

SCIENCE MS COLLEGE and CAREER READINESS STANDARDS

FRANKLIN COUNTY MIDDLE SCHOOL

8 TH GRADE PACING GUIDE

Note to educators: This document does not replace the standards. The pacing guide is not a standalone document and must be used in conjunction with the standards. The pacing guide provides clarification and helps teachers to better plan their time by showing what topics are to be taught during a nine-week period. The pacing guide does not provide the conceptual “big picture” required to fully comprehend the goal of the standard.

8th GRADE 1ST NINE WEEKS

INQUIRY

Clarification: Inquiry skills must be taught first nine weeks but reinforced each nine weeks through activities, labs, and experiments.

Additional Information:

- Lab Safety
- Lab Equipment
- Scientific Method
- Graphing

GENETICS

L.8.2B.2 Use various scientific resources to research and support the historical findings of Gregor Mendel to explain the basic principles of heredity.

Additional Information:

- Define: heredity, alleles, homozygous, heterozygous, traits, genes, etc.
- Law of Segregation
- Dominant/Recessive
- Mendel's pea plant experiments

L.8.2B.3 Use mathematical and computational thinking to analyze data and make predictions about the outcome of specific genetic crosses (monohybrid Punnett Squares) involving simple dominant/recessive traits.

L.8.2A.1 Obtain and communicate information about the relationship of genes, chromosomes, and DNA, and construct explanations comparing their relationship to inherited characteristics.

Additional Information:

- Cell organelle overview
- DNA pathway to traits (DNA, RNA, Protein, Trait)
- Heredity
- Walter Sutton Chromosome Theory of Inheritance

REPRODUCTION

L.8.2A.2 Create a diagram of mitosis and explain its role in asexual reproduction, which results in offspring with identical genetic information.

Clarification: Students can draw, color, label, and arrange, parts of cell cycle to show phases.

Additional Information:

- Cell cycle
- Mitosis
- Cells Alive is a good resource

L.8.2A.3 Construct explanations of how genetic information is transferred during meiosis.

Clarification: Draw or build each phase of meiosis

Additional Information:

- Explain meiosis phases
- Cross-over- creates diversity
- Law of Independent Assortment

L.8.2A.4 Engage in discussion using models and evidence to explain that sexual reproduction produces offspring that have a new combination of genetic information different from either parent.

Additional Information:

- Model meiosis
- Genetic diversity occurs through sexual reproduction

L.8.2A.5 Compare and contrast advantages and disadvantages of asexual and sexual reproduction.

Additional Information:

- Topic not limited to these scenarios or solely based on humans
- Debate
- Venn diagram
- Socratic seminar

Review/Assess for Benchmark

GENETICS

L.8.2B.1 Construct an argument based on evidence for how environmental and genetic factors influence the growth of organisms.

Additional Information:

- Nature vs Nurture
- Lack/ abundance: water, food, habitat, mates, pollution, disease
- Cross-species pollination or breeding
- Topics are not limited to these
- Provide real-world scenarios (snakehead fish, gills to lungs, etc.)

L.8.2C.1 Communicate through diagrams that chromosomes contain many distinct genes and that each gene holds the instructions for the production of specific proteins, which in turn affects the traits of the individual (not to include transcription or translation).

Additional Information:

- Draw, label, place pictures in order
- Demonstrate DNA unravelling, separating, to create RNA, which moves to ribosomes to make protein

L.8.2C.2 Construct scientific arguments from evidence to support claims about the potentially harmful, beneficial, or neutral effects of genetic mutations on organisms.

Additional Information:

- Socratic seminar, report, debate
- Mutations are found throughout all species.

L.8.2B.4 Debate the ethics of artificial selection (selective breeding, genetic engineering) and the societal impacts of humans changing the inheritance of desired traits in organisms.

Additional Information:

- Pedigrees charts
- Advantages and disadvantages
- Inbreeding/Hybridization, cloning
- Societal: loss of variety, mutations, disease, cross-species pollination, disrupt food sources, GMO, etc.

Review/Assess for Benchmark

8TH GRADE: 2ND NINE WEEKS

NATURAL SELECTION

L.8.4A.1 Use various scientific resources to analyze the historical findings of Charles Darwin to explain basic principles of natural selection.

Clarification: Who was Charles Darwin? What did he propose? What was his evidence? What new evidence has been discovered to better understand organism relationships?

