



Springfield Public Schools  
Springfield, New Jersey 07081

**Science**  
Grade 7

Curriculum Guide

2026

This curriculum may be modified through varying materials, techniques, and strategies as per an individual student's IEP.

*Springfield Board of Education  
Approved July 27, 2026*



**Springfield Public Schools  
Springfield, New Jersey**

**Rachel Goldberg  
Superintendent of Schools**

**Erica Scudero  
Assistant Superintendent**

**Curriculum Developed By:**

**Ron Slate ~ Principal of Florence M. Gaudineer Middle School**

**Gregory Salmon ~ STEM Supervisor**

**Jen Mortensen ~ Teacher**

**Alison Gillen ~ Teacher**

# Springfield Public Schools

Cultivating compassionate and extraordinary learners!

## EXTRACT OF THE MINUTES OF A MEETING OF THE BOARD OF EDUCATION OF THE TOWNSHIP OF SPRINGFIELD COUNTY OF UNION, NEW JERSEY AS RECORDED IN THE OFFICIAL MINUTE BOOK

Resolution: 21

Introduced By: Mrs. Gamarekian

Seconded By: Vice President Rinaldi

Adopted: July 27, 2026

### Curriculum Adoption

To approve the following new and revised curriculum and courses for the 2026-2027 school year:

#### *1. High School Courses*

- a. AP Cybersecurity (new course)
- b. AP Business with Personal Finance (new course)
- c. AP Biology
- d. AP Chemistry
- e. AP Physics 1
- f. PLTW Robotics and Automation
- g. PLTW Introduction to Engineering Design
- h. PLTW Principles of Engineering
- i. Biology
- j. Biology Honors
- k. Chemistry
- l. Chemistry Honors
- m. Conceptual Physics
- n. Physics
- o. Environmental Science
- p. Forensics
- q. Human Anatomy and Physiology
- r. Oceanography
- s. Science 8
- t. Molecular Biology Research Lab (new course)

#### *2. Middle School Courses*

- a. Science 6
- b. Science 7

#### *3. Elementary School Courses*

- a. Kindergarten Science
- b. Grade 1 Science
- c. Grade 2 Science

(continued)

I, Michelle Calas, School Business Administrator/ Board Secretary of the Springfield Board of Education, hereby certify that the extract from the minutes of a meeting of the Board of Education duly called and held on July 27, 2026 has been compared by me with the original minute book of said Board of Education, and is a true, complete and exact copy thereof, as far as the same relates to the subject matter to on said extract.

In WITNESS THEREOF, I have hereunto set my hand and seal of the Springfield Board of Education, this 28<sup>th</sup> day of July 2026.

SEAL



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Michelle Calas  
School Business Administrator/ Board Secretary



### Unit Overview Template

**Content Area:** Science **Grade Level:** 7 **Unit Title:** Engineering, Design and Investigation

**Unit Summary:** Students build understandings of what occurs at the atomic and molecular scale. Students apply understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level account to explain states of matter and changes between states.

**Primary Interdisciplinary Connections:** Mathematics

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☒ ICT Literacy  
☒ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

**Unit Rationale:** Science aims to build explanations of the natural world. Science works only with testable ideas. Scientists strive to test their ideas with evidence from the natural world. The process of science involves observation, exploration, testing, communicating and application. Scientific observations can be made directly or indirectly with tools. Scientists look for patterns in their observations and data. Scientists check each other's work.

#### Career Readiness (Standard 9)

9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

### Learning Targets

**Standards:** MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4

**Content Statements:** Engineering Design

**CPI#:**

**Cumulative Progress Indicator (CPI):**

|            |                                                                                                                                                                                                                                                                      |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MS-ETS1-1  | Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. |
| MS-ETS1-2  | Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.                                                                                                                          |
| MS-ETS1-3  | Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.                                      |
| MS-ETS1-4  | Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.                                                                                                          |
| 8.2.8.ED.1 | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.                                                                                                                                |
| 8.2.8.ED.2 | Identify the steps in the design process that could be used to solve a problem.                                                                                                                                                                                      |
| 8.2.8.ED.3 | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).                                                                                                                              |
| 8.2.8.ED.5 | Explain the need for optimization in a design process                                                                                                                                                                                                                |



|             |                                                                                                                                         |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 8.2.8.EC.1  | Explain ethical issues that may arise from the use of new technologies.                                                                 |
| 8.2.8.EC.2  | Examine the effects of ethical and unethical practices in product design and development.                                               |
| 8.2.8.ITH.3 | Evaluate the impact of sustainability on the development of a designed product or system.                                               |
| 8.2.8.ETW.3 | Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. |
| Math.7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                          |

### Science and Engineering Practices:

#### Asking Questions and Defining Problems

Asking questions and defining problems in grades 6–8 builds on K–5 experiences and progresses to specifying relationships between variables and clarifying arguments and models.

- Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)

#### Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

#### Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)

#### Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world.

- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

### Disciplinary Core Ideas (DICs):

#### ETS1.A: Defining and Delimiting Engineering Problems

- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1)



### **ETS1.B: Developing Possible Solutions**

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3)
- Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

### **ETS1.C: Optimizing the Design Solution**

- Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (MS-ETS1-3)
- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

### **Crosscutting Concepts:**

#### **Influence of Science, Engineering, and Technology on Society and the Natural World**

- All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ETS1-1)
- The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-ETS1-1)

### **Unit Essential Questions:**

- How can the scientific method be useful in my own life?
- What are the different steps of the scientific method, and how do they work together?
- How do the different variables (independent, dependent, control) relate to one another and how does a change in one variable affect the other variables?
- How do scientists use quantitative, qualitative, experimental and non-experimental methods of scientific inquiry to understand Earth?
- How do observations made while testing proposed explanations provide new insights into natural phenomena?

### **Unit Enduring Understandings:**

- Students will understand that the central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process.
- Students will understand that beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures.



- Students will understand that the observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into natural phenomena.
- Students will understand that scientists use quantitative, qualitative, experimental and non-experimental methods of scientific inquiry to understand the natural world.
- Students will understand that he/she is capable of creating fair tests of an experimental question.

**Unit Learning Targets:**

**Students will....**

- Describe and compose an appropriate hypothesis.
- Identify problems, factors and questions for a scientific investigation.
- Identify variables — independent, dependent, controlled — that should be considered in an experiment.
- Select and use appropriate tools, equipment, technology, and metric units of measurement to make observations.
- Record observations using methods that complement investigations.
- Construct, use and interpret graphs and data tables.
- Use data and information gathered to develop an explanation of experimental results.
- Use evidence to identify patterns.
- Use safety procedures and equipment safely to conduct scientific investigations.



### Evidence of Learning

**Summative Assessment:** Unit assessment, lab assessments

**Equipment Needed:** iPads for presentation (PowerPoint, Prezi, or iMovie), online graphing sites, PhotoBooth.

**Teacher Resources:** Gizmos

Formative Assessments:

- Station activities
- Interactive science notebook
- Homework readings and support material
- Quizzes
- Lab analysis
- Presentation of work
- Exit card
- Student questioning



### Lesson Plans

| Lesson             | Time Frame |
|--------------------|------------|
| Lesson 1: Tools    | 5 days     |
| Lesson 2: Process  | 10 days    |
| Lesson 3: Analysis | 5 days     |

**Teacher Notes:** Emphasize the usage of proper tools, processes, and analysis when completing activities.

**Curriculum Development Resources/Technology Resources:** Students will have access to a iPad for data recording (spreadsheets or word docs), temperature probe, and online graphing sites.

