SWALLOW SCHOOL DISTRICT CURRICULUM GUIDE	
Curriculum Area: **Science**	Course Length: Full Year
Grade: **6th**	Date Last Approved: June 2015

Stage 1: Desired Results

Course Description and Purpose:

The sixth grade science curriculum has a heavy emphasis on the physical sciences. The year starts with a unit on Customary and Metric (SI) units of measurement while applying these skills in a lab based setting. The year continues with a study of Space Systems, Weather and Climate and touches on the life sciences in a unit on Ecosystems. The physical sciences are covered extensively in units on Forces and Interactions, Energy and Properties of Waves. All areas of study require students to engage in lab based experiences applying science process skills, mathematical and computational thinking.

Enduring Understanding(s):

1. Gravitational forces are always attractive. There is a gravitational forces between any two masses this force is dependent upon the mass of the object.
2. Forces can be seen as something that changes the energy of a system.
3. Interactions can be attractive or repulsive. Their sizes may depend on distance, magnitude of the charge/current or magnetic strengths.
4. Newton's Third Law which states: for any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in opposite direction. For every action there is an equal and opposite reaction.
5. Where there is a change in the energy of motion, the result will be a change in a resulting energy. When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.
6. The total energy of a system depends on the types, states and amounts of matter present within the system.
7. A simple wave has a repeating pattern with a specific wavelength, frequency and amplitude. When waves interact with matter, they can be reflected, transmitted or a combination of both. Waves that are transmitted can be refracted.
8. Digitized signals are a more reliable way to encode and transmit information.
9. Patterns of interactions can be recognized among organisms in an ecosystem.
10. Biotic and abiotic factors in an ecosystem effects the population.

Essential Question(s):

1. How are gravitational interactions and mass related?
2. How are forces and energy related?
3. How do objects physically interact?
4. How can the transfer of energy be explained with scientific laws?
5. How can we use energy to understand changes?
6. How are the different forms of energy affected by variables?
7. What are the characteristic properties of waves and how do they interact with matter?
8. How are waves used to send digital information?
9. What factors interact and influence weather and climate?
10. How is energy transferred between the sun, oceans and atmosphere?
11. How does a system of living and nonliving things operate to meet the needs of organisms in an ecosystem?

Learning Targets:

1. Students can plan, implement, and evaluate investigations utilizing the scientific process. (Skill/Product)
2. Students can apply mathematics and computational thinking. (Skill)
3. Students can research, evaluate, and communicate information. (Skill/Product)
4. Students can assess the relationship between structure and function. (Reasoning)
5. Students can assess key issues in nonfiction texts. (Reasoning)
6. Students can develop and analyze models. (Skill/Product)
7. Students can analyze scientific issues and support their claims with evidence. (Reasoning)

Stage 2: Learning Plan

I. Measurement and the Metric System (SI system)

A. Customary and Metric Units (SI)
B. Conversions
C. Lab equipment applications
D. Attending to precision

Standards: Laboratory skill development

Learning Targets Addressed:
Targets 2
Target 3
Target 4
Target 5
Target 6

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Students can determine which kind of measurement is called for and select the appropriate tool to use. ● Independently measure to within the stated accuracy expectation and use the correct label. ● Students can correctly convert a given measurement from customary to metric and vice versa.
Formative	Skill	● Students can correctly use and accurately measure with a given measurement tool.
Summative	Skill	● Given a measurement task, (i.e. length, mass,liquid volume, temperature, etc.) students can demonstrate proficiency by measure to within the stated accuracy.

II. Space Systems

A. Place in the solar system
B. Motion of the Earth
C. Instruments and Technology
D. Scientific Theories of Universe Development

Standards: MS-ESS1-1, MS-ESS1-2, MS-ESS1-3

Learning Targets Addressed:
Target 1
Target 2
Target 3
Target 4
Target 5
Target 6
Target 6

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Students can research and create a presentation about one of the major bodies (planets, dwarf planets, moons, stars, etc.) in the known universe. ● Given text, students can explain the leading theories about how the universe and its components were formed.
Formative	Knowledge, Product	● Given a diagram, students can correctly identify the major bodies in our solar system. ● Using models, students can correctly show the motion of the Earth in space and around the sun. ● Students will create a scale model of the solar system in regard to relative planet size. ● Students can explain the reason for and functions of various space instruments (i.e. Hubble, satellites, probes, ISS).
Summative	Knowledge, Reasoning	● Students can summarize the unique qualities of the planets in the solar system. ● Students can explain the movements of the Earth in space and connect these movements to day/night, seasons and years. ● Students can defend a claim about which space programs (if any) should be funded by NASA.

