

Course Title: Science – Grade 7
Board Approval Date: 11/18/13
Credit / Hours: N/A

Course Description:

This course focuses on mastery of the PA Academic Standards for Science and Technology. The focus of this course is on Life Science. As students progress through this course they will participate in a systematic study of scientific inquiry, cells, genetics, change over time, classification of living things, unicellular organisms, and multicellular organisms.

Life Science at the Middle School constructs a foundation of a scientific understanding of the workings of living things through cell structure, cell function, and genetics and an appreciation of the complexity of the living things sharing life on earth with us. Through vocabulary building, we prepare students to better understand current events in the ever-changing fields of biotechnology and health science.

Learning Activities / Modes of Assessment:

Large group instruction	Tests and Quizzes
Laboratory experiments	Checklists / Teacher Observation
Small group work/discussion	Projects with Rubrics
Computer simulations	Lab Reports / Write-ups
Various websites	Summarizing activities
Homework	PSSA practice questions and curricular bell ringers
Hands-on activities	CDT testing

Instructional Resources:

Science Explorer: The Nature of Science and Technology (Prentice Hall, 2007) (including online access)
Science Explorer: Cells and Heredity (Prentice Hall, 2007) (including online access)
Science Explorer: From Bacteria to Plants (Prentice Hall, 2007) (including online access)
Science Explorer: Animals (Prentice Hall, 2007) (including online access)
Various instructional videos and educational websites
Laptops
Vernier Labquests and variety of probeware
Discovery Education video services
www.brainpop.com

Course Pacing Guide

Course: **Science – Grade Seven**

Course Unit (Topic)	Length of Instruction (Days/Periods)
1. Scientific Inquiry	25 days
2. Cells	40 days
3. Genetics	40 days
4. Change Over Time	10 days
5. Classification of Living Things	10 days
6. Unicellular Organisms	20 days
7. Multicellular Organisms	<u>20 days</u>
DAYS TOTAL	165 Days

Topic: 01 scientific inquiry

Days: 25

Subject(s): Science

Grade(s): 7th

Know:	Understand:	Do:
<p>Vocabulary</p> <p>Observing, Quantitative observation, Qualitative observation, Inferring, Predicting, Classifying, Making models, Scientific inquiry, Hypothesis</p> <p>Variable, Independent variable, Dependent variable, Controlled variable, Controlled experiment, Operational definition, Data, Scientific theory, Scientific law, Skepticism</p> <p>Concepts:</p> <p>Skills used by scientists, essential components of scientific inquiry, tools and techniques of measuring, metric system</p>	<p>Science is a way of thinking and of analyzing the world.</p>	<p>SI.5-7.1 – Essential Understand how theories are developed.</p> <p>SI.5-7.2 – Essential Identify questions that can be answered through scientific investigations and evaluate the appropriateness of questions.</p> <p>SI.5-7.3 – Essential Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.</p> <p>SI.5-7.4 – Essential Describe relationships using inference and prediction.</p> <p>SI.5-7.5 – Essential Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.</p> <p>SI.5-7.6 – Essential Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.</p> <p>SI.5-7.7 – Essential Analyze alternative explanations and understanding that science advances through legitimate skepticism.</p> <p>SI.5-7.8 – Essential Use mathematics in all aspects of scientific inquiry.</p> <p>SI.5-7.9 – Essential Understand that scientific investigations may result in new ideas for study, new methods, or procedures for an investigation or new technologies to improve data collection.</p>

Topic: 01 scientific inquiry
Subject(s): Science

Days: 25
Grade(s): 7th

Know:	Understand:	Do:
		<p>S7.A.2.1.1 - Use evidence from investigations to clearly describe relationships and communicate and support conclusions.</p> <p>S7.A.2.1.2 - Identify a design flaw in a simple technological system and devise possible working solutions.</p> <p>S7.A.2.2.1 - Describe the safe and appropriate use of instruments and scales to accurately and safely make measurements under a variety of conditions.</p> <p>S7.A.2.2.2 - Apply measurement systems to record and interpret observations under a variety of conditions.</p> <p>S7.A.3.2.1 - Make inferences based on scientific models (e.g., charts, graphs, diagrams).</p>