**Click the links below to access additional resources used to design this unit:**

<http://ngss.nsta.org/DisplayStandard.aspx?view=topic&id=39>



### Lesson Plan 1 Template

**Content Area:** Science

**Lesson Title:** Tools

**Time Frame:** 5 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☒ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy    ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills    ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

#### **Integration of Technology:**

Students will use technology to collect, analyze, and communicate data:

- iPads for recording measurements
- Digital temperature probes
- Online graphing tools
- Interactive review platforms: Kahoot, Boom cards, Wordwall

#### **Equipment Needed:**

Lab materials: Triple beam or digital balance, graduated cylinder, metric rulers/sticks, temperature probe, beakers, measuring tape, everyday objects to measure

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Students will:</b> <ul style="list-style-type: none"> <li>• Identify and use metric units for length, mass, volume and temperature.</li> <li>• Know the acceptable prefixes.</li> <li>• Accurately measure using provided lab tools.</li> <li>• Have working standards of metric units</li> <li>• Convert between metric units and record answers precisely.</li> <li>• Communicate measurements and graphing results with peers.</li> </ul> | <b>Lesson Sequence</b> <ol style="list-style-type: none"> <li>1. Anchoring<br/>Phenomenon: A classroom challenge results in two nearly identical structures built from the same materials, yet one survives increasing weight while the other collapses instantly at a much lower load, and students are given only the final results with no explanation of what caused the difference.</li> <li>2. What are the benefits of the metric system?</li> <li>3. Metric units: acceptable base units and prefixes.</li> </ol> | <ul style="list-style-type: none"> <li>• Exit tickets identifying correct metric units</li> <li>• Wordwall on metric units and prefixes</li> <li>• Metric Mania conversion</li> <li>• Metric Mania worksheets</li> <li>• Lab stations</li> <li>• Mars Climate Orbiter - Metric Mishap</li> <li>• Metric System Olympics</li> <li>• Rainbow Lab</li> <li>• Lab safety superhero</li> <li>• Identification of Laboratory Safety Protocols and equipment.</li> </ul> |



- |                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <ul style="list-style-type: none"><li>● Practice appropriate lab safety.</li></ul> | <ol style="list-style-type: none"><li>4. Stations to explore length, mass, volume, temperature using lab equipment.</li><li>5. Reading comprehension - Mars Climate Orbiter</li><li>6. Metric memories - guess the measurement.</li><li>7. Metric Olympics - estimate then measure for each station.</li><li>8. How to be safe in the lab.</li><li>9. Safety Classroom Walk -About<ol style="list-style-type: none"><li>a. Objective: Identify the safety equipment and understand its purpose. focus on when and how to use the equipment.</li></ol></li><li>10. <a href="#">Metric Scavenger Hunt</a><ol style="list-style-type: none"><li>a. Objective: Identify and match real-world items with appropriate metric units (mm, cm, m, km, g, kg, mL, L).</li></ol></li><li>11. <a href="#">Metric Train Stations</a></li></ol> |  |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



- |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>a. Objective:<br/>         Improve estimation skills with metric measures as well as improving overall understanding of measuring using the metric system.</p> <p>12. Metric Relay Race (Conversion Practice)</p> <p style="padding-left: 20px;">a. Objective: Speed and accuracy converting between mm/cm/m and g/kg, mL/L</p> <p>13. Metric Conversion Puzzle Stations (Escape-Room Style)</p> <p style="padding-left: 20px;">a. Objective: Practice multi-step conversions (e.g. km → m → cm)</p> |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Differentiation:**

Leveled sheets to help with units and conversions. Visual metric ladder charts. Peer collaboration in mixed ability groups. Teacher-guided small group support. Students can practice at their own pace.

**Resources Provided:**

- Metric mania [conversion](#)
- [Metric Olympics](#)
- Measuring stations- [mass](#), [length](#), [volume](#), temperature
- [Metric scavenger hunt](#)



### Lesson Plan 2 Template

**Content Area:** Science

**Lesson Title:** The Science Process

**Time Frame:** 10 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☒ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy    ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy    ☒ Life and Career Skills  
☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

#### **Integration of Technology:**

Students will have access to iPads for data recording (Google sheets or Google docs), temperature probe, and online graphing sites.

#### **Equipment Needed:**

Lab equipment for student experiments, including additional material: sugar cubes, water, eggs, various bouncing balls, pennies, eye droppers, gummy bears, various household liquids.

| Goals/Objectives                                                                                                                                                                                                                                                                                                                      | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Students will:</b> <ul style="list-style-type: none"> <li>Determine questions that can be investigated in a scientific investigation.</li> <li>Distinguish between independent and dependent variables.</li> <li>Collect data and look for patterns in the data.</li> <li>Construct experiments that include variables.</li> </ul> | <b>Lesson Sequence</b> <ol style="list-style-type: none"> <li>Anchoring<br/>Phenomenon: A time-lapse video shows multiple teams attempting the same build challenge using the same instructions, but each final product behaves differently in unexpected ways (some wobble, some tilt, some fail immediately), even though no obvious step was missed or changed.</li> <li>Questioning - what is a good question to investigate?</li> <li>Determining variables-distinguish between IV and DV (floating egg).</li> </ol> | <ul style="list-style-type: none"> <li><a href="#">Asking Good Questions activity</a></li> <li><a href="#">IV and DV practice</a></li> <li><b>Controlling variable practice</b></li> <li><b>Reading on IV DV</b></li> <li><a href="#">Sugar cube race</a></li> <li><a href="#">The new scientific method activities</a></li> <li><a href="#">Penny Lab</a></li> <li><a href="#">Stolen Mascot</a></li> </ul> |



- |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ol style="list-style-type: none"><li>4. Sugar cube Race - setting the variables.</li><li>5. Collecting data using a ball drop. The "Control vs. No Control" Challenge (30 minutes)</li><li>6. Students will explore the importance of control groups in experiments using simple testable materials comparing the conclusions to explain how the presence or absence of a control group affects the reproducibility of the results.</li><li>7. Mascot Mystery<ol style="list-style-type: none"><li>a. Collaborate to analyze and compare household powder exemplars with simulated crime scene evidence in order to identify which suspect stole the mascot using observation and evidence-based reasoning. Recording of quantitative data for presentation.</li></ol></li><li>8. Gummy Bear Lab<ol style="list-style-type: none"><li>a. Work collaboratively to test how different liquids affect gummy bears through the process of</li></ol></li></ol> |  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



- diffusion.  
measure and  
record the mass  
and length of the  
gummy bears at  
designated time  
intervals.  
accurate record  
keeping,  
organized data  
tables, and clear  
presentation of  
results using  
graphs
9. Drops on a Penny Lab  
a. Investigate how  
surface tension  
changes with  
different liquids  
by counting the  
number of drops  
that can fit on a  
penny before  
spilling. After  
establishing this  
control trial,  
another liquid is  
selected.  
Experiments are  
repeated and  
results compared  
as data is  
organized in  
tables while  
discussions of  
how molecular  
interactions  
influence the  
results.

**Differentiation:**

Leveled worksheets for practice, partners for experiments (mixed ability), support for experimental setup, visual lab instructions and anchor charts. Modeling graphing and data recording; provide templates where necessary. Assistance with microscope techniques; two microscopes for comparative analysis of samples to exemplars.



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**Resources Provided:**

- [Mystery Powders](#)
- [Soap and sink](#)
- [Ball Drop Lab](#)
- [Drops on a Penny](#)



### Lesson Plan 3

**Content Area:** Science      **Lesson Title:** Scientific Analysis      **Time Frame:** 5 days

#### Lesson Components

##### 21<sup>st</sup> Century Themes

- ☒ Global Awareness      ☒ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

##### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation      ☒ Critical Thinking and Problem Solving      ☐ Information Literacy      ☐ Life and Career Skills  
☒ Communication and Collaboration      ☐ Media Literacy      ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

##### **Integration of Technology:**

Students will use iPads for presentation (Google Slides, etc.), use on online graphing sites, spreadsheets software (Google sheets) video applications. Capture and create digital presentations (Google Slides or video tools)

##### **Equipment Needed:**

Material for experiments, individual pieces of rope, iPads, graphing sites, interactive whiteboard

| Goals/Objectives                                                                                                                                                                                                         | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                              | Formative Assessment<br>Tasks                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Students will:</b> <ul style="list-style-type: none"> <li>Analyze data and use evidence to write a conclusion.</li> <li>Create a graph of results.</li> <li>Communicate their student-designed experiment.</li> </ul> | <b>Lesson Sequence</b> <ol style="list-style-type: none"> <li>Anchoring<br/>Phenomenon: Students are shown a “design competition scoreboard” where different groups claim their solution is best, but the evidence includes conflicting measurements, inconsistent trial results, and different interpretations of success, leaving no clear winner based on the data alone.</li> <li>Collecting and using data</li> <li>Graphing data- Build a 3D graph activity.</li> </ol> | <ul style="list-style-type: none"> <li>Read the data</li> <li><a href="#">Data Nuggets</a></li> <li>Graphing trends</li> <li>Tie a knot challenge</li> <li>Plant experiment</li> </ul> |



- |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"> <li>a. Objective-Build a 3D representation of collected data. Utilizing graphs and collected data to provide CER. Review the collected qualitative and quantitative data and generate findings in presentation or poster format to demonstrate understanding.</li> <li>4. Tie a knot (STEM challenge)               <ul style="list-style-type: none"> <li>a. Objective- Create a method to tie a knot without letting go of the rope enabling the development of scientific inquiry, spatial reasoning, and engineering design thinking. Independence and growth in hypothesis testing and kinetic analysis.</li> </ul> </li> <li>5. Design Ice Cube Shelter               <ul style="list-style-type: none"> <li>a. Objective - Using own supplies, collaborative exploration of preventing ice cube from melting compared to</li> </ul> </li> </ul> |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



- other groups.  
Students will  
apply  
investigative and  
design  
techniques  
implementing  
trials of their  
experiment.  
Accelerate the  
timeline using  
hand warmers or  
hair dryers.  
Presentation of  
results as a  
persuasive  
advertisement  
supported with  
collected data.
6. Plant Experiment
- a. Objective-  
Conducting a  
controlled  
investigation  
utilizing a core  
systematic  
approach from  
question to  
result  
sharing/presenta  
tion of unique  
plant  
experiment;  
student based  
inquiry. Student  
responsible for  
summative  
narrative of  
experiment  
including  
analysis of data  
to pivot future  
experiments  
with a refined  
hypothesis

**Differentiation:**

Provide leveled reading for activities. Offer structured graph templates, guided data tables, and step-by-step CER organizers for students who need additional support. Allow students to present findings in multiple formats such as written reports, slide presentations, short videos, or visual posters.

