7-Science (2016)

Wright City R-II
Science
Grade 7, Duration 1 Year, 1 Credit
Required Course

Course Description

This science course will explore several scientific topics that are grouped together primarily in five larger groups. These units consist of Weather & Climate, Energy, Force & Motion, Astronomy, and Engineering Technology. Laboratory investigations and hands on activities will be utilized to deepen student understanding by allowing them to solve real world problems by researching, constructing models, applying scientific principles, and analyzing results.

Scope and Sequence

Timeframe	Unit	Instructional Topics
6 Week(s)	Measurement/Inquiry	1. Making Measurements 2. Experimental Design
6 Week(s)	Weather & Climate	1. Hydrologic Cycle 2. Air Masses/Fronts/Pressure Systems 3. Atmospheric/Oceanic Circulation 4. Earth and Human Activity
6 Week(s)	Energy	1. Types of Energy 2. Energy Transformations 3. Electric and Magnetic Forces
6 Week(s)	Force & Motion	1. Calculating/Graphing Speed 2. Measuring Force/Newton's Laws
6 Week(s)	Astronomy	1. Earth Sun Moon System 2. Earth-Sun System (Seasons) 3. Role of Gravity in the Solar System and the Galaxy
6 Week(s)	Engineering and Design	1. Defining/Analyzing Criteria and Constraints of a Problem/Solution 2. Design Analysis/Comparing Designs

Prerequisites

Completion of 6th Grade Science Course

Course Instructional Resources/Textbook

This course is not supported by a specific text. Most, if not all, resources will be online.

Course Details

UNIT: Measurement/Inquiry -- 6 Week(s)

Unit Description
Scientific inquiry includes the ability of students to formulate a testable question and explanation, and to select appropriate investigative methods in order to obtain evidence relevant to the explanation. Students will gather evidence by making observations using a variety of techniques/tools. Lastly, students will communicate their results while also justifying their explanations.

Enduring Understandings/Essential Learner Outcomes

-I can measure length to the nearest centimeter (cm)
-I can measure mass to the nearest gram (g)
-I can measure volume to the nearest (mL)
-I can measure temperature to the nearest degree Celsius (C°)
-I can write a testable question as well as a hypothesis.
-During an experiment, I can identify the independent and dependent variable
-During an experiment, I can use collected data to create a data table and generate a graph to communicate results.
-During an experiment, I can use data to evaluate their conclusion.
-I can evaluate the design of an experiment, and make suggestions for improvements in the experimental design.

TOPIC: Making Measurements -- 3 Week(s)

Description
Students will measure length, mass, volume, temperature, and density using the appropriate tools, units, and methods. Once measurements have been taken, students will use various prefixes(ie. kilo-, centi-,milli-, etc) to convert them into different appropriate values.

Academic Vocabulary (What terms will students need to know?)
length
mass
volume
density
temperature
meter stick
triple beam balance
graduated cylinder
meter
liter
gram
water displacement method
LxWxH
Degrees Celsius

Learning Targets

The student will measure length to the nearest millimeter. (also convert to and from various metric prefixes)

Students will use meter sticks to measure various lengths and properly record their data. Emphasis on identifying how lengths compare considering their prefix.

Assessment: Lab
Performance

I can measure mass to the nearest gram. (also convert to and from various metric prefixes)

Students will use triple beam balances to measure the mass of various objects and properly record their data. Emphasis on identifying how different masses compare considering their prefix.

Assessment: Performance

The student will measure the volume of an object to the nearest milliliter.

Student will use LxWxH and the water displacement method to find the volume of various objects.

Assessment: Performance
Lab

The student will measure the density of various objects by measuring the mass, volume, and using the formula D=m/v.

Students will measure temperature to the nearest degree Celsius using a thermometer.

Several measurements will be made of substances at different temperatures. Students will also learn to identify thermometer readings.

Assessment: Lab
Performance

The student will convert metric measurements between all prefixes including kilo-, centi-, and milli-, by manipulating decimal placement.

