SCIENCE

LENGTH OF TIME: One semester

GRADE LEVEL: 3

DESCRIPTION OF COURSE:
This course is broken into three units:

1) The Balancing Forces: Investigating Floating Trains unit will help students master disciplinary core ideas in physical science while supporting students' development of key science practices such as developing and using models, analyzing data, and constructing scientific explanations. The unit incorporates an explicit focus on the crosscutting concept of Stability and Change, with opportunities to address the crosscutting concepts of Patterns and Cause and Effect.

2) The Environments and Survival: Snails, Robots, and Biomimicry unit will help students master disciplinary core ideas in life science while supporting students' development of key science practices such as developing and using models, constructing evidence-based explanations, and designing solutions. The unit incorporates an explicit focus on the crosscutting concept of Structure and Function, with opportunities to address the crosscutting concept of Systems and System Models.

3) The Weather and Climate: Establishing an Orangutan Reserve unit will help students master disciplinary core ideas in Earth science while supporting students' development of key science practices such as analyzing and interpreting data, evaluating evidence, and constructing arguments. The unit incorporates an explicit focus on the crosscutting concept of Patterns with opportunities to address the crosscutting concepts of Scale, Proportion, and Quantity and Stability and Change.

All three 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 3, 5, 6, 8)

A. 3.1 Biological Sciences

Students will:

1. Understand that plants and animals closely resemble their parents. (3.1.3.B)
2. Describe features that are observable in both parents and their offspring. (3.1.4B1)

3. Recognize that reproduction is necessary for the continuation of life. (3.1.4.B2)
4. Differentiate between inherited and acquired characteristics of plants and animals. (3.1.5.B1)
5. Describe animal characteristics that are necessary for survival. (3.1.3.C3)
6. Recognize that fossils provide us with information about living things that inhabited the Earth long ago. (3.1.3.C3)

B. Physical Sciences (3.2)
Students will:

1. Explain how movement can be described in many ways. (3.2.3.B1)
2. Explore how energy can be found in moving objects, light, sound, and heat. (3.2.3.B2)
3. Explain how an object's change in motion can be observed and measured. (3.2.4.B1)
4. Identify types of energy and their ability to be stored and changed from one form to another. (3.2.4.B2)
5. Explain how mass of an object resists change to motion. (3.2.5.B1)
6. Examine how energy can be transferred from one form to another. (3.2.5.B2)

C. Earth and Space Sciences
Students will:

1. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. (3.3.3.A5)
2. Connect the various forms of precipitation to the weather in a particular place and time. (3.3.3.A4)

D. Science as inquiry (3.1.3.A9, 3.1.3.B6, 3.2.3.C4, 3.2.3A6, 3.2.3.B7, 3.3.3.A7, 3.3.3B3, 4.1.3.F, 4.2.3.D 4.3.3.C, 4.4.3.E)

PA Academic Standards for Environment and Ecology (Grades 3-8, 10, 12)
Students will:

1. Identify organisms that are dependent on one another in a given ecosystem. (4.5.3.D)
2. Explain how specific adaptions can help organisms survive in their environment. (4.5.4.D)
3. Explain that ecosystems change over time due to natural and/or human influences. (4.1.4.E)
4. Identify resources humans take from the environment for their survival. (4.5.3.A)

PERFORMANCE ASSESSMENTS/EXPECTATIONS:

1) Balancing Forces

- Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

- Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- Define a simple design problem that can be solved by applying scientific ideas about magnets.

2) Environments and Survival

- Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
- Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
- Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

3) Weather and Climate

- Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
- Obtain and combine information to describe climates in different regions of the world.
- Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

TITLES OF UNITS:

1. Balancing Forces — First Quarter
2. Environments and Survival — First-Second Quarter
3. Weather and Climate — Second Quarter

SAMPLE INSTRUCTIONAL STRATEGIES:

Each third grade unit contains an extensive selection of varied instructional strategies fo 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 assistance/parent helpers
2. Special projects
3. Cooperative groups

METHODS OF EVALUATION:

1. Completed Investigation Notebook pages
2. Critical juncture assessments
3. End of unit assessments
4. Notation in science notebooks

INTEGRATED ACTIVITIES / CROSS CUTTING CONCEPTS:

1) Balancing Forces

- Do. Students are challenged to use magnetic force to counterbalance the force of gravity by making a magnet float and then by making a paper clip float.
- Talk. Multiple opportunities for student-to-student talk engage the class in figuring out what they can infer about the forces acting on objects based on the positions of those objects either being stable or changing.
- Read. Students read a book about hover boards and reflect on when the forces on the hover board are unbalanced (causing the position of the objects to change) and when they are balanced (resulting in objects whose positions are stable).
- Write. During the course of the unit, students write several scientific explanations explaining how a floating train works, taking into account when the train is moving and when it is stable.
- Visualize. Through developing diagrams, students work to visualize the invisible forces acting on objects that cause the position of those objects to change or remain stable.

2) Environments and Survival

- Talk. Multiple opportunities for student-to-student talk engage the class in figuring out how traits for different structures affect an organism's likelihood of survival in an environment. By the end of the unit, students present oral arguments describing how the structures employed in their robot designs function to meet the design criteria.
- Read. Students read a book about different mouth structures in a variety of organisms to discover how each structure functions to help the organism survive. In their role as biomimicry engineers, students also read about different examples of structures in organisms that have provided engineers with inspiration for their design solutions.
- Write. Students write explanations of how organisms' structures function in a given environment, based on digital models they have created.

- Visualize. Students observe structures in fossilized organisms and visualize how each structure may have functioned in environments long ago to help organisms survive. Students also use diagrams in text and in a digital simulation to visualize the function of structural traits in different organisms in order to inspire ideas for designs that solve problems.

3) Weather and Climate

- Do. Students create a physical line plot with their bodies, using data cards about orangutan heights. Students then use this same data to create line plots to compare male and female orangutan heights. Through these activities, students are introduced to the idea of using line plots to find patterns in data.
- Talk. A formalized group-based discourse routine focused on discussing evidence engages the class in using patterns in temperature and precipitation to predict what the weather in a place will continue to be like.
- Read. Students read What's Going On with the Weather, a text that compares the pattern of temperature in San Francisco to Boston's temperature pattern. Students reflect on how the pattern of temperatures in both cities compares to the pattern of temperature in their own location.
- Write. During the course of the unit, students write several scientific arguments about which of three islands has weather most like the weather where orangutans live. Students propose which island is the best place for an orangutan reserve, using their understanding of weather patterns.
- Visualize. Students work with graphs and charts, which are visual representations of weather over time. Making weather over time visual allows students to compare weather patterns across distinct locations.