**Resources Provided:**

- [Design Challenge - Ice cube shelter](#)
- Data nuggets
- Graphing trends



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson Strongly, Moderately or Weakly meets the criteria below.**

| Lesson Activities                                                                                                    | Strongly                            | Moderately                          | Weakly                   |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

### Curriculum Design Template

**Content Area:** Science **Grade Level:** 7 **Unit Title:** Engineering, Design and Investigation

**Created:** 2026

**Board Approved on:**



### Unit Overview Template

**Content Area:** Science **Grade Level:** 7 **Unit Title:** Matter and its Interactions

**Unit Summary:** Students build an understanding of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. Students also provide a molecular level explanation of states of matter and changes between states.

**Primary Interdisciplinary Connections:** Mathematics

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy  
☒ Information Literacy ☒ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy

**Unit Rationale:** This physical science unit reinforces the importance of understanding how matter around us interacts with other matter. This unit reinforces the concept of identifying substances by its properties, furthermore explains why elements are considered the basic building blocks of matter. Matter will be broken down into parts (atoms) where theories will be explained and periodic table trends discussed. The unit will also examine the change process as it relates to matter and its impact on our world.

**Career Readiness (Standard 9):**

9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

### Learning Targets

**Standards:** MS-PS1-1; MS-PS1-3; MS-PS1-4

**Content Statements:** Matter and Its Interactions.

| CPI#:       | Cumulative Progress Indicator (CPI):                                                                                                                        |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MS-PS1-1    | Develop models to describe the atomic composition of simple molecules and extended structures.                                                              |
| MS-PS1-3    | Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.                                   |
| MS-PS1-4    | Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. |
| 8.2.8.ED.1  | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.                       |
| 8.2.8.ED.2  | Identify the steps in the design process that could be used to solve a problem.                                                                             |
| 8.2.8.ED.3  | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).                     |
| 8.2.8.ED.5  | Explain the need for optimization in a design process                                                                                                       |
| Math.7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                                              |



## Science and Engineering Practices:

### Developing and Using Models

Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to predict and/or describe phenomena. (MS-PS1-1), (MS-PS1-4)

### Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3)

## Disciplinary Core Ideas (DICs):

### PS1.A: Structure and Properties of Matter

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MS-PS1-3)
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. (MS-PS1-4)
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)
- Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). (MS-PS1-1)
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter. (MS-PS1-4)

### PS1.B: Chemical Reactions

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-3)

### PS3.A: Definitions of Energy

- The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects. (secondary to MS-PS1-4)
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system’s total thermal energy. The total thermal energy (sometimes called the total internal



energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material. (secondary to MS-PS1-4)

### **Crosscutting Concepts:**

#### **Cause and Effect**

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

#### **Scale, Proportion, and Quantity**

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

#### **Structure and Function**

- Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3)

### ***Connections to Engineering, Technology, and Applications of Science***

#### **Interdependence of Science, Engineering, and Technology**

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3)

#### **Influence of Science, Engineering and Technology on Society and the Natural World**

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (MS-PS1-3)

### **Unit Essential Questions:**

- How do different types of atoms combine to form substances?
- How can you use physical and chemical properties of a substance to identify a pure substance?
- How are molecules of a gas, liquid or solid arranged relative to one another?
- What is the spatial relationship of molecules in a gas, liquid or solid?
- How do natural resources undergo chemical processes to form synthetic material?
- How do we benefit from synthetic material?
- How can you predict the change of state for a substance when you change the temperature or pressure?

### **Unit Enduring Understandings:**

- Substances are made from different types of atoms, which combine with one another in various ways.



- Atoms form molecules that range in size from two to thousands of atoms.
- Substances can change state by adding or removing thermal energy.
- Engineering advances have led to important discoveries in the fields of medicine, foods, and alternative fuels.
- Each pure substance has characteristic physical and chemical properties that can be used to identify it.
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- Models can help you observe phenomena at various scales that are too large or too small to see.

**Unit Learning Targets:**

**Students will....**

- Complete computer simulation to build molecules and compounds.
- Use ball and stick manipulatives to represent different elements and compounds.
- Observe expansion and contraction of solids, liquids and gases and develop a model to explain their observations.
- Determine the type of substances based on characteristic properties.
- Predict the state of a substance based on surrounding temperature.
- Determine if a substance is naturally occurring or man-made.
- Determine the impact of man-made substances.



### Evidence of Learning

**Summative Assessment:** Design your slime - 3 days

**Equipment Needed:** Each team will need plastic cups, graduated cylinders, borax, Elmer's glue, water, and a budget sheet. Each team will design and produce a slime that out-bounces the original formula for slime. Students must stay within budget, by keeping track of how much they spend to create their slime.

**Teacher Resources:** [Slime Activity](#)

#### **Formative Assessments:**

- Build a model of a molecule.
- Complete the PhET simulation of "Building Molecules."
- Explain the difference between a molecule and a compound.
- Complete the "Parts of an Atom" packet.
- Test powders in mystery powders lab .
- Test a "Mystery Powder" and report on your findings.
- Complete the "Gas, Liquid or Solid" animation.



### Lesson Plans

| Lesson                     | Time Frame |
|----------------------------|------------|
| Lesson 1: Build a Molecule | 3 days     |
| Lesson 2: Phase Changes    | 3 days     |
| Lesson 3: Mystery Powders  | 4 days     |

**Teacher Notes:** Emphasize careful usage of materials to ensure mixtures are effective.

**Curriculum Development Resources/Technology Resources:**

*Click the links below to access additional resources used to design this unit:*

[Phet - Build an Atom](#)

[Phet - Build a Molecule](#)

[Explore Learning](#)



### Lesson Plan 1 Template

Content Area: Science      Lesson Title: Build a Molecule      Time Frame: 3 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☐ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☒ Media Literacy    ☒ ICT Literacy

**Interdisciplinary Connections:** Mathematics

#### **Integration of Technology:**

Students will use a website to build molecules and use iPads to communicate the results of their work.

#### **Equipment Needed:**

Models of atoms  
 Atom kits and household supplies to build models of molecules

| Goals/Objectives                                                                                                                                                                  | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>Describe the parts of an atom.</li> <li>Explore how molecules are put together.</li> <li>Build simple molecules.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>Anchoring<br/>Phenomenon: A clear substance is placed into a sealed container and over time it transforms into a completely different-looking material with new properties (color, texture, and behavior), but nothing appears to have been added or removed from the system.</li> <li>What are the parts of an atom?</li> <li>Students use interactive simulations like PhET and hands-on models with craft materials to visualize and build</li> </ol> | <ul style="list-style-type: none"> <li>Worksheet on parts of the atom, molecules</li> <li>Mini quiz</li> <li>Homework</li> <li>Rubric on model of molecule</li> <li><a href="#">Create an Atomic Trading Card</a></li> <li>Connect molecules with real world impact.</li> <li>Post-analysis sheet on building a molecule</li> </ul> |



- representations of protons, neutrons, and electrons, reinforcing their understanding of atomic structure and spatial relationships. Collaborative work with visual aids and anchor charts helps students distinguish between the nucleus and electron shells while connecting atomic structure to elemental properties.
4. Atom Detective – Identify the Mystery Atom
  5. Identify elements by using a periodic table to analyze subatomic data and physical properties. By solving tiered "clue cards," they will demonstrate how protons and electron configurations define an atom's identity. This process connects atomic structure to real-world chemical behavior.
  6. Model of a molecule
  7. Construct three-dimensional models to visualize the relationship between subatomic particles and electron shells. Working in collaborative roles, they will identify the nucleus and surrounding electrons using unique colors and labels, reinforcing the



- structural hierarchy of the atom and the specific placement of protons, neutrons, and electrons.
8. How are molecules put together?
  9. This hands-on, kinesthetic activity engages students in constructing 3D molecular models using simple, inexpensive everyday materials. By physically assembling molecules, students develop a concrete understanding of how atoms bond together and organize in space—concepts that are often abstract and difficult to visualize through textbooks alone. This activity bridges the gap between theoretical chemistry knowledge and practical, visual understanding by allowing students to manipulate materials and see molecular structures from multiple angles.
  10. Can you build a molecule?
  11. Students learn about chemical bonding, molecular structure, and the composition of important biological molecules. Students work individually or in small groups to build



- representations of common molecules found in nature and essential to life processes, transforming their understanding from memorization to genuine comprehension.
12. Visit the PhET site and build a molecule using the simulation.
  13. The PhET simulator allows students to build molecules by dragging and dropping atoms with immediate visual feedback on structure and bonding. Students can quickly experiment with different atom combinations and test molecular validity. This digital tool complements hands-on model building by offering a dynamic, reusable alternative that accommodates different learning styles.