Assessment: Performance

TOPIC: Hydrologic Cycle -- 1 Week(s)

Description
What are the Earth's systems(ie. Atmosphere, Hydrosphere, Geosphere, Cryosphere)??

Academic Vocabulary (What terms will students need to know?)
energy
atmosphere

Learning Targets

Students will be able to evaluate the design of an experiment and make suggestions for improvements.
Students will be able to identify the independent variable and dependent variable within an experiment.
Students will use collected data to create a data table and generate a graph to communicate results.
Students will use data provided from an investigation to evaluate their conclusion.

UNIT: Weather & Climate -- 6 Week(s)

Unit Description
This unit will provide a deeper understanding of what drives the planet’s weather cycle. The unit will focus on types of weather, but will investigate primarily why we have changing weather on Earth. This will consist of understanding how heat is transferred throughout the atmosphere, how the rotation of the Earth can actually spin up weather systems, and also how weather and climate are two completely different concepts.

Enduring Understandings/Essential Learner Outcomes
-What are the Earth’s systems??
-What are the states of matter??
-What is the difference between condensation, evaporation, and precipitation??
-What energy does the Sun provide??
-What is the hydrological cycle??
-What are the Earth’s systems(ie. atmosphere, hydrosphere, geosphere)??
-What are the states of matter??
-What is the difference between condensation, evaporation, and precipitation??
-What energy does the Sun provide??
-What is the hydrological cycle??

Academic Vocabulary
-weather
-precipitation
-evaporation
-condensation
-front
-atmosphere
-air mass

TOPIC: Hydrologic Cycle -- 1 Week(s)

Description
What are the Earth's systems(ie. Atmosphere, Hydrosphere, Geosphere, Cryosphere)??
What energy does the Sun provide Earth with??

Academic Vocabulary (What terms will students need to know?)
energy
atmosphere
hydrosphere
geosphere
cryosphere

Learning Targets

I can identify and differentiate between the atmosphere, geosphere, cryosphere, and hydrosphere.
SC.6-8.ESS2.4

I can describe and identify precipitation, condensation, evaporation, runoff, and groundwater.
SC.6-8.ESS2.4

Students will be able to describe and model how water moves through the hydrologic cycle.
SC.6-8.ESS2.4

I can use evidence to explain that Earth's resources are distributed by geologic processes/human activity.
Assessment: Open Response
SC.6-8.ESS3.1

TOPIC: Air Masses/Fronts/Pressure Systems -- 2 Week(s)

Description
Students will research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses cause changes in the weather.

Academic Vocabulary (What terms will students need to know?)
-weather -air masses
-temperature -weather maps
-pressure
-humidity
-precipitation
-wind
-high pressure
-low pressure

Learning Targets

I can identify that pressure is a quality of air and different pressures have certain characteristics.
Assessment: Class Discussion/Participation
SC.6-8.ESS2.5

I can compare the behavior and effects of high pressure vs. low pressure systems.
Assessment: Lab
SC.6-8.ESS2.5

I can analyze the effects of multiple types of fronts and how they affect weather conditions.
SC.6-8.ESS2.5

I can analyze weather maps to determine types of weather that are present due to interaction of air masses.
Assessment: Stations Lab
SC.6-8.ESS2.5

I can analyze weather data to make a forecast future weather events. (Tornadoes & Hurricanes)
Assessment: Class Discussion/Participation
SC.6-8.ESS3.2

TOPIC: Atmospheric/Oceanic Circulation -- 2 Week(s)

Description
Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Learning Targets

I can explain how a convection current circulates gas(air) or liquid in terms of density.
SC.6-8.ESS2.6

I can identify and analyze how circulation in the atmosphere and ocean is driven by the sun and spin of the Earth.
SC.6-8.ESS2.6

I can use a model of atmospheric and oceanic circulation to describe how the movements are creating a pattern.
SC.6-8.ESS2.6

I can create a model that illustrates how atmospheric and oceanic circulation cause regional climates.
SC.6-8.ESS2.6

I can identify factors that affect regional climate as latitude, proximity to large bodies of water, elevation, and geographic features.
SC.6-8.ESS2.6

TOPIC: Earth and Human Activity -- 1 Week(s)

Description
This topic will discuss how humans have affected Earth's natural systems and resources. It will also address the issues of human response/intervention to these disruptions.

