SWALLOW SCHOOL DISTRICT CURRICULUM GUIDE	
Curriculum Area: Science	**Course Length**: Full Year
Grade: 4th Grade	**Date Last Approved:** March 15, 2018; **Reviewed:** Spring 2021

Stage 1: Desired Results

Course Description and Purpose: In fourth grade science, there are four units. In the first unit, Input/Output Computer Systems which students will study about how technology works through programming by making a connection to the human brain and nervous system. In the second and third units Motion, Force, and Models/Energy: Collisions students will study the Conservation of Energy including the transfer of energy and forces. In our final unit Soils, Rock, and Landforms, students will study rocks and minerals.

Enduring Understanding(s):

- There are a variety of forces acting upon objects at all times affecting motion.
- The motion of an object is affected by forces.
- Energy is necessary for change to occur in matter
- Energy can be stored, transferred, and transformed, but cannot be destroyed.
- Potential energy can be stored in many ways and is released as kinetic energy.
- Engineers propose a solution to develop for a design problem after evaluating multiple possible designs.
- Contact forces transfer energy during a collision, resulting in a change in the object's motion.
- Rocks and minerals are a valuable natural resource that are useful based on their individual properties.
- Rocks and minerals are constantly being recycled and reformed through the processes of the rock cycle.
- The many minerals are the building blocks for all inorganic materials that make up the Earth.
- The characteristics of rocks and minerals present on Earth today provide clues to the geological history of our planet.
- Computers are systems of inputs, outputs, and processors that can perform many tasks very quickly.
- The display on a digital screen corresponds to an x-y coordinate system.
- Computer programs do not need to be right the first time. Testing and fixing things is normal when programming.

Essential Question(s):

- What makes objects move the way they do?
- How are potential and kinetic energy related?
- What happens to energy during a collision?
- How do materials cycle through the Earth's systems?
- Something about cycles or geologic time or relationships.
- How are properties used to identify, sort, and classify rocks and minerals?
- What kind of simple tools are used to help determine the properties and how are the tools used?
- How does acid rain affect rocks that contain calcite?
- What kinds of rocks would be a good choice for building material? Why?
- How does a computer system work?
- How do humans translate a problem so that a computer can operate on it?
- What are the advantages that technology offers to humans that allow us to accomplish things we couldn't do without technology?

Learning Targets:

1. Students can apply the scientific process to evaluate investigations or the design process to create design solutions to solve a problem. (Skill/Product)
2. Students can organize and communicate information. (Skill)
3. Students can develop and interpret models. (Skill/Product)
4. Students can support a claim with evidence. (Skill/Product/Reasoning)

Stage 2: Learning Plan

I. Launch Input/Output Computer Systems

A. Input, Processing and Output
B. Information Highway
C. Data Collection and Display

Standards Referenced:

3-5-ETS1-1
3-5-ETS1-2
3-5-ETS1-3

Learning Targets Addressed:

Science Target 1
Science Target 3
Science Target 4
RLA Target 2

Key Resources Used:

- PLTW
- Tynker

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Explain why computer scientists break big problems into subproblems. ● Identify parts of a computational solution that can be abstracted and modularized in order to make the solution efficient and generalizable. ● Identify basic input and output devices in computer systems. ● Give examples of real-life applications of computer systems.
Formative	Skills/ Reasoning	● Decompose a problem and use a predefined set of commands to write an algorithm that will solve the problem. ● Demonstrate the correct use of the x-y coordinate system when manipulating object positions and movement on a screen during an animated solution ● Use variables appropriately as part of a computational solution to store and manipulate values that may change as the program runs ● Implement a loop when appropriate to make a program repeat a section of code until an ending condition is reached. ● Use a conditional statement in a program as a true/false test to make the program follow a specified sequence of steps depending on the state of the condition. ● Program characters in an animation or game to respond to event triggers.

Summative	Product	• Program characters in an animation game to respond to event triggers. • Create a video/blog about the human brain and how it reacts to outside stimuli.