**Differentiation:**

Students access interactive online tutorials, Khan Academy lessons, Studyjams, and Chem4Kids websites to explore atomic structure at their own pace. Peer partnerships and small-group work support diverse learners, while visual aids and anchor charts help students identify atoms and reference key information during hands-on building activities.

**Resources Provided:**

- [PhET : Build an Atom](#)
- [Parts of the Atom tutorial](#)
- [PhET site: Build a Molecule](#)
- [Parts of the Atom website](#)



### Lesson Plan 2 Template

Content Area: Science      Lesson Title: Phase Changes      Time Frame: 3 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☐ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills    ☐ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

#### **Equipment Needed:**

iPad  
 Ball-and-stick models to build molecules  
 Material to build molecules: marshmallows, etc.

| Goals/Objectives                                                                                                                                                                                                                                                           | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Formative Assessment<br>Tasks                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Explain the differences among gases, liquids and solids.</li> <li>• Develop a way to show a substance as a gas, liquid and solid.</li> <li>• Predict the phase of a substance based on the temperature.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: A substance in a controlled environment appears to change state in a way that defies expectations (for example, freezing while being heated or remaining solid at temperatures where it should melt), and students are shown conflicting evidence from multiple measurement tools.</li> <li>2. What do solids, liquids and gases look like at the molecular level?</li> <li>3. <a href="#">Use pHet simulation</a></li> </ol> | <ul style="list-style-type: none"> <li>• Graphic organizer of terms</li> <li>• Visual Representation of a substance as a gas, liquid, and solid</li> <li>• Mini quiz of terms</li> <li>• Gizmo lab - assessment</li> <li>• Check work on "guess the state."</li> </ul> |



4. Venn diagram or compare/contrast the similarities and differences in the different states.
5. Students sort property cards into overlapping circles for solids, liquids, and gases, identifying which characteristics define each state and which properties overlap. This activity develops critical thinking as students analyze how particle behavior determines the properties of each state of matter..
6. How would you represent a gas, a liquid or solid?
7. Students use snack items like cereal or raisins to model the three states of matter by arranging particles tightly for a solid, spread out for a liquid, and spaced far apart for a gas. This tactile model helps students visualize how particle spacing relates to the properties of each state of matter.
8. Complete the Gizmo on phase changes.
9. Students use interactive Gizmo simulations to manipulate temperature and pressure while observing how molecular motion changes during phase



transitions. This visualization helps students connect particle behavior to observable state changes and understand how energy affects molecules.

10. Guess the state of the given molecules.

11. [Be the Molecule™](#)

Kinesthetic Game:  
Students stand in a marked square (a container) and act out molecular behavior: packing tightly for solids, moving around for liquids, and running fast to fill the room for gases.

**Differentiation:**

Students use guided notes, animated videos for visual and auditory learners, and collaborative partner activities where students physically model molecules and their movements. These varied resources accommodate different learning styles while reinforcing molecular behavior during state changes.

**Resources Provided:**

- [Online practice](#)
- Gizmo ( Explore learning site) Phase Changes lab
- [Study jams: change of states](#)
- [Molecules in motion](#)



### Lesson Plan 3 Template

Content Area: Science      Lesson Title: Mystery Powders      Time Frame: 4 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Presentation of results by Google Slides, iMovie, or Prezi

#### **Equipment Needed:**

Mystery powders- white substances that students can test such as flour, cornstarch, baking soda, baking powder, etc.  
 Chemicals to test: water, vinegar, iodine.

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                           | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>Determine how 4 white powders react to water, vinegar, and iodine.</li> <li>Test a mystery substance.</li> <li>Determine the name of the mystery substance.</li> <li>Convince the class that you have the correct identification.</li> <li>Determine if a change is chemical or physical.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>Anchoring<br/>Phenomenon: Several white powders that look identical react in dramatically different ways when exposed to the same liquid (some fizz, some clump, some dissolve, some change color), and there is no visible way to tell them apart beforehand.</li> <li>Explore the difference between chemical and physical changes.</li> <li><a href="#">Gummy Bear Experiment:</a></li> <li>Students investigate physical and chemical changes by cutting gummy bears (physical</li> </ol> | <ul style="list-style-type: none"> <li>Graphic organizer of physical and chemical changes</li> <li><a href="#">Gummy Bear experiment</a></li> <li>monitor chart of data</li> <li>Exit card - what is the reaction?</li> <li><a href="#">Test of unknown powders</a></li> <li>rubric for presentation</li> <li>Question students as they work with the mystery powder</li> <li>PowerPoint, iMovie, or Prezi of results</li> </ul> |



- change) and dissolving them in substances (chemical change). This hands-on experiment helps students distinguish between how matter can be transformed physically versus chemically.
5. Card Sorting Activity: Students categorize examples like cutting hair, crushing cans, rusting nails, and burning paper to distinguish between the two types of changes.
  6. Test the four white powders for typical reactions.
  7. Students test four white powders (salt, sugar, baking soda, cornstarch) through observation, solubility, vinegar, and iodine tests to distinguish between physical and chemical changes. This hands-on investigation helps students identify unknown substances by analyzing observable reactions, such as fizzing with vinegar or color change with iodine, while understanding how different tests reveal chemical properties.
  8. identify their mystery substance and prove their conclusion with evidence of physical



|  |                       |  |
|--|-----------------------|--|
|  | and chemical changes. |  |
|--|-----------------------|--|

**Differentiation:**

Students work in collaborative lab groups with assigned roles to ensure all members contribute. Students choose their presentation format—written report, digital poster, video, diagram, or oral presentation—to demonstrate understanding. Each student completes an individual assessment identifying the mystery powder and explaining their reasoning with evidence from the lab.

**Resources Provided:**

- [Physical properties of matter Reading](#)
- [Chemical properties reading-](#)
- [Characteristic properties](#)
- [Physical and chemical changes station](#)
- [Changes in matter](#)



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately or Weakly* meets the criteria below.**

| Lesson Activities                                                                                                    | Strongly                            | Moderately                          | Weakly                   |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

### Curriculum Design Template

**Content Area:** Science      **Grade Level:** 7      **Unit Title:** Matter and its Interactions

**Created:** 2026

**Board Approved on:**



### Unit Overview Template

**Content Area:** Science **Grade Level:** 7 **Unit Title:** From Molecules to Organisms: Structures and Processes

**Unit Summary:** The cell concepts in this unit will enable students to fully understand that living organisms are composed of cellular units that carry out functions required for life. Cellular units are composed of molecules, which also carry out biological functions. Furthermore, the different structures in a cell work together to ensure the cell's survival. Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell. Students will begin by studying the cell organelles and their functions to show that different cell types can have different structures, but some cell structures are common to all cells. Using a microscope, students will view various types of cells, which will enable the students to compare the benefits and limitations of existing as a single-celled organism and as a multicellular organism. In addition, they will be able to relate the structures of cells, tissues, organs, and systems to their functions in supporting life by using arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions.

It is necessary for cells to transport molecules in and out of the cell (diffusion and osmosis), as well as go through the processes of cellular respiration, photosynthesis, and fermentation. The basic understanding of these processes will allow students to recognize that each cell undergoes processes that ensure its survival and, often, the survival of other organisms.