Academic Vocabulary (What terms will students need to know?)
Non-renewable resource
Renewable Resource
weathering
natural hazards
forecast
catastrophic
mitigate

Learning Targets

I can explain how past processes have resulted in the uneven distributions of the Earth's resources(mineral, energy, and groundwater)
SC.6-8.ESS3.1

I can describe resources as renewable or non-renewable due to factors such as the long amount of time it takes to form or that it has only been formed a few times in Earth's history.
SC.6-8.ESS3.1

UNIT: Energy -- 6 Week(s)

Unit Description
This unit will explore the multiple types of energy as well as how they interact with each other. We will be using investigations to understand how these transformations take place and how they affect our everyday lives.

Enduring Understandings/Essential Learner Outcomes
Upon completion of this unit, students will be able to differentiate between multiple types of energy, observe and measure the transfer of energy within a system, design/construct objects that either maximize or minimize this transfer, and use graphical displays to communicate these transfers.

Academic Vocabulary
Energy
Potential Energy
Kinetic Energy
Average Speed

Thermal Energy
Mass
Temperature

TOPIC: Types of Energy -- 2 Week(s)

Description
This topic will explore the multiple types of energy and how they differ from each other.

Academic Vocabulary (What terms will students need to know?)
energy
potential energy
kinetic energy
thermal energy
sound energy
radiant energy
chemical energy
nuclear energy
gravitational energy
mechanical energy

Learning Targets

I will differentiate between potential energy and kinetic energy.
SC.6-8.PS3.1

I will describe how energy cannot be created or destroyed but only transforms to other types.

I will that during an energy transformation, heat is often transferred from one object to another because of a difference in temperature.

TOPIC: Energy Transformations -- 2 Week(s)

Description
This topic will require students to observe/measure amounts of energy as it moves from one place to another within a system. (Thermal Energy Transfer or PE and KE)

Academic Vocabulary (What terms will students need to know?)
convection
conduction
radiation
law of conservation of energy
heat loss

Learning Targets

I will measure/evaluate the amount of energy in a substance by the amount of thermal energy it adds to water.

Assessment: Presentation

SC.6-8.PS3.4

I will describe kinetic energy and potential energy as having an inversely proportional relationship.

Assessment: Class Response System

SC.6-8.PS3.5

I can create a conceptual model to describe the change in potential energy within a system.

Assessment: Project

SC.6-8.PS3.2

I can design a device that either minimizes or maximizes thermal energy transfer. (1 of 3)

Assessment: Project

SC.6-8.PS3.3

I can construct a device that either minimizes or maximizes thermal energy transfer. (2 of 3)

Assessment: Project

SC.6-8.PS3.3

I can create an electromagnet with varying strengths by using multiple designs.

Assessment: Lab

SC.6-8.PS3.3

TOPIC: Calculating/Graphing Speed -- 2 Week(s)

Description
This topic focuses primarily on the measuring the motion of objects.

Academic Vocabulary (What terms will students need to know?)
speed
distance (multiple units)
time (multiple unit)
constant speed
average speed
meters per second

Learning Targets

I will build and diagram multiple circuits(series and parallel)

Assessment: Performance
SCI.7.1.2.A.m SCI.7.1.2.A.n

I can create an electromagnet with varying strengths by using multiple designs.

Assessment: Lab
SC.6-8.PS2.3

I can conduct an investigation to provide evidence that ***ELECTRIC*** fields exist between objects that are not in contact.

