrysalises	Within this investigation, students participate in transferring painted lady pupae to an enclosed netted container where it stays until it emerges as a butterfly.
5-6	**Investigation 5:** Adult Butterflies	As the painted lady butterflies emerge, continued observations take place as the insect eats. At this time, students may discover eggs, and if some hatch, additional larvae will appear; this fosters an environment in which the life cycle of a butterfly becomes reinforced.
3	**Investigation 5:** Flower Powder	Through a video, students participate in a review of the role birds and insects assist in pollinating flowers; students search for flowers rich with pollen and butterflies and insects participating in cross pollination; then students build pollinators in order to test the shape and materials for the collection of pollen.

Resources for this Unit

Lawrence Hall of Science Team, F. (Ed.). (2015). *Insects and Plants Investigations Guide* (Next Generation ed.). CA: Delta Education.