Living things need to process information using sensory receptors. Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

#### **Primary Interdisciplinary Connections: Social Studies and Communication Arts**

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy  
☒ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy

#### **Career Readiness (Standard 9):**

9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

### Learning Targets



**Standards:** MS-LS1; MS-LS1-2; MS-LS1-3; MS-LS1-7; MS-LS1-8; MS-ETS1-2; MS-ETS1-3; MS-ETS1-4

**Content Statements:** From Molecules to Organisms: Structures and Processes; Engineering Design

| <b>CPI#:</b> | <b>Cumulative Progress Indicator (CPI):</b>                                                                                                                                             |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MS-LS1-1     | Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.                                        |
| MS-LS1-2     | Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.                                                               |
| MS-LS1-3     | Use arguments supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.                                                                 |
| MS-LS1-6     | Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.                              |
| MS-LS1-7     | Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. |
| MS-LS1-8     | Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.                             |
| MS-ETS1-2    | Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.                                             |
| MS-ETS1-4    | Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.                             |
| 8.2.8.ED.1   | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.                                                   |
| 8.2.8.ED.2   | Identify the steps in the design process that could be used to solve a problem.                                                                                                         |
| 8.2.8.ED.3   | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).                                                 |
| 8.2.8.ED.5   | Explain the need for optimization in a design process                                                                                                                                   |
| Math.7.RP.A  | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                                                                          |

### Science and Engineering Practices:

#### Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS1-2)
- Develop a model to describe unobservable mechanisms. (MS-LS1-7)
- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

#### Planning and Carrying Out Investigations



Planning and carrying out investigations in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

- Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation. (MS-LS1-1)

### **Constructing Explanations and Designing Solutions**

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5), (MS-LS1-6)

### **Engaging in Argument from Evidence**

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon. (MS-LS1-3)
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2)

### **Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS1-8)

## **Disciplinary Core Ideas (DICs):**

### **LS1.A: Structure and Function**

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell. (MS-LS1-2)
- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. (MS-LS1-3)

### **LS1.C: Organization for Matter and Energy Flow in Organisms**



- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
- Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

#### **LS1.D: Information Processing**

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

#### **PS3.D: Energy in Chemical Processes and Everyday Life**

- The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)
- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

#### **ETS1.B: Developing Possible Solutions**

- A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
- Models of all kinds are important for testing solutions. (MS-ETS1-4)

#### **ETS1.C: Optimizing the Design Solution**

- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

#### **Crosscutting Concepts:**

##### **Cause and Effect**

- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS1-8)

##### **Scale, Proportion, and Quantity**

- Phenomena that can be observed at one scale may not be observable at another scale. (MS-LS1-1)

##### **Systems and System Models**

- Systems may interact with other systems; they may have subsystems and be a part of larger complex systems. (MS-LS1-3)



### **Energy and Matter**

- Matter is conserved because atoms are conserved in physical and chemical processes. (MS-LS1-7)
- Within a natural system, the transfer of energy drives the motion and/or cycling of matter. (MS-LS1-6)

### **Structure and Function**

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS1-2)

### ***Connections to Engineering, Technology, and Applications of Science***

#### **Interdependence of Science, Engineering, and Technology**

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS1-1)

### ***Connections to Nature of Science***

#### **Science is a Human Endeavor**

- Scientists and engineers are guided by habits of mind such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. (MS-LS1-3)

#### **Scientific Knowledge is Based on Empirical Evidence**

- Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

### **Unit Essential Questions:**

- How are living things different?
- How do the organelles of a cell work together as a system?
- How is the body of a multicellular organism a system of interacting subsystems?
- How do molecules move in and out of the cell through the cell membrane?
- How do sense receptors respond to different inputs, transmitting them as signals that travel along nerve cells to the brain?
- How are signals processed in the brain, resulting in immediate behaviors or memories?

### **Unit Enduring Understandings:**

- All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
- In multicellular organisms, the body is a system of multiple interacting subsystems. These



subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.

- Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories.

**Unit Learning Targets:**

**Students will....**

- Identify names and functions of each part of a cell.
- Explain the interactions between the cell parts.
- Explain how cells transport molecules in and out through the cell membrane.
- Distinguish between multicellular and unicellular organisms.
- Compare tissues, organs, and organ systems.
- View cells using a compound light microscope.



### Evidence of Learning

#### **Summative Assessment:** Unit Assessment

- The Cell Parts portion of this unit will culminate with the Cell Connection project/activity that demonstrates understanding of each cell part, their functions, and how the cell parts work together as a system.
- The Body Systems portion of this unit will culminate with a life-size body representing 3-4 of the main body systems (including an explanation of how these systems work together).
- The Information Processing portion of this unit will culminate with a built model of a neuron (including an explanation of how information is sent).

**Equipment Needed:** Microscopes, Video Microscope, iPads, Extraneous supplies (for model building)

**Teacher Resources:** Various websites, Class Website

#### **Formative Assessments:**

- Homework worksheets
- Entrance/Exit Forms
- Quizzes
- Discussion
- Mini activities with questions



### Lesson Plans

| Lesson                           | Time Frame |
|----------------------------------|------------|
| Lesson 1: Cells                  | 15 days    |
| Lesson 2: Body Systems           | 10 days    |
| Lesson 3: Information Processing | 5 days     |

#### Curriculum Development Resources/Technology Resources:

*Click the links below to access additional resources used to design this unit:*

[Amazing Cells Book](#)

[Teach Genetics.com](#)

[OER Common Cell Hub](#)

[Amoeba Sisters Video Channel](#)



### Lesson Plan 1 Template

Content Area: Science      Lesson Title: Cell Parts and Functions      Time Frame: 15 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos, PhET

#### **Equipment Needed:**

iPads, Microscopes, Video Microscope, Prepared and blank Slides, Cover Slips, Vegetables, Beakers, Salt, Water

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Students will:</p> <ul style="list-style-type: none"> <li>• Distinguish between unicellular or multicellular organisms.</li> <li>• Distinguish among types of cells.</li> <li>• Develop and use a model to describe the function of a cell as a whole system.</li> <li>• Describe ways organelles contribute to the function of a cell.</li> <li>• Observe particles moving through a selectively permeable membrane.</li> <li>• Explain how the processes of diffusion and osmosis move molecules in living cells.</li> <li>• Compare passive and active transport.</li> </ul> | <p>Lesson Sequence</p> <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: Students are shown a high-resolution time-lapse of a living organism (such as a plant, animal tissue, or microscopic life sample) where visible changes in structure and function occur over time, but the internal cause of those changes cannot be directly observed.</li> <li>2. Label both plant and animal cell diagrams and record the functions of the organelles.</li> <li>3. Use microscope slides for identification of cell membrane and nucleus</li> </ol> | <ul style="list-style-type: none"> <li>• Complete homework reinforcement worksheets.</li> <li>• Complete the Activity List.</li> <li>• Participate in class discussions.</li> <li>• Complete the exit cards.</li> <li>• Take the quiz on cell parts and functions.</li> <li>• <a href="#">Complete the Egg-Cellent Lab.</a></li> <li>• Complete cell transport stations by answering questions and observations.</li> <li>• Take the quiz on cell transport.</li> </ul> |



- Observe diffusion and osmosis through lab stations.

4. Compare the functions to another "system." (Cell Connection).
5. Create a "cell town" and compare the organelles to a town function/job.
6. Using microscopes, view both unicellular and multicellular organisms. (Protists, onions)
7. Examine pond water and identify living organisms.
8. Observe the process of osmosis through an egg cell's membrane
9. Egg-Cellent Lab.
10. Observe osmosis through cell transport stations.
11. Station lab with examination of onion dissection and elodea samples.

**Differentiation:**

The Cell Parts and Functions activity list includes different learning styles. Some students may use the online games and review resources to better understand the cell parts. The Cell Connection activity is differentiated by ability level (some students will compare to school and other students will create their own analogies for comparisons). Worksheets are modified to differentiate material. Cell Transport stations offer a hands-on approach, as well as a good visual representation of osmosis. In addition, the questions themselves are differentiated.

**Resources Provided:**

- [Biology 4Kids](#) (Cell information)
- [Cells Alive](#) (Interactive Cell Diagrams)
- [Plant & Animal Cells](#) (Plant/Animal Cell Diagrams)
- [Cell Parts](#) (Cell parts and functions)
- [Cell Tour](#) (Virtual Cell Tour)
- Various worksheets
- Cell Transport Stations



### Lesson Plan 2 Template

Content Area: Science      Lesson Title: Body Systems      Time Frame: 10 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

#### **Equipment Needed:**

iPads, Mural Paper, Construction Paper, Headphones

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                            | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Formative Assessment<br>Tasks                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Create models of the human body</li> <li>• Show the Respiratory System, Digestive System, Circulatory System</li> <li>• Explain how the body is a system of interacting subsystems</li> <li>• Create a model or design an experiment demonstrating how the system interacts with another</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: A healthy organism is observed performing normal activities, but when one body system is “disrupted” in a simulated model (circulation, respiration, or digestion), multiple seemingly unrelated systems begin to fail in unexpected ways, raising the question of how all systems are connected.</li> <li>2. Each group member researches a system.</li> <li>3. Working with x-rays or classroom models, students choose a system and create a project demonstrating understanding of organs within the system; how</li> </ol> | <ul style="list-style-type: none"> <li>• Complete homework worksheets for each system</li> <li>• Exit Forms</li> <li>• Class Discussions</li> <li>• Various Diagrams of Organ Systems</li> <li>• Doctor for a day</li> </ul> |



- they work together and function as a whole. The project is informational with a creative twist utilizing technology or artistic expression.
4. Write a children's story or a play explaining how each system interacts with one another.
  5. In the role as author, students collaborate to write a story/play about their chosen organ within the confines of the organ system.
  6. Create a model or design an experiment to demonstrate how one system interacts with another.
  7. Using household supplies, students work collaboratively to design a method to pick up a cup mimicking a working hand; demonstrating understanding of muscles, bones & tendons.
  8. "What If" Scenarios: Interconnected Body Systems
  9. Students explore how body systems are deeply interdependent by examining critical "what if" scenarios where the failure or malfunction of one system triggers a cascade of consequences throughout the entire body. Students analyze realistic situations
  10. Doctor for a day



|  |                                                                                                                                                                                                   |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | 11. Students are presented with patient charts and based on symptoms and understanding of organs/systems they will diagnose patients with condition/disease. Requires collaboration and research. |  |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Differentiation:**

Working collaboratively, students research how their chosen body system functions and create an informational project (story, play, model, or multimedia presentation) that demonstrates how organs interact within the system and explains its role in keeping the body working.