Topic: 02 Cells

Days: 40

Subject(s): Science

Grade(s): 7th

Know:	Understand:	Do:
<p>Vocabulary:</p> <p>organelle, cell wall, cell membrane, nucleus, cytoplasm, mitochondria, endoplasmic reticulum, ribosome, Golgi body, chloroplasts, vacuole, lysosome, carbohydrates, proteins, lipids, cell, cell theory, microscope, amino acid, enzyme, nucleic acid, DNA, RNA, cell cycle, mitosis, prophase, metaphase, anaphase, telophase, cytokinesis, interphase, replication, respiration, photosynthesis, osmosis, diffusion, selectively permeable, active transport, passive transport, autotroph, heterotroph, pigment, chlorophyll, stomata, fermentation, chromosomes, mutation</p> <p>Concepts:</p> <p>Parts of the microscope, slide and sample preparation techniques, structure and function of cell organelles, macromolecules in the cell, steps of cell division, photosynthesis, and respiration, methods of transport across cell membranes</p> <p>3.1.7.A5. - FORM AND FUNCTION - Explain how the cell is the basic</p>	<p>The cell is the basic unit of life. Parts of a cell have specific functions.</p>	<p>3.1.7.A1. – Essential COMMON CHARACTERISTICS OF LIFE - Describe the similarities and differences of physical characteristics in diverse organisms.</p> <p>3.1.7.A2. – Essential ENERGY FLOW - Describes how organisms obtain and use energy throughout their lives.</p> <p>3.1.7.A5. – Essential FORM AND FUNCTION - Explain how the cell is the basic structural and functional unit of living things.</p> <p>3.1.7.A6. – Essential ORGANIZATION - Identify the levels of organization from cell to organism.</p> <p>3.1.7.A7. – Essential MOLECULAR BASIS OF LIFE - Compare life processes (e.g. growth, digestion) at the organism level with life processes at the cellular level.</p> <p>3.1.7.A8. – Essential UNIFYING THEMES - MODELS Apply the appropriate models to show interactions among organisms in an environment.</p> <p>SI.5-7.3 – Essential Design and conduct a scientific investigation and understand that current scientific knowledge guides scientific investigations.</p> <p>SI.5-7.5 – Essential Use appropriate tools and technologies to gather, analyze, and interpret data and understand that it enhances accuracy and allows scientists to analyze and quantify results of investigations.</p> <p>3.1.7.A4. – Essential CELL CYCLES - Explain how cells arise from pre-existing cells.</p>

Topic: 02 Cells

Days: 40

Subject(s): Science

Grade(s): 7th

Know:

Understand:

Do:

structural and functional unit of living things.

3.1.7.A6. -

ORGANIZATION -

Identify the levels of organization from cell to organism.

3.1.6.A2. - **ENERGY**

FLOW - Describe how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain from producers (plants) to consumers to decomposers.

3.1.6.A4. - **CELL**

CYCLES - Recognize that all organisms are composed of cells and that many organisms are unicellular and must carry out all life functions in one cell.

3.1.7.A4. - **CELL**

CYCLES - Explain how cells arise from pre-existing cells.

SI.5-7.6 – Essential

Develop descriptions, explanations, and models using evidence and understand that these emphasize evidence, have logically consistent arguments, and are based on scientific principles, models, and theories.

3.1.6.A8. - **UNIFYING THEMES - SCALE** Explain why the details of most cells are visible only through a microscope.

S7.B.1.1.2 - Describe how specific structures in living things (from cell to organism) help them function effectively in specific ways (e.g., chlorophyll in plant cells- photosynthesis; root hairs- increased surface area; beak structures in birds- food gathering; cacti spines-protection from predators).

3.2.7.A4. - **REACTIONS** - Describe how reactants change into products in simple chemical reactions.

Topic: 03 Genetics

Days: 40

Subject(s): Science

Grade(s): 7th

Know:

3.1.7.B4. – Compact BIOTECHNOLOGY - Describe how selective breeding and biotechnology can alter the genetic composition of organisms.

.Vocabulary:

genes, alleles, trait, chromosomes, heredity, genetics, fertilization, homozygous, heterozygous, Punnett square, dominant traits, recessive traits, phenotype, genotype, generation, offspring, purebred, hybrid, dominant alleles, recessive alleles, probability, codominance, multiple alleles, sex-linked gene, carrier, genetic disorder, pedigree, karyotype, selective breeding, inbreeding, hybridization, clone, genetic engineering, genome, meiosis, sex linked chromosomes

Concepts:

DNA structure, genes, chromosomes, and traits; Mendelian genetics; Punnett squares, genetic disorders, and genetic engineering

Understand:

DNA determines traits, and traits are inherited.

Do:

3.1.7.B1.a – Essential

HEREDITY - Explain how genetic instructions influence inherited traits.

3.1.7.B1.b – Essential

HEREDITY - Identify Mendelian patterns of inheritance.