Assessment: Lab
SC.6-8.PS2.5

I can conduct an investigation to provide evidence that ***MAGNETIC*** fields exist between objects that are not in contact.

Assessment: Lab
SC.6-8.PS2.5

UNIT: Force & Motion -- 6 Week(s)

Unit Description
This unit will investigate the fact that motion is not possible without forces. We will talk about the laws that explain this, and also discuss some of the forces that work against motion. We're also going to learn how to measure force and motion using instruments with some hands on lab activities.

Enduring Understandings/Essential Learner Outcomes
-Students will be able to identify/test/investigate how the change in an object's motion is entirely dependent on the sum of the forces acting on the object.
-Students will be able to use graphical displays to communicate all of their observations/results.

Academic Vocabulary
Force
Speed
Newton
Unbalanced Force
Balanced Force
Newton's Laws
Frame of reference
Electromagnetism

TOPIC: Calculating/Graphing Speed -- 2 Week(s)

Description
This topic focuses primarily on the measuring the motion of objects.

Academic Vocabulary (What terms will students need to know?)
speed
distance (multiple units)
time (multiple unit)
constant speed
average speed
meters per second

Learning Targets

I will calculate the speed of an object using the formula s=d/t with a focus on speed units.
SCI.7.2.1.A.c

I will interpret a line graph representing an object's motion in terms of distance over time.
SCI.7.2.1.A.d

I will create/pair a distance vs time graph with an appropriate scenario.

TOPIC: Measuring Force/Newton's Laws -- 4 Week(s)

Description
This topic will focus on using a spring scale to measure the force acting on an object as well as investigate how Newton's Laws of Motion govern how objects move.

Academic Vocabulary (What terms will students need to know?)
Force
Newton's 1st Law
Inertia
Newton's 2nd Law
Newton
Newton's 3rd Law
Gravity

Learning Targets

I will measure the amount of newtons(force) that is acting on an object by using a spring scale.
Assessment: Lab
SC.6-8.PS2.2

I will apply Newton's Laws to various scenarios and explain how each are being used.
SC.6-8.PS2.2

I can design a solution that minimizes the force acting on an object during a collision.
SC.6-8.PS2.1

I can develop an evaluation of the design solution used to minimize the force acting on an object during a collision.
SC.6-8.PS2.1

UNIT: Astronomy -- 6 Week(s)

Unit Description
This unit will discuss and explain most of the observable properties in the universe. It will also allow you to predict most of the motions that happen in our solar system and throughout the universe. All celestial bodies will be categorized and the distances between them will be measured.

Enduring Understandings/Essential Learner Outcomes
-Students will use models of the 'Earth-Sun' and 'Earth-Moon-Sun' system to explain ALL cyclical patterns of motion and the consequences of each.
-Students will explain/model that gravity is the root cause of ALL motion in the Solar System/Milky Way/Universe

Academic Vocabulary
Gravity
Orbit
Axial Tilt
Lunar Phases
Moon
Planet
Star

TOPIC: Earth Sun Moon System -- 2 Week(s)

Description
Develop and use a model of the Earth Sun Moon system to explain the cyclical patterns of the lunar phases and eclipses of the sun and moon. (Examples of models can be physical, physical, or conceptual and should emphasize relative positions and distances.)

Academic Vocabulary (What terms will students need to know?)
rotation
revolution
eclipse
orbit
new moon
full moon
first quarter
last quarter
waxing
waning
gibbous
crescent

Learning Targets

I will describe how the shadows on the moon are caused by it's orbit around the Earth.

Assessment: Lab
SC.6-8.ESS1.1

I will create a model to illustrate the phases of the moon.

Assessment: Project
SC.6-8.ESS1.1

I will create a model to illustrate the locations of the Earth, moon, and Sun during both lunar eclipses and solar eclipses.

Assessment: Project
SC.6-8.ESS1.1

I will observe how the change in the amount of sunlight changes depending on the time of year by creating a graph.

Assessment: Rubric
SC.6-8.ESS1.2

-I can use actual distances within the Solar System to create a small scale version.