**Resources Provided:**

- [Body Systems Page of Class Website](#)
- Various worksheets
- [Video Digestive System](#)
- [Circulatory System Video](#)
- [Respiratory System Animation](#)



### Lesson Plan 3 Template

Content Area: Science      Lesson Title: Information Processing      Time Frame: 5 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy        ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Sight vs. Sound and Reaction Time Gizmos

#### **Equipment Needed:**

iPads, Beads (Neuron Model), Pipe Cleaners, Straws, Clay

| Goals/Objectives                                                                                                                                                                                                 | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Formative Assessment<br>Tasks                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>Explain how senses change energy from the environment.</li> <li>Gather and synthesize information on how the brain uses and stores information.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>Anchoring Phenomenon: Students analyze a scenario where an organism responds correctly to its environment in real time (avoiding danger, seeking food, reacting to stimuli), but when key internal communication pathways are altered in a model simulation, the same organism makes inappropriate or delayed responses with no visible external damage.</li> <li>Label and color the main parts of the brain and identify the functions.</li> <li>Identify the major brain structures (cerebrum, cerebellum, brainstem, etc.) and accurately label</li> </ol> | <ul style="list-style-type: none"> <li>Homework worksheets</li> <li>Station Questioning and Answers</li> <li><a href="#">Color the parts of the brain</a></li> <li><a href="#">Create a neuron model</a></li> <li>Entrance/Exit Cards</li> <li>Check-in Quiz</li> </ul> |



- and color a diagram while explaining the primary function of each part.
4. Watch Synapses Change short animation.
  5. View an animation demonstrating synaptic transmission and explain how neurons communicate with each other through neurotransmitters and synapses.
  6. Create a model of a neuron and label its parts.
  7. Construct a three-dimensional or visual model of a neuron using available materials and correctly label the cell body, dendrites, axon, and axon terminals while describing the role of each component.
  8. Complete experiential brain stations.
  9. Interactive stations to experience how different brain regions control specific functions (balance, memory, coordination, sensory input, etc.) and connect hands-on experiences to their understanding of brain structure and function

**Differentiation:**

This lesson has a variety of activities to meet the needs of individual students. There are activities that utilize the different learning modalities such as, model building (hands-on), coloring (visual), and brain stations (both visual and kinesthetic). Provide a partially labeled brain diagram with only 4-5 major structures and a word bank with simple function definitions to match; create a guided note sheet with fill-in-the-blank sentences and visuals to complete during the synapses



animation; offer a pre-made neuron model template or beginner kit with pre-printed labels so students focus on assembly and coloring rather than building from scratch; and reduce experiential brain stations to 3-4 simplified activities with clear, step-by-step visual instructions, a guided worksheet with checkboxes, and peer or adult support for navigation.

**Resources Provided:**

- [Synapses Change](#)
- [Various Brain Stations](#)



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately or Weakly* meets the criteria below.**

| Lesson Activities                                                                                                    | Strongly                            | Moderately                          | Weakly                   |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

### Curriculum Design Template

|                              |                           |                                                                          |
|------------------------------|---------------------------|--------------------------------------------------------------------------|
| <b>Content Area:</b> Science | <b>Grade Level:</b> 7     | <b>Unit Title:</b> From Molecules to Organisms: Structures and Processes |
| <b>Created:</b> 2026         | <b>Board Approved on:</b> |                                                                          |



### Unit Overview Template

**Content Area:** Science    **Grade Level:** 7    **Unit Title:** Heredity: Inheritance and Variation of Traits

**Unit Summary:** Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. The genetics concepts in this unit will enable students to fully understand that organisms contain genetic information that influences their traits, and they pass this on to their offspring during reproduction. Students will begin by studying cell division and mitosis, enabling students to understand that different organisms can grow, repair damaged cells, and reproduce. Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. In addition, variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. Asexual reproduction results in offspring with identical genetic information. In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. In order to bridge the knowledge of reproduction to heredity, the students will identify the parts of a DNA molecule and its structure, explain how DNA copies itself, and describe the structure and function of each kind of RNA (involved in protein synthesis). A connection to the inheritance of traits can be linked to the fact that alterations in DNA can result in evolutionary changes that are inherited. Students will then recognize that through reproduction, genetic traits are passed from one generation to the next, as well as the importance of sexual reproduction and meiosis and that these processes ensure the preservation of species and diversity of life. Furthermore, in artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring. The probability of successful reproduction of animals and plants can be affected by characteristic animal behaviors that increase the odds of reproduction. Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.

**Primary Interdisciplinary Connections:** Mathematics

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy  
☒ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

**Unit Rationale:** This unit focuses on the systematic functions of organisms as part of an interdependent environment. The main components of this unit will cover Reproduction, Genetics and Heredity. It will also cover complex questions posing scientists today given advancements in technology in these areas.



**Career Readiness (Standard 9):**

- 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.
- 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
- 9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

**Learning Targets**

**Standards:** MS-LS1; MS-LS3; MS-LS4; MS-ETS1

**Content Statements:** From Molecules to Organisms: Structures and Processes. Heredity: Inheritance and Variation of Traits. Biological Evolution: Unity and Diversity

**CPI#:**

**Cumulative Progress Indicator (CPI):**

|             |                                                                                                                                                                                                                                                             |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MS-LS1-4    | Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. |
| MS-LS1-5    | Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.                                                                                                                           |
| MS-LS3-1    | Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.                         |
| MS-LS3-2    | Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation                                                                    |
| MS-LS4-5    | Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.                                                                                                         |
| MS-ETS1-4   | Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.                                                                                                 |
| 8.2.8.ED.1  | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.                                                                                                                       |
| 8.2.8.ED.2  | Identify the steps in the design process that could be used to solve a problem.                                                                                                                                                                             |
| 8.2.8.ED.3  | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).                                                                                                                     |
| 8.2.8.ED.5  | Explain the need for optimization in a design process                                                                                                                                                                                                       |
| Math.7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                                                                                                                                              |

**Science and Engineering Practices:**

**Constructing Explanations and Designing Solutions**



Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles, and theories.

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-LS1-5)

### **Engaging in Argument from Evidence**

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Use an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS1-4)

### **Developing and Using Models**

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop and use a model to describe phenomena. (MS-LS3-1), (MS-LS3-2)

### **Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)

## **Disciplinary Core Ideas (DICs):**

### **LS1.B: Growth and Development of Organisms**

- Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
- Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)
- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)

### **LS3.A: Inheritance of Traits**

- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (MS-LS3-1)



- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited. (MS-LS3-2)

### **LS3.B: Variation of Traits**

- In sexually reproducing organisms, each parent contributes half of the genes acquired (at random) by the offspring. Individuals have two of each chromosome and hence two alleles of each gene, one acquired from each parent. These versions may be identical or may differ from each other. (MS-LS3-2)
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

### **LS4.B: Natural Selection**

- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

## **Crosscutting Concepts:**

### **Cause and Effect**

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS1-4), (MS-LS1-5), (MS-LS4-5)
- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)

### **Structure and Function**

- Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function. (MS-LS3-1)

## ***Connections to Engineering, Technology, and Applications of Science***

### **Interdependence of Science, Engineering, and Technology**

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)

## ***Connections to Nature of Science***

### **Science Addresses Questions About the Natural and Material World**

- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)



### Unit Essential Questions:

- How is the outcome of asexual reproduction different from sexual reproduction?
- What animal behaviors increase the odds of reproduction?
- Explain why cells need to reproduce.
- What is the difference between mitosis and meiosis?
- Why is meiosis needed for sexual reproduction?
- When are mutations likely to occur?
- How can mutations over millions of years lead to a new species?
- Explain the process of DNA replication..
- How are traits inherited?
- What are the basic principles of genetics?
- What is the difference between an individual's genotype and phenotype?
- How are the probabilities of offspring predicted?
- How are sex-linked traits passed to offspring?
- How are genetic disorders inherited?
- What is the importance of advances in genetics?
- What are the advantages and disadvantages of genetic engineering?