3.1.7.B2. – Essential

REPRODUCTION - Compare sexual reproduction with asexual reproduction.

3.1.7.B5. – Essential

UNIFYING THEMES - PATTERNS Compare and contrast observable patterns in the physical characteristics across families, strains and species.

SI.5-7.8 – Essential

Use mathematics in all aspects of scientific inquiry.

3.1.7.B4. - BIOTECHNOLOGY - Describe how selective breeding and biotechnology can alter the genetic composition of organisms.
 S7.B.2.2.1 - Identify and explain differences between inherited and acquired traits.
 S7.B.2.2.2 - Recognize evidence that the gene is the basic unit of inheritance and explain the effect of dominant and recessive genes on inherited traits.
 S7.B.2.2.3 - Explain how mutations can alter a gene and are a source of new variations in a population.
 S7.B.2.2.4 - Describe how selective breeding or biotechnologies can change the genetic makeup of an organism (e.g., domesticated dogs, horses, cows; crops, hybrid plants; integrated pest management).

Topic: 03 Genetics
Subject(s): Science

Days: 40
Grade(s): 7th

Know:	Understand:	Do:
3.1.7.B2. - REPRODUCTION - Compare sexual reproduction with asexual reproduction.		

Topic: 04 Change Over Time

Days: 10

Subject(s): Science

Grade(s): 7th

Know:

3.1.7.C3. – Important
UNIFYING THEMES -
CONSTANCY AND
CHANGE Identify
evidence drawn from
geology, fossils, and
comparative anatomy
that provides the basis
for the theory of
evolution.

4.5.7.D.c – Compact
Explain how biological
diversity relates to the
ability of an ecosystem
to adapt to change.

4.5.7.D.d – Compact
Explain how an
adaptation is an
inherited, structure,
function, or behavior
that helps an organism
survive and reproduce.

3.1.5.C2. – Important
ADAPTATION - Give
examples of how
inherited characteristics
(e.g., shape of beak,
length of neck, location
of eyes, shape of teeth)
may change over time as
adaptations to changes in
the environment that
enable organisms to
survive.

Vocabulary:

species, fossil,
adaptation, evolution,
scientific theory, natural
selection, variation,
competition, selective
breeding, homologous
structures, branching
tree

Understand:

The theory of evolution
can be explained by
analyzing evidence
showing how organisms
change over time.

Do:

3.1.7.C2.a – Essential
ADAPTATION - Explain why the extinction of a
species may occur when the environment changes.

3.1.7.C2.b – Essential
ADAPTATION - Explain that mutations can alter a
gene and are the original source of new variations in a
population.

SI.5-7.1 – Essential
Understand how theories are developed.

3.1.7.C1. – Essential
NATURAL SELECTION - Describe how natural
selection is an underlying factor in a population's
ability to adapt to changes.

Topic: 04 Change Over Time
Subject(s): Science

Days: 10
Grade(s): 7th

Know:	Understand:	Do:
<p>Concepts:</p> <p>Darwin's voyage, natural selection, species definitions, fossil evidence, comparative anatomy and DNA analysis</p>		

Topic: 05Classification of living things

Days: 10

Subject(s):

Grade(s):

Know:

Understand:

Do:

Vocabulary

classification,
taxonomy, binomial
nomenclature, Linnaeus,
scientific name,
common name,
kingdom, phylum, class,
order, genus, species,
homeostasis

Concepts

Living things have
common characteristics

Classification systems
help scientists study
living things

3.1.7.A5. - FORM AND
FUNCTION - Explain
how the cell is the basic
structural and functional
unit of living things.

3.1.7.A6. -
ORGANIZATION -
Identify the levels of
organization from cell to
organism.

Classification systems
help scientists study
living things.

3.1.7.A1. – Essential

COMMON CHARACTERISTICS OF LIFE -
Describe the similarities and differences of physical
characteristics in diverse organisms.

3.1.7.A5. – Essential

FORM AND FUNCTION - Explain how the cell is the
basic structural and functional unit of living things.

3.1.7.A6. – Essential

ORGANIZATION - Identify the levels of organization
from cell to organism.

Topic: 06Unicellular Organisms

Days: 20

Subject(s):

Grade(s):

Know:

3.1.7.A3. – Compact
LIFE CYCLES -
 Explain why the life
 cycles of different
 organisms have varied
 lengths.