Assessment: Lab
SC.6-8.ESS1.4

TOPIC: Earth-Sun System (Seasons) -- 2 Week(s)

Description
Develop and use a model of the Earth-Sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.

Academic Vocabulary (What terms will students need to know?)
axial tilt
seasons
latitude
tropic of cancer
tropic of capricon
equator

Learning Targets

I will explain that the sole cause of seasons on Earth is the axial tilt of the Earth

Assessment: Class Discussion/Participation

SC.6-8.ESS1.2

I will describe the axial tilt of the Earth as the reason that some parts receive more sunlight than others.

Assessment: Research

SC.6-8.ESS1.2

I will create a model that illustrates that the earth receives different amount of sunlight in different areas due to its axial tilt.

Assessment: Project

SC.6-8.ESS1.2

I will observe how the change in the amount of sunlight changes depending on the time of year by creating a graph.

Assessment: Rubric

TOPIC: Role of Gravity in the Solar System and the Galaxy -- 2 Week(s)

Description
Develop and use a model to describe the role of gravity in the motions within the galaxies and the solar system. Emphasis for the model is on gravity as the force that holds together the whole solar system and Milky Way galaxy and controls orbital motions within them.

Academic Vocabulary (What terms will students need to know?)
solar system
galaxy
orbital
gravity
universe

Learning Targets

I will describe how gravity is the sole reason that solar systems and galaxies are held together.

Assessment: Class Discussion/Participation

SC.6-8.ESS1.3

I will develop a model that describes how gravity holds the solar system together.

Assessment: Project

SC.6-8.ESS1.3

I will develop a model that describes how gravity holds the Milky Way galaxy together.

Assessment: Project

SC.6-8.ESS1.3

I can create a graph that indicates the relationship between the force of gravity on an object and its mass and distance from other objects.

Assessment: Project

SC.6-8.PS2.4

UNIT: Engineering and Design -- 6 Week(s)

Unit Description
This unit will require students to identify various problems in science/society and design successful solutions by developing, modeling, and testing their design. A focus on testing and recognizing design constraints will allow them to better understand how the engineering process works.

Enduring Understandings/Essential Learner Outcomes
-Students will design multiple solutions to real world problems.
-Students will analyze data from design tests to find improvements to or all new designs.
-Students will use create a systematic process that will allow them to evaluate how well a specific design meets the criteria.
-Students will identify the best characteristics of designs and combine them to create an even better solution.

Academic Vocabulary
Design
Constraint
Criteria
Iterative Testing
Optimal

TOPIC: Defining/Analyzing Criteria and Constraints of a Problem/Solution -- 3 Week(s)

Description
This topic will focus on the student's ability approach a real world problem analytically so that they can design an appropriate solution that meets the given criteria.

Academic Vocabulary (What terms will students need to know?)
Design
Criteria
Solution
Constraint
Analyze

Learning Targets

I can describe how criteria and constraints within a design problem have to be considered when creating a solution.

Assessment: Class Discussion/Participation

SC.6-8.ETS.1

I can use multiple sources to take a position in a well-written essay.

Assessment: Written Document/Paper

SC.6-8.ESS3.5

TOPIC: Design Analysis/Comparing Designs -- 3 Week(s)

Description
This topic will require students determine similarities and differences among several design solutions to identify which characteristics can be combined into other designs. It will also require students to modify an existing object, tool, or process to optimize its effectiveness.

Academic Vocabulary (What terms will students need to know?)
Optimize
Similarities
Differences
Modification
Systematic

Learning Targets

I can use a systematic process to compare multiple design solutions to determine how well they solve the problem.
SC.6-8.ETS.2

I can use tests to collect data that will help me generate ideas of how to modify a design.
Assessment: Research
SC.6-8.ESTS.4

I can identify/combine the best characteristics of multiple designs to create a new solution to better meet the criteria for success.
Assessment: Research
SC.6-8.ETS.3