### Unit Enduring Understandings:

- Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring.
- Animals engage in characteristic behaviors that increase the odds of reproduction.
- Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction.
- Genetic factors as well as local conditions affect the growth of the adult plant.
- Reproduction must occur for species to survive.
- Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits.
- Variations of inherited traits between parent and offspring arise from genetic differences that result from the subset of chromosomes (and therefore genes) inherited.
- In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others are harmful, and some neutral to the organism.
- Different organisms can grow, repair damaged cells, and reproduce because of cell division and mitosis.
- DNA contains the instructions for all life.
- The information in DNA that determines what an organism will be is contained in a code dictated by the order of subunits called nucleotides.



- A change in a cell's genetic message is called a mutation, which often destroys the cell's function.
- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed onto offspring.
- Mendelian inheritance reflects the mathematical rules of probability.
- The law of dominance explains that one trait (the dominant trait) is expressed in homozygous and heterozygous conditions.
- The recessive trait is expressed only in the homozygous condition.
- In Mendel's pea plant experiments, the recessive trait reappeared in approximately 25% of the offspring produced by crossing two heterozygous pea plants.
- Many human disorders follow Mendelian inheritance patterns, with recessive genes controlling many human genetic disorders.
- Advances in genetics can affect your health, the foods that you eat, and your environment.

#### **Unit Learning Targets:**

*Students will....*

- Explain why mitosis is important.
- Examine the steps of mitosis.
- Compare mitosis in plant and animal cells.
- Distinguish between the processes of mitosis and meiosis.
- Explain how DNA copies itself.
- Explain how traits are inherited.
- Identify Mendel's role in the history of genetics.
- Use a Punnett square to predict the results of crosses.
- Compare and contrast the difference between an individual's genotype and phenotype.
- Build models of "bugs" that depict different genotypes and phenotypes.
- Describe two human genetic disorders and how they are inherited.
- Explain how sex-linked traits are passed to offspring.
- Evaluate the importance of advances in genetics.
- Identify the advantages and disadvantages of genetic engineering.
- Identify different animal behaviors that increase the odds of reproduction.



### Evidence of Learning

**Summative Assessment:** (5-10 days for each of the projects)

- The Cell Division portion of this unit will culminate with a Cell Cycle poster that demonstrates understanding of how and why the cell reproduces. (5 days)
- The “Bug Builders” project/lab will reflect student understanding of the genetic concepts. (10 days)

**Equipment Needed:** iPads, Microscopes, Microscope Slides of Onion Root tip, Craft supplies, “Bug” model supplies

**Teacher Resources:** Various Google Sites

**Formative Assessments:** Tests, quizzes

- Exit Forms
- Homework worksheets
- Quizzes
- Discussion
- Mini Activities with questions
- The “Bug Builders” project/lab will reflect student understanding of the genetic concepts. (10 days)



### Lesson Plans

| Lesson                                            | Time Frame |
|---------------------------------------------------|------------|
| Lesson 1: Cell Reproduction (Mitosis and Meiosis) | 5 days     |
| Lesson 2: DNA                                     | 3 days     |
| Lesson 3: Genetics                                | 10 days    |

#### Curriculum Development Resources/Technology Resources:

*Click the links below to access additional resources used to design this unit:*

[Cell Reproduction](#)

[DNA](#)

[Genetics](#)



### Lesson Plan 1 Template

Content Area: Science

Lesson Title: **Cell Reproduction**

Time Frame: 5 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy        ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills    ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

**Equipment Needed:** iPads, lab equipment

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                        | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Formative Assessment Tasks                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will be able to: <ul style="list-style-type: none"> <li>• Distinguish between sexual and asexual reproduction.</li> <li>• Identify the stages of the cell cycle.</li> <li>• Examine the phases of mitosis.</li> <li>• Compare mitosis in plant and animal cells.</li> <li>• Identify the phases of meiosis.</li> <li>• Compare mitosis vs. meiosis.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: A living organism is shown producing new cells for growth and repair, but some cells begin dividing at dramatically different rates in different parts of the same organism, leading to visible changes in structure and function that cannot be explained by uniform cell reproduction alone.</li> <li>2. Watch the short video clip on mitosis.</li> <li>3. Recognize the primary phases of mitosis, specifically prophase, metaphase, anaphase, and telophase.</li> </ol> | <ul style="list-style-type: none"> <li>• Complete homework reinforcement worksheets</li> <li>• <a href="#">Onion Root Tip Lab (VIRTUAL)</a></li> <li>• Participate in class discussions</li> <li>• Complete the exit card</li> <li>• Take the quiz on stages of the cell cycle</li> </ul> |



4. Complete the virtual lab that shows the cells of an onion root tip.
5. Examine the phases of mitosis using the presented diagram.
6. Interact with a digital diagram to explore each phase of mitosis in detail, manipulate visual representations, and explain the key events occurring during each stage.
7. View the onion root tip slides under the microscopes and identify cells undergoing mitosis.
8. use microscopes to observe actual onion root tip cells, locate cells in various phases of mitosis, and record their observations on a worksheet.
9. Create a poster using various craft items to model the stages of the cell cycle, including the phases of mitosis.
10. Design and construct a visual representation of the cell cycle and mitosis phases using creative materials, label each stage, explain the events occurring during each phase.
11. Read the meiosis information sheet and complete the worksheet.
12. Informational text about meiosis,



understand how it differs from mitosis, and answer comprehension questions demonstrating understanding of meiosis stages and outcomes.

13. Complete the mitosis vs. meiosis comparison chart.
14. Analyze the similarities and differences between mitosis and meiosis by completing a comparison chart that identifies key characteristics, purposes, and outcomes of each process.

**Differentiation:** Some students might work exclusively online and create a PowerPoint to show the stages of the cell cycle. Some students may use the online games and review resources to better understand the stages of the cell cycle. Worksheets are modified to differentiate material.

**Resources Provided:**

- [Cell Reproduction](#)
- Various Worksheets (Stages of Mitosis, Cell Division)



### Lesson Plan 2 Template

Content Area: Science

Lesson Title: DNA

Time Frame: 3 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☐ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy        ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☐ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills    ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

**Equipment Needed:** iPads, DNA model pieces, Blender (DNA Extraction Lab)

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                       | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Formative Assessment Tasks                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Create a model of a DNA molecule.</li> <li>• Model the process of DNA replication.</li> <li>• Identify the parts of a DNA molecule and its structure.</li> <li>• Explain how DNA copies itself (replication).</li> <li>• Describe the process of protein synthesis.</li> <li>• Extract the DNA from peas or strawberries.</li> <li>• Identify the suspect using DNA fingerprinting.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring<br/>Phenomenon: Two organisms with nearly identical visible traits produce unexpectedly different biological results when their DNA is analyzed in a simulation (including differences in protein production and trait expression), raising the question of how the same basic genetic code can lead to different outcomes.</li> <li>2. Create a paper model of DNA (color coding the nitrogen bases, sugars, and phosphates).</li> <li>3. use an interactive online tool to explore and manipulate the DNA replication</li> </ol> | <ul style="list-style-type: none"> <li>• Complete HW reinforcement worksheets</li> <li>• <a href="#">DNA Extraction Lab</a></li> <li>• <a href="#">DNA Extraction Lab (VIRTUAL)</a></li> <li>• <a href="#">DNA Workshop Activity</a></li> <li>• Participate in class discussions</li> <li>• <a href="#">Complete the paper model activity</a></li> </ul> |



- |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>process step-by-step, identifying the role of enzymes and explaining how genetic information is accurately copied.</p> <ol style="list-style-type: none"><li>4. Demonstrate the replication process using the paper model.</li><li>5. view a video explaining protein synthesis, identify the roles of DNA, mRNA, and tRNA, and describe how genetic instructions are translated into proteins.</li><li>6. DNA Workshop Activity (online tool to show process of replication)</li><li>7. use an interactive online tool to explore and manipulate the DNA replication process step-by-step, identifying the role of enzymes and explaining how genetic information is accurately copied.</li><li>8. Watch a short clip on protein synthesis.</li><li>9. view a video explaining protein synthesis, identify the roles of DNA, mRNA, and tRNA, and describe how genetic instructions are translated into proteins.</li><li>10. Complete the DNA Extraction Lab.</li></ol> |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



11. perform a hands-on lab using household materials to extract DNA from cells, observe the physical DNA precipitate, and explain the steps of the extraction process.
12. use a virtual simulation to conduct a DNA extraction experiment, follow laboratory procedures digitally, and analyze results without physical materials.
13. Complete the DNA Fingerprinting Virtual Crime Scene scenario.
14. analyze DNA evidence from a virtual crime scene by comparing DNA fingerprints of suspects to evidence collected, apply gel electrophoresis concepts, and determine which suspect matches the crime scene DNA.