Additional Information:

- Survival of the fittest
- More offspring are produced than can survive
- Populations change over time (Adaptations)
- Variations that increase reproductive success will be more common in the next generations

L.8.4A.2 Investigate to construct explanations about natural selection that connect growth, survival, and reproduction to genetic factors, environmental factors, food intake, and interactions with other organisms.

Additional Information:

- Suggestions- real-world timeline, Socratic seminar, research paper, PowerPoint
- How do these six factors influence natural selection
- Great culminating activity

L.8.4B.1 Analyze and interpret data (e.g. pictures, graphs) to explain how natural selection may lead to increases and decreases of specific traits in populations over time.

Additional Information:

- **Good sites: Google** -Data on Natural Selection, What Darwin Finches Can Teach Us

L.8.4B.2 Construct written and verbal explanations to describe how genetic variations of traits in a population increase some organisms' probability of surviving and reproducing in a specific environment.

Additional Information:

- As a suggestion could be taught with L.8.4A.2

EVOLUTION

L.8.4B.3 Obtain and evaluate scientific information to explain that separated populations, that remain separated, can evolve through mutations to become a new species (speciation).

Additional Information:

- How does speciation occur? Why does it occur?

L.8.4B.4 Analyze displays of pictorial data to compare and contrast embryological and homologous/analogous structures across multiple species to identify evolutionary relationships.

Additional Information:

- View embryonic traits and differentiate

E.8.7.3 Construct and analyze scientific arguments to support claims that most fossil evidence is an indication of the diversity of life that was present on Earth and that relationships exist between past and current life forms.

Additional Information:

- Homologous/Analogous structures

Review/Assess for Benchmark

ENVIRONMENTAL RESOURCES

E.8.10.1 Read and evaluate scientific information about advancements in renewable and nonrenewable resources. Propose and defend ways to decrease national and global dependency on nonrenewable resources.

Additional Information:

- Research renewable/nonrenewable resources

E.8.10.2 Create and defend a proposal for reducing the environmental effects humans have on Earth (e.g., population increases, consumer demands, chemical pollution, deforestation, and change in average annual temperature).

Additional Information:

- Discuss pros and cons with students (refrain from bias)

E.8.10.3 Using scientific data, debate the societal advantages and disadvantages of technological advancements in renewable energy sources.

Additional Information:

- Cost, land, habitat destruction, extinctions or biodiversity losses
- biomass, geothermal, wind, solar, and hydroelectric

E.8.10.4 Using an engineering design process, develop a system to capture and distribute thermal energy that makes renewable energy more readily available and reduces human impact on the environment (e.g., building solar water heaters, conserving home energy).*

E.8.7.1 Use scientific evidence to create a timeline of Earth's history that depicts relative dates from index fossil records and layers of rock (strata).

Additional Information:

- Law of Superposition
- Continental drift (plate tectonics)
- Index fossils
- Law of Fossil Succession
- Carbon dating
- Suggestion- perform E.8.7.4

E.8.7.2 Create a model of the processes involved in the rock cycle and relate it to the fossil record.

Additional Information:

- Igneous, metamorphic, and sedimentary rocks
- Compaction/Cementation
- Weathering/Erosion
- Potential labs may include starburst, chocolate, crayons etc.

E.8.7.4 Use research and evidence to document how evolution has been shaped both gradually and through mass extinction by Earth's varying geological conditions (e.g., climate change, meteor impacts, and volcanic eruptions). 10

Review /Assess for benchmark

8th GRADE 3RD NINE WEEKS

GEOLOGY

E.8.9A.1 Investigate and explain how the flow of Earth's internal energy drives the cycling of matter through convection currents between Earth's surface and the deep interior causing plate movements.

Additional Information:

- Mid-ocean ridge, subduction zones, sea floor spreading, constructive/destructive forces
- Asthenosphere vs lithosphere

E.8.9A.2 Explore and debate theories of plate tectonics to form conclusions about past and current movements of rocks at Earth's surface throughout history.

Additional Information:

- Alfred Wegener
- Same fossils found on continents
- Sea floor spreading (plate tectonics)

E.8.9A.3 Map land and water patterns from various time periods and use rocks and fossils to report evidence of how Earth's plates have moved great distances, collided, and spread apart.

Additional Information:

- Alfred Wegener

E.8.9A.4 Research and assess the credibility of scientific ideas to debate and discuss how Earth's constructive and destructive processes have changed Earth's surface at varying time and spatial scales.