Vocabulary

binary fission, asexual
 reproduction, sexual
 reproduction,
 conjugation, endospore,
 decomposer, infectious
 disease, toxin, antibiotic,
 antibiotic resistance,
 vaccine, virus, host,
 parasite, bacteriophage,
 protein coat, active
 virus, hidden virus,
 antibodies, immune
 system, epidemic,
 protozoan, pseudopod,
 contractile vacuole,
 cilia, symbiosis,
 mutualism, algae, spore,
 diatom, dinoflagellate,
 euglenoid, algal bloom,
 slime mold,
 eutrophication

Concepts

Physical characteristics
 of virus, bacteria, and
 protists.

Life cycles of virus,
 bacteria, and protists

Examples of unicellular
 organisms

Understand:

Unicellular organisms
 are diverse and carry out
 all life functions in one
 cell.

Do:

3.1.7.A1. – Essential
COMMON CHARACTERISTICS OF LIFE -
 Describe the similarities and differences of physical
 characteristics in diverse organisms.

3.1.7.B2. – Essential
REPRODUCTION - Compare sexual reproduction
 with asexual reproduction.

SI.5-7.2 – Essential
 Identify questions that can be answered through
 scientific investigations and evaluate the
 appropriateness of questions.

SI.5-7.3 – Essential
 Design and conduct a scientific investigation and
 understand that current scientific knowledge guides
 scientific investigations.

SI.5-7.4 – Essential
 Describe relationships using inference and prediction.

SI.5-7.5 – Essential
 Use appropriate tools and technologies to gather,
 analyze, and interpret data and understand that it
 enhances accuracy and allows scientists to analyze and
 quantify results of investigations.

SI.5-7.8 – Essential
 Use mathematics in all aspects of scientific inquiry.

3.1.7.A3. - LIFE CYCLES - Explain why the life
 cycles of different organisms have varied lengths.
 3.4.8.E1. - MEDICAL TECHNOLOGIES - Analyze
 what technologies are used in genetic engineering
 and predict how it may change the future of
 medicine.

Topic: 06Unicellular Organisms

Days: 20

Subject(s):

Grade(s):

Know:

Understand:

Do:

Impact of specific unicellular organisms on other living things

3.1.6.A4. - CELL CYCLES - Recognize that all organisms are composed of cells and that many organisms are unicellular and must carry out all life functions in one cell.

3.1.6.A5. - FORM AND FUNCTION - Describe basic structures that plants and animals have that contribute to their ability to make or find food and reproduce.

3.1.7.B2. - REPRODUCTION - Compare sexual reproduction with asexual reproduction.

Topic: 07Multicellular Organisms

Days: 20

Subject(s):

Grade(s):

Know:

Understand:

Do:

3.1.7.A3. – Compact
LIFE CYCLES -
 Explain why the life
 cycles of different
 organisms have varied
 lengths.

Vocabulary

vertebrate, invertebrate,
 asymmetry, radial
 symmetry, bilateral
 symmetry, anterior,
 posterior, dorsal, ventral,
 locomotion, porifera,
 platyhelminthes,
 nematoda, annelida,
 cnidaria, mollusca,
 larva, polyp, medusa,
 colony, parasite, host,
 free-living organism,
 scavenger, closed
 circulatory system, open
 circulatory system, gill,
 gastropod, herbivore,
 carnivore, omnivore,
 cephalopod, arthropod,
 exoskeleton, molting,
 crustacean,
 metamorphosis,
 arachnid, chordate,
 notochord, ectotherm,
 endotherm, fish,
 amphibian, tadpole,
 lung, reptile, bird,
 mammal, invasive
 species

Concepts:

Diversity in
 multicellular organisms

Identification and
 description of structures

Multicellular organisms
 display great diversity in
 physical characteristics
 and of interactions in an
 environment.

3.1.7.A1. – Essential
COMMON CHARACTERISTICS OF LIFE -
 Describe the similarities and differences of physical
 characteristics in diverse organisms.

3.1.7.A2. – Essential
ENERGY FLOW - Describes how organisms obtain
 and use energy throughout their lives.

3.1.7.A8. – Essential
UNIFYING THEMES - MODELS Apply the
 appropriate models to show interactions among
 organisms in an environment.

3.1.7.A3. - LIFE CYCLES - Explain why the life
 cycles of different organisms have varied lengths.

Topic: 07Multicellular Organisms

Days: 20

Subject(s):

Grade(s):

Know:

Understand:

Do:

that carry out the life functions in multicellular organisms

3.1.6.A5. - FORM AND FUNCTION - Describe basic structures that plants and animals have that contribute to their ability to make or find food and reproduce.

3.1.6.A6. - ORGANIZATION - Identify examples of unicellular and multicellular organisms.