Shrewsbury Borough School District
Science Curriculum Guide
Grade 6
Revised 2016

Mission Statement:

The mission of the Shrewsbury Borough School District, a system built on successful cooperation among family, school and community, is to prepare all students to achieve excellence and to become responsible citizens through rigorous educational programs consistent with New Jersey Core Content State Standards and which respect individual differences and diversity. Students will be prepared to meet the challenges presented in the regional high school and the world beyond.

Shrewsbury Borough School's Curriculum Writing Committee:

Approved by Shrewsbury Borough Board of Education:
August 2015

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Shrewsbury Borough School District
Science Curriculum Guide
2015

Implementation: September 2015
Course Philosophy:

Students in middle school develop understanding of a wide range of topics in Earth and space sciences that build on science concepts from elementary school through more advanced content, practice, and crosscutting themes. There are three Earth and space science standard topics in grade six: Earth's Place in the Universe, Earth's Systems, and Climate. The content of the performance expectation is based on current community-based geoscience literacy efforts such as the Earth Science Literacy Principles1, and is presented with a greater emphasis on an Earth systems science approach. The performance expectations strongly reflect the many societal relevant aspects of Earth and space sciences (resources, hazards, environments impacts) and related connections to engineering and technology.

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Course Description:

The grade six Earth and Space sciences curriculum will focus on four main areas: Beyond Earth, Geologic History of Earth, Earth's Systems, and Weather and Climate. The performance expectations in Earth's Place in the Universe help students formulate answers to the questions: "What makes up our solar system and how can the motion of Earth explain seasons and eclipses?" Middle school students can examine Earth's place in relation to the solar system, Milky Way galaxy, and universe. Additional questions students will address include: "How do people figure out that Earth and life on Earth have changed over time?" and "How does the movement of tectonic plates impact the surface of Earth?" Students can examine geoscience data in order to understand the processes and event in Earth's history. The performance expectations in Earth's Systems help students formulate answers to the questions: "How do the materials in and on Earth's crust change over time?" and "How does water influence weather, circulate in the oceans, and shape Earth's surface?" Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Additionally, students will investigate the factors, which interact and influence weather and climate. The performance expectations in Earth and Human Activity help students formulate answers to the questions: "How can natural hazards be predicted?" and "How do human activities affect Earth systems?" Students understand the ways that human activities impact Earth's other systems.

Scope and Sequence

Shrewsbury Borough School District
Science Curriculum Guide
2015

Course Title: **Earth and Space Sciences**	Grade Level: **6**
Units:	

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Unit **1** Overview
Unit Title: Beyond **Earth**
Grade Level: 6
Recommended Pacing: 3 months; block scheduling
Unit Summary: Earth orbits the Sun as the solar system revolves with the Milky Way, which is among billions of galaxies that make up the universe. Even though scientists have learned a great deal about the Moon and planets from telescopes, they want to learn more by sending spacecraft.

NGSS:

MS-EESS1: Earth's Place in the Universe

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

MS-4 Energy

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer. * [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.]

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

Unit 1
ISTE Standards:

1. a-d Creativity and Innovation-Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes through technology.

2. a-d Communication and Collaboration- Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

3. a-d Research and Information Fluency- Students apply digital tools to gather, evaluate, and use information.

4. a-d Critical Thinking, Problem Solving, and Decision Making –Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Science and Engineering Practices:

Developing and Using Models

Analyzing and Interpreting Data

Constructing Explanations and Designing Solutions

Unit 1 Essential Questions:

How have people modeled the solar system?

Why is gravity important in the solar system?

What are the properties of the sun?

What is known about the terrestrial planets?

What is known about the gas giant planets?

How are Earth's days, years, and seasons related to the way Earth moves in space?

How do Earth, the moon, and the sun affect each other?

What can we learn from space images?

How do we explore space?

What are some milestones of space exploration?

Unit 1 Learning Targets ***Students will be able to…***	**Unit 1 Learning Targets** ***Students will do…***
- make sense of a given phenomenon, students develop a model of the Earth-moon-sun system in which they identify the relevant components - describe the relationships and interactions between components of the solar and galaxy systems using their model - use patterns observed from their model to provide causal accounts and make predictions for events, including: moon phases, eclipses, and seasons - use the model to describe what gravity is, the pattern it causes, why some objects do not orbit, and describe what a given phenomenon might look like without gravity - how to use quantitative analyses to describe similarities and differences among solar system objects by describing patterns of features of those objects at different scales and draw conclusions about the identifying characteristics of different categories of solar system objects based on their	- develop and use a model to describe phenomena - read for content mastery - develop and use content related vocabulary - analyze and interpret data to determine similarities and differences in findings - cite specific textual evidence to support analysis of science and technical texts - complete a variety of laboratory activities to support the content - write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content - build and launch a model rocket - model Earth's seasons

Unit 1 – Evidence of Learning	

Formative Assessments:

- Glencoe Level Red Textbook Entry-Level Assessments: Target Your Reading – (TB anticipation guide) Chapters 14 & 15
- Reading Checks and Section Reviews
- Exit tickets
- Lab work
- Homework
- Brain POP quizzes
- Various content related models
- Analyze and share evidence about a particular planet concentrating on data such as surface features, object layers, orbital radii, composition, structure, etc.