III. Weather and Climate

A. Water's influence on weather
B. Weather Models
C. Energy transfer (sun, ocean, and atmosphere)
D. Weather factors

Standards: MS-ESS2-4, MS-ESS2-5, MS-ESS2-6, MS-ESS3-1, MS-ESS3-2

Learning Targets Addressed:
Target 2
Target 3
Target 5
Target 6

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Students will review the water cycle in connection with how and why clouds form and how condensation eventually results in various forms of precipitation. ● Students will determine that the Earth's energy originates in the sun which in turn transfers energy to the oceans and

		atmosphere. ● Students will monitor a homemade barometer of the course of a month and determine the effects that changes in pressure have on future weather.
Formative	Knowledge, Skill	● Students will collect weather data over the course of the unit, noting such factors as temperature, wind speed and direction, precipitation, cloud cover and barometric pressure. ● Given text, students will investigate the various types of severe weather, what causes them and how to be safe in each case.
Summative	Skill, Knowledge	● Students will correctly interpret weather data to make an accurate forecast. ● Students will summarize the effects that air masses and fronts have on future weather, noting patterns over time.

IV. Ecosystems

A. Needs of organisms in ecosystems
B. Matter and energy flow in ecosystems
C. Interactions within ecosystems
D. Biotic and abiotic factors
E. Biodiversity and animal reproduction

Standards: MS-LS2-1, MS-LS2-2, MS-LS2-3, MS-LS2-4, MS-LS2-5

Learning Targets Addressed:
Target 1
Target 3
Target 4
Target 5
Target 7

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Given text, students will explain and label diagrams to show their understanding of energy flow in ecosystems. ● Students will investigate biodiversity and animal interactions within ecosystems at a local zoo.
Formative	Knowledge, Skill	● Students will determine how biotic and abiotic factors affect the carrying capacity of a population. ● Students will conduct a dissection of an owl pellet to investigate the flow of matter and energy in an ecosystem.
Summative	Product, Reasoning	● Students will research and create a presentation explaining an invasive species and its impact on ecosystems. ● Students will determine what, if anything, should be done about an invasive species and recommend step to

		implement their finding.

V. Forces and Interactions

A. Types of forces (gravitational, magnetic, electrical)
B. Newton's Laws (to include colliding objects)
C. Forces and Energy transfer
D. Interaction between objects in a system

Standards: MS-PS2-1, MS-PS2-2, MS-PS2-3

Learning Targets Addressed:
Target 1
Target 2
Target 4
Target 5
Target 6
Target 7

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge Product	● Students will analyze vehicle data to recommend which vehicle would be safest. ● Given text, students will determine the effects of various types of forces, including gravity and magnetism. ● Students will create sketches or diagrams to show their understanding of Newton's laws of motion.
Formative	Skill	● Students will conduct a series of experiments with carts, ramps and track to measure and explain Newton's laws of motion. ● Students will calculate vehicle speed in various situations. ● Students will conduct a series of experiments to determine the effects that speed, mass, and center of mass have on collisions.
Summative	Knowledge, Reasoning	● Students will differentiate between Newton's laws of motion and how they apply to everyday life (especially as it applies to vehicle safety). ● Students will evaluate the features of vehicles to determine which is safest and recommend, with reasons, which is best to purchase.

VI. Energy

A. Energy transfer
B. Kinetic and Potential energy
C. Relationship between force and energy

Standards: MS-PS3-1, MS-PS3-2, MS-PS3-3, MS-PS3-4, MS-PS3-5

Learning Targets Addressed:
Targets 1

Target 6
Target 7

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge	● Given text, students can determine and draw examples of the difference between kinetic and potential energy. ● Students can compare and contrast various sources of energy that humans create and use. After this, they will evaluate alternative energy sources.
Formative	Skill	● Students can complete a bounce height lab using a golf ball to determine the relationship between force and energy. ● Students can determine the cause of changes in energy transfer of different surfaces.
Summative	Knowledge, Reasoning	● Students will create diagrams and explai the difference between kinetic and potential energy. They will use data collected during labs as evidence to support their claim. ● Students can evaluate alternative energy sources and defend their claim as to which is best for humans in the future and why.

VII. Waves

A. Properties of waves
B. Wave Interactions
C. Digital information

Standards: MS-PS4-1, MS-PS4-2, MS-PS4-3

Learning Targets Addressed:
Target 1,
Target 2
Target 3
Target 6
Target 7

Assessment Map:

Type	Level	Assessment Detail
Practice	Knowledge, Skill	● Given text and/or online resources, students can identify the properties of waves. ● Given text, students can identify and define the various types of waves. ● Students can identify how certain types o waves (radio, microwave, infrared) can transmit digital information. This could include cell phones, satellites, radios and

		remote controls.
Formative	Skill	● Students can complete labs using Slinkies and string/yarn to create longitudinal and transverse waves and measure wavelength. They will also use this equipment to demonstrate different kinds of wave interactions. ● Given diagrams, students can identify properties of various types of waves, including the different electromagnetic waves.
Summative	Knowledge, Skill	● Students will summarize the properties of various types of waves. ● Students will explain common uses of electromagnetic waves. ● Students will use Slinkies and/or string and yarn to demonstrate the properties of and differences between transverse and longitudinal waves.