II. Motion, Force, and Models/ Energy: Collisions

A. Energy
B. Potential and Kinetic Energy
C. Transfer of Energy
D. Forces of Energy

Standards: 4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4, 3-5-ETS1-1, 3-5-ETS1-2, and 3-5-ETS1-3

Learning Targets Addressed:

Science Target 1
Science Target 3
Science Target 4
RLA Target 2

Key Resources Used:

- FOSS
- Launch

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	• Vocabulary derived from nonfiction reading and other materials to gain knowledge about a topic. • State questions that engineers may ask when gathering information about a situation people want to change. • List ways in which energy can be transferred
Formative	Skills/ Reasoning	• Provide evidence that energy can be transferred from place to place. • Classify energy in a system as potential or kinetic energy. • Explain, citing evidence, the relationship between the speed of an object and the energy of that object. • Predict the transfer of energy as a result of a collision between two objects. • Plan and perform fair tests in which variables are controlled to identify a product's strengths and limitations. • Generate multiple solutions to a design problem while taking into account criteria and constraints.
Summative	Product	• Design, test and refine a restraint system that transfers energy from

			one form to another.

III. Soils, Rocks and Landforms

A. Schoolyard Rock
B. Mineral Hardness
C. Other Mineral Properties
D. Minerals in Granite

Standards: 4-ESS1-1, 4-ESS2-1

Learning Targets Addressed:

Science Target 1
Science Target 3
Science Target 4
RLA Target 2

Key Resources Used:

- FOSS

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	• Earth is mainly made of rock. • Rocks on the earth's surface are constantly being broken down into smaller and smaller pieces, from mountains to boulders, stones, pebbles and small particles that make up soil. • Rocks can be sorted based on properties, such as shape, size, color, weight or texture. • Properties of rocks can be used to identify the conditions under which they were formed. • Igneous rocks are formed when melted rock cools, hardens and forms crystals. Melted rock that cools slowly inside a volcano forms large crystals as it cools. Melted rock that cools rapidly on the earth's surface forms small crystals (or none at all). • Sedimentary rocks are formed underwater when small particles of sand, mud, silt or ancient shells/skeletons settle to the bottom in layers that are buried and cemented together over a long period of time. They often have visible layers or fossils. • Metamorphic rocks are formed when igneous or sedimentary rocks are reheated and cooled or pressed into new forms. They often have bands, streaks or clumps of materials. • Rock properties make them useful for different purposes. Rocks that can be cut into regular shapes are useful for buildings and statues; rocks that crumble easily are useful for making mixtures such as

			concrete and sheetrock. ● All rocks are made of materials called minerals that have properties that may be identified by testing. ● Mineral properties include color, odor, streak, luster, hardness and magnetism. ● Minerals are used in many ways, depending on their properties. For example, gold is a mineral that is easily shaped to make jewelry; talc is a mineral that breaks into tiny grains useful for making powders.
	Formative	Skills/ Reasoning	● Teacher observations ● Rock information organizer for each type of rock – igneous, sedimentary, and metamorphic ● Maintain responses to investigations and discussions in student's science notebook ● Mock Rocks Response Sheet ● Scratch Test Response Sheet ● Mineral Properties Response Sheet ● Calcite Quest Response Sheet ● Performance Assessment Scratch Test ● Performance Assessment Vinegar Test
	Summative	Product	● Rocks and Minerals Unit Assessment ● Constructed Response- What are the three types of rocks and how are they formed? ● Constructed Response- Describe the process in which earth materials change. ● Constructed Response- Draw conclusions and defend the best uses for several (3 or more) rock properties. ● Differentiate between rocks and minerals. ○ Use the senses and simple measuring tools to gather data about various rocks and classify them based on observable properties (e.g., shape, size, color, weight, visible markings). ● Conduct simple tests to determine properties of different minerals (e.g., color, odor, streak, luster, hardness, magnetism), organize data in a table, and use the data and other resources to identify unknown mineral specimens. ● Summarize nonfiction text to compare and contrast the conditions under which igneous, metamorphic and sedimentary rocks are formed. ● Observe and analyze rock properties

			(e.g., crystal size or layers) to infer the conditions under which the rock was formed. ● Evaluate the usefulness of different rock types for specific applications (e.g., construction, countertops, statues or monuments).