Additional Information:

- Mid-ocean ridge, subduction zones, sea floor spreading, constructive/destructive forces, hot spots, volcanoes, weathering, plate tectonics, etc.
- Asthenosphere vs lithosphere

E.8.9A.5 Use models that demonstrate convergent and divergent plate movements that are responsible for most landforms and the distribution of most rocks and minerals within Earth's crust.

Additional Information:

- Potential lab-edible plate tectonics

E.8.9A.6 Design and conduct investigations to evaluate the chemical and physical processes involved in the formation of soils.

Additional Information:

- Leaching- chemical and mechanical weathering, accumulation-additions, Losses- weathering, transformation, translocation

E.8.9A.7 Explain the interconnected relationship between surface water and groundwater.

Additional Information:

- Gaining streams, losing streams, and disconnected streams

E.8.9B.1 Research and map various types of natural hazards to determine their impact on society.

Clarification: look at different regions of the world and determine: What natural disasters occur in that region. Which are predictable and which are not?

Additional Information:

- Ring of Fire, tsunami, earthquakes, tornado alley, fire zones, flood zones, hurricane zones, droughts, mudslides, etc.

E.8.9B.2 Compare and contrast technologies that predict natural hazards to identify which types of technologies are most effective.

Additional Information:

- Weather forecasting, tsunami detection, earthquake detection, volcanic activity
- Drone technology –flood and fire

E.8.9B.3 Using an engineering design process, create mechanisms to improve community resilience, which safeguard against natural hazards (e.g., building restrictions in flood or tidal zones, regional watershed management, Fire wise construction).*

Review /Assess for benchmark

LIGHT WAVES

P.8.6.1 Collect, organize, and interpret data about the characteristics of sound and light waves to construct explanations about the relationship between matter and energy.

Additional Information:

- Focus on light to include brightness, color, requires medium or not, bending.
- Label parts of a wave.
- Light wave implies the entire electromagnetic spectrum is covered.
- Waves transfers energy to other forms of matter.

P.8.6.3 Conduct simple investigations about the performance of waves to describe their behavior (e.g., refraction, reflection, transmission, and absorption) as they interact with various materials (e.g., lenses, mirrors, and prisms).

Additional Information:

- Focus on light
- Electromagnetic spectrum -draw, color and label

P.8.6.6 Obtain and evaluate scientific information to explain the relationship between seeing color and the transmission, absorption, or reflection of light waves by various materials.

SOUND

P.8.6.1 Collect, organize, and interpret data about the characteristics of sound and light waves to construct explanations about the relationship between matter and energy.

Additional Information:

- Focus on sound: requires a medium or not and bending.
- Label parts of a wave.
- Waves transfers energy to other forms of energy.

P.8.6.3 Conduct simple investigations about the performance of waves to describe their behavior (e.g., refraction, reflection, transmission, and absorption) as they interact with various materials (e.g., lenses, mirrors, and prisms).

Additional Information:

- Focus on sound only

Review /Assess for benchmark

8TH 4TH NINE WEEKS

WAVES

P.8.6.4 Use scientific processes to plan and conduct controlled investigations to conclude sound is a wave phenomenon that is characterized by amplitude and frequency.

Additional Information:

- Properties of waves
- Virtual oscilloscope is helpful to determine waves frequencies and amplitudes
- Tuning forks, stringed instruments, add lab

P.8.6.5 Conduct scientific investigations that describe the behavior of sound when resonance changes (e.g., waves in a stretched string and design of musical instruments).

Additional Information:

- Possible materials to be used: metal rods, guitars, virtual sound labs, different size PVC.

P.8.6.2 Investigate research-based mechanisms for capturing and converting wave energy (frequency, amplitude, wavelength, and speed) into electrical energy.

Additional Information:

- The wave energy refers to ocean waves converted to electrical energy. May include: oscillating water column, pendulum system, power buoy, Salter's Duck system, Pelamis Wave Energy Converter, Wave Roller Systems, Archimedes Wave Swing, and others.

P.8.6.7 Research the historical significance of wave technology to explain how digitized tools have evolved to encode and transmit information (e.g., telegraph, cell phones, and wireless computer networks).

P.8.6.8 Compare and contrast the behavior of sound and light waves to determine which types of waves need a medium for transmission.

Additional Information:

- Dual properties of light- Rays vs Waves
- Light through a wall vs sound
- Compare/Contrast speed of sound vs light

Review/State Test