Summative Assessments:

- Glencoe Level Red Textbook Chapter tests: 14 & 15
- Lab work
- PBL assignment: - Could NASA set up a colony on the moon?
- Glencoe Level Red LAB: CH 15- Design Your Own – Space Colony

Lab Activities:

- Glencoe Level Red Launch Lab: How many stars are in the sky?
- Gizmos labs: Moonrise, Moonset, and Phases; Orbital Motion – Kepler's Laws; Solar System Explorer; Seasons: Earth, Moon, and Sun
- Glencoe Level Red Virtual Lab: CH 14 - *How does an artificial satellite stay in orbit?;* CH 15 - *What are the dimensions of the solar system?*
- Chapter 14 UV Spectra Lab
- Chapter 14 Wonderopolis – What Can Satellites Do? Video and print text
- Chapter 15 Gizmo – HR Diagram
- Glencoe Level Red Video Lab: CH 14 - *Model Visible Light Seen Through Nebulae; CH* 15 - *Space Colony*
- Modeling the Moon's Motions and Phases (Science Boreal Kit)
- Glencoe Level Red Mini Lab: CH 15 - Modeling Earth's Seasons
- Build and launch a model rocket using ESTES kits (Spring)

Unit 1 - Materials/Equipment:
Required Lab Materials: Estes model rocket kits, graph paper, rice, black construction paper, shaded lamp, globe, safety glasses, UV beads, pipe cleaners, snack size Ziploc bags, SPF+ lotion
Materials/Equipment/Resources: Gizmos subscription, Quizlet subscription, Brain POP subscription, Glencoe Level Red series, Teachers Domain video clips, Science Fusion series – Space Science, Nasa.gov, Mr. Parr science songs, Science Boreal Modeling Motions of the Moon kit, Smart Board, student chromebooks

Unit 2 Overview
Unit Title: Geologic History of Earth
Grade Level: 6
Recommended Pacing: 3 months – block scheduling
Unit Summary: Only a small number of minerals make up most of Earth's rocks. Rock, fossils, and other types of natural evidence are used to study Earth's history and measure geologic time.

NGSS:

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

ISTE Standards:

1.a-d Creativity and Innovation-Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes through technology.

2. a-d Communication and Collaboration- Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

3. a-d Research and Information Fluency- Students apply digital tools to gather, evaluate, and use information.

4. a-d Critical Thinking, Problem Solving, and Decision Making –Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

Science and Engineering Practices:

- Constructing Explanations and Designing Solutions

- Analyzing and Interpreting Data

- Developing and Using Models

- Asking Questions and Defining Problems

Unit 2 Essential Questions:

How do we learn about Earth's history?

What are the main types of rocks?

What is the rock cycle?

How are the relative ages of rocks measured?

What is the geologic time scale?

What are the forces within Earth that cause movement of Earth's plates?

What are the four main types of mountains?

Unit Learning Targets ***Students will be able to…***	**Unit Learning Targets** ***Students will do…***
- articulate a statement that relates the given phenomenon to a scientific idea, including how events in the Earth's 4.6 billion-year-old history are organized relative to one another using the geologic time scale - construct an explanation to describe how the relative order of events is determined on the geologic time scale using rock strata and major events in the Earth's history and/or specific changes in fossils over time - use reasoning to connect the evidence and support an explanation for how the geologic time scale is used to construct a timeline of the Earth's history - develop and use a model in which they identify and describe the relationships between the relevant components including: general types of Earth materials, energy from the sun, energy from the Earth's hot interior, relevant earth processes, and the temporal and spatial scales for the system	- read for content mastery - develop and use content related vocabulary - cite specific textual evidence to support analysis of science and technical texts - complete a variety of laboratory activities to support the content - write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content - view various content related videos - model the fossil record - create a fossil flipbook - model Pangaea - model the process of deposition that forms sedimentary rock layers

Unit 2 - Evidence of Learning
Formative Assessments: - Glencoe Level Red Textbook CH 9 & 10 Section Entry-Level Assessments: Target Your Reading – (TB anticipation guide) - Glencoe Level Red Textbook CH 9 & 10 Section Reading Checks and Section Reviews - Fusion – The Dynamic Earth Module E Unit 2 Idea Wheels – Lesson 1 - Fusion – The Dynamic Earth Module E Unit 2 Lesson Reviews - Lab Work - Homework - Exit tickets - Brain POP quizzes - Various content related models

Summative Assessments:

Glencoe Level Red Chapters 9& 10 assessments

Fusion – The Dynamic Earth Module E Unit 2 Chapter assessments

Fusion – The Dynamic Earth Module E Unit 2 Lesson quizzes

Fusion – The Dynamic Earth Lab Manual Unit 2 Lesson 4 – Timeline of Earth's History

Lab Reports

Lab Activities:

- Fusion – The Dynamic Earth Lab Manual Unit 2 Lesson 1 Quick Lab – Modeling the Fossil Record
- Fusion – The Dynamic Earth Lab Manual Unit 2 Lesson 1 Quick Lab – Fossil Flipbook
- Model Pangaea and research the related theories (binder activity)
- Fusion – Daily Demos: Clay Fossils & Cast in Wax
- Fusion – The Dynamic Earth Lab Manual Unit 2 Lesson 2 Quick Lab – Layers of Sedimentary Rock
- Gizmos Lab – Building Pangaea
- Science Tasks with Otis and Flask (TPT – Fossils)

Unit 2 - Materials/Equipment:

Required Lab Materials: 2 L plastic bottles w/caps, funnel, gravel, magnifying lens, mixing bowl, potting soil, coarse sand, safety goggles, colored pencils unlined white paper, Pangaea cutouts, index cards, stopwatch, buttons with holes, thread, clay, shallow-small plastic containers, candles, matches, small knife
Materials/Equipment/Resources: Quizlet subscription, Brain POP subscription, Gizmos subscription, Science Fusion Module E components, Mr. Parr Science songs (Minerals Song), Learn 360 video – Mountains and Mountain Building Process, Glencoe Level Red series, Glencoe Earth Science series, Teachers Domain videos, Smart Board, student chromebooks, resources to provide descriptions of the geologic history of several areas