

SCIENCE

LENGTH OF TIME: One semester

GRADE LEVEL: Kindergarten

DESCRIPTION OF COURSE:

This course consists of two units from Amplify Science, Lawrence Hall of Science, Berkeley, CA.

- 1) The Pushes and Pulls: Designing a Pinball Machine unit will help students master disciplinary core ideas in physical science while supporting students' development of key science practices such as planning and carrying out investigations, analyzing and interpreting data, designing solutions to problems, and making explanations. The unit incorporates an explicit focus on the crosscutting concept of Cause and Effect, with opportunities to address the crosscutting concept of Structure and Function.
- 2) The Needs of Plants and Animals: Milkweed and Monarchs unit will help students master disciplinary core ideas in life science while supporting students' development of key science practices such as planning and carrying out investigations, analyzing and interpreting data, constructing explanations, and designing solutions to problems. The unit incorporates an explicit focus on the crosscutting concept of Systems and System Models, with opportunities to address the crosscutting concept of Patterns; Scale, Proportion, and Quantity; and Structure and Function.

Both units provide substantial experience with Pennsylvania's Common Core State Standards (PACCSS) for English Language Arts (ELA) as they relate to reading and writing informational text. The unit includes opportunities to address some PACCSS for Mathematics, with optional extensions that allow further standards coverage.

COURSE STANDARDS:

PA Academic Standards for Science and Technology and Engineering Education (Grades Pre-K-3)

A. Biological Sciences (3.1)

Students will:

1. Explain that living things can only survive if their needs are being met (3.1.2.C2)
2. Describe the basic needs of living things and their dependence on light, food, air, water, and shelter. (3.1.3.A2)
3. Describe the different resources that plants and animals need to live. (3.1.4.A2)
4. Recognize that plants survive through adaptations, such as stem growth towards light and root growth downward in response to gravity. (3.1.3.C1)

B. Physical Sciences (3.2)

Students will:

1. Explain how movement can be described in many ways. (3.2.3.B1)
2. Observe and describe how pushes and pulls change the motion of objects. (3.2.1.B1)
3. Explore how energy's ability to cause motion or create change. (3.2.3.B2)
4. Explore how energy can be found in moving objects, light, sound, and heat. (3.2.3.B2)

C. Science as inquiry (3.1.K.A9, 3.1.K.B6, 3.1.K.C4, 3.2.K.A6, 3.2.K.B7, 3.3.K.A7, 3.3.K.B3, 4.1.K.F, 4.2.K.D, 4.3.K.C, 4.4.K.E, 4.5.K.F)

PA Academic Standards for Environment and Ecology (PreK-3)

Ecology (4.1)

Students will:

1. Observe and describe what happens to living things when needs are met (4.1.K.E)
2. Recognize the importance of conserving natural resources (4.3.K.B)

PERFORMANCE ASSESSMENTS/EXPECTATIONS:

- 1) Pushes and Pulls: Through critical juncture assessments and end of unit assessments, students will demonstrate achievement of the standards by:
 - Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
 - Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
 - 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.
 - 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.
 - Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
- 2) Needs of Plants and Animals: Through critical juncture assessments and end of unit assessments, students will demonstrate achievement of the standards by:
 - Use observations to describe patterns of what plants and animals (including humans) need to survive.
 - Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.
 - Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
 - Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.

- 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.
- 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.

TITLES OF UNITS:

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|--------------------------------|------------------|
| 1. Pushes and Pulls | Marking Period 3 |
| 2. Needs of Plants and Animals | Marking Period 4 |

SAMPLE INSTRUCTIONAL STRATEGIES:

Each kindergarten unit contains an extensive selection of varied instructional strategies for the teacher to integrate into the classroom.

MATERIALS:

1. Materials contained in each Amplify kit
2. Chromebooks for simulations

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Peer helpers/parent helpers
2. Special projects
3. Cooperative groups
4. Extra teacher assistance
5. Outside presenters

METHODS OF EVALUATION:

1. Completed Investigation Notebook pages
2. Critical juncture assessments
3. End of unit assessments

INTEGRATED ACTIVITIES/CROSS CUTTING CONCEPTS:

- 1) Pushes and Pulls
 - Do. Students have multiple opportunities to investigate connections between observable causes and effects, such as seeing the effect of exerting a strong force or gentle force on a ball.
 - Talk. Each investigation is followed by opportunities for student-to-student talk through which students develop an understanding of the mechanisms that connect those causes to their effects—exerting a gentle force results in moving the ball a shorter distance than exerting a strong force.

- Read. In *Forces in Ball Games*, the unit's reference book, students read about forces in different games that involve balls. Students analyze what caused a force to be exerted and the effect of that force.
- Write. Students write a mini-book that explains why the pinball moves the way it does. Students' explanations include a description of the effect of a specific kind of force that is exerted.
- Visualize. Throughout the unit, students focus on visualizing the movement that one might expect after a specific kind of force is exerted.

2) The Needs of Plants and Animals

- Do. Students observe different plant parts and consider how they work together as a system.
- Talk. Students engage in student-to-student talk each time they gather evidence, either from hands-on investigations or text. Many of the prompts focus on providing time for students to discuss the relationship between plants and animals in their habitats, between plant parts and the whole plant, etc.
- Read. In *A Plant in the Desert*, students read about how desert plants get the water they need. This helps students integrate the concept of dependencies that comprise a system of interacting parts—plant roots, water, the whole plant.
- Write. Students connect causes and effects in oral and written explanations with the support of explanation language frames—sentence structures that support linking specific causes and mechanisms to effects by using the words *so* or *because*.
- Visualize. The class watches time-lapse videos of plants growing and look through a reference book that shows many different plants and the different plant parts, including the shape of the roots. This is something that you can't ordinarily see.