**Differentiation:** Provide pre-cut DNA model pieces with color-coded labels already assigned; use simplified online tools with guided step-by-step instructions; watch shorter video clips with pauses for comprehension checks; and complete virtual labs with scaffolded worksheets and word banks.

**Resources Provided:**

- [PBS](#)
- [How to Extract DNA](#)
- [Science Links](#)



### Lesson Plan 3 Template

Content Area: Science      Lesson Title: Genetics      Time Frame: 10 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☒ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills    ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Genetics

**Integration of Technology:** Digital activities (Punnett squares), Short Video Clips, iMovie (Bug Builders Activity)

**Equipment Needed:** iPads, Various Materials (Bug Builders)

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Formative Assessment<br>Tasks                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Explain how traits are inherited.</li> <li>• Identify Mendel's role in the history of genetics.</li> <li>• Use a Punnett square to predict the results of crosses.</li> <li>• Compare the difference between an individual's genotype and phenotype.</li> <li>• Describe 2 genetic disorders and how they are inherited.</li> <li>• Explain how sex-linked traits are passed to offspring.</li> <li>• Evaluate the importance of advances in genetics.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring<br/>Phenomenon: A family pedigree and simulated breeding scenario show offspring with traits that do not match predicted inheritance patterns (including unexpected combinations of dominant and recessive traits), even when all parental genetic information appears to be clearly documented.</li> <li>2. Survey the class to determine whether traits controlled by dominant alleles are more common than those controlled by recessive alleles.</li> </ol> | <ul style="list-style-type: none"> <li>• Complete IIW reinforcement worksheets</li> <li>• Participate in class discussions</li> <li>• Quiz on Genetics Vocabulary</li> <li>• Quiz on Punnett squares</li> </ul> |



- |                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <ul style="list-style-type: none"><li>• Identify advances in genetics.</li><li>• Write a persuasive argument in reaction to an article about cloning animals for food OR using CRISPR to edit genes.</li></ul> | <ol style="list-style-type: none"><li>3. collect data on classmates' observable traits (eye color, hair color, attached/unattached earlobes, etc.), analyze the frequency of dominant versus recessive traits, and draw conclusions about trait distribution in the population.</li><li>4. Show diagrams of Mendel's pea plant experiments (Discussion homozygous/heterozygous genotypes).</li><li>5. examine diagrams of Mendel's experiments, distinguish between homozygous and heterozygous genotypes, and explain how Mendel's observations led to the discovery of dominant and recessive alleles.</li><li>6. Complete the Guinea Pig activity (Punnett squares).</li><li>7. Use Punnett squares to predict offspring genotypes and phenotypes from guinea pig crosses, apply the rules of probability, and explain how traits are inherited.</li><li>8. Simulate the combining of alleles through Genetics with a Smile and create a human face.</li></ol> |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



9. Use an interactive online tool to combine alleles and generate a unique human face, observe how different allele combinations produce different traits, and explain the genetic basis for variation.
10. Complete the SpongeBob Genetics (Punnett squares).
11. Solve genetic problems using SpongeBob characters, create Punnett squares to predict offspring traits, and apply Mendelian genetics principles to fictional scenarios.
12. Complete the Bug Builders Performance Task.
13. Design an organism by selecting traits controlled by specific alleles, justify their choices based on genetic principles, and explain how their organism would survive in a given environment.
14. Complete the Doctor of Disorders task.
15. Research genetic disorders, analyze inheritance patterns using pedigree charts, and apply their understanding of dominant and recessive alleles to explain how genetic conditions are passed through families.



16. Complete the Genetic Advancements webquest.
17. Research current genetic technologies (gene therapy, genetic testing, selective breeding) and gather information about their applications, benefits, and ethical considerations.
18. Complete the persuasive writing prompt (Food from Clones article or CRISPR article).
19. read an article about genetic advancements (cloning or CRISPR), develop a position on the topic, and write a persuasive essay supported by evidence and reasoning about the benefits or concerns of genetic technology.

**Differentiation:** Provide simplified trait surveys using pictures and checkboxes; offer pre-labeled Mendel diagrams with definitions of homozygous and heterozygous already filled in; supply pre-drawn Punnett squares with some boxes completed and a word bank of possible answers. Use the interactive "Genetics with a Smile" tool with guided instructions and simplified trait options; provide SpongeBob genetics problems with visual aids and partially completed Punnett squares. Simplify the Bug Builders task by providing pre-selected trait options and a checklist; use a guided worksheet for the Doctor of Disorders task with pedigree charts already drawn; provide a shorter webquest with websites pre-selected and guiding questions; and offer a structured persuasive writing template with sentence starters and a simplified article excerpt for the writing prompt.

**Resources Provided:**

- [Bill Nye: Cloning Video](#)
- [Bill Nye: Genetically Modified Foods](#)
- [Karyotype](#)



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately or Weakly* meets the criteria below.**

| Lesson Activities                                                                                                    | Strongly                            | Moderately                          | Weakly                   |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

### Curriculum Design Template

**Content Area:** Science and Variation of Traits

**Grade Level:** 7

**Unit Title:** Heredity: Inheritance

**Created:** 2026

**Board Approved on:**



### Unit Overview Template

**Content Area:** Science  
and Diversity

**Grade Level:** 7

**Unit Title:** Biological Evolution: Unity

**Unit Summary:** The evolution concepts in this unit will enable students to fully understand and recognize that sometimes, differences between organisms of the same kind provide advantages for surviving and reproducing in different environments. Furthermore, these selective differences may lead to dramatic changes in characteristics of organisms in a population over extremely long periods of time. Students will begin by demonstrating the process of natural selection and explaining that individual organisms with certain traits are more likely to survive and have offspring in particular environments. They will use mathematical evidence to support how natural selection may lead to increases and decreases of specific traits in populations over time. They will show how the extinction of a species is related to an inability to adapt to changing environmental conditions. Students will be able to identify five types of evidence for evolution by analyzing and interpreting data that shows patterns in the fossil record, by comparing patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy development of embryos, by explaining the anatomical similarities and differences among modern organisms and between fossil organisms to infer evolutionary relationships, and by comparing the DNA of closely related species. In addition, they will identify characteristics that all primates share and discuss the evolutionary history of modern primates, which demonstrates the understanding that the ancient ancestor of present-day humans appeared on Earth 4-6 million years ago.

**Primary Interdisciplinary Connections:** Mathematics

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy  
☒ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☐ Media Literacy

**Unit Rationale:** This unit will utilize scientific tools to gain an understanding of Evolution and the process of Natural Selection. The students will gain an understanding of adaptations and how character traits help different species survive in specific environments.

**Career Readiness (Standard 9):**

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

### Learning Targets

**Standards:** MS-LS4; MS-ETS1

**Content Statements:** Biological Evolution: Unity and Diversity; Engineering Design.

**CPI#:**

**Cumulative Progress Indicator (CPI):**

MS-LS4-1

Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history



|             |                                                                                                                                                                                                           |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | of life on Earth under the assumption that natural laws operate today as in the past.                                                                                                                     |
| MS-LS4-2    | Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.    |
| MS-LS4-3    | Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.        |
| MS-LS4-4    | Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. |
| MS-LS4-5    | Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.                                                       |
| MS-LS4-6    | Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.                                        |
| MS-ETS1-4   | Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.                                               |
| 8.2.8.ED.1  | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.                                                                     |
| 8.2.8.ED.2  | Identify the steps in the design process that could be used to solve a problem.                                                                                                                           |
| 8.2.8.ED.3  | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).                                                                   |
| 8.2.8.ED.5  | Explain the need for optimization in a design process                                                                                                                                                     |
| Math.7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                                                                                            |

### Science and Engineering Practices:

#### Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze displays of data to identify linear and nonlinear relationships. (MS-LS4-3)
- Analyze and interpret data to determine similarities and differences in findings. (MS-LS4-1)

#### Using Mathematics and Computational Thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

- Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)

#### Constructing Explanations and Designing Solutions



Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. (MS-LS4-2)
- Construct an explanation that includes qualitative or quantitative relationships between variables that describe phenomena. (MS-LS4-4)

### **Obtaining, Evaluating, and Communicating Information**

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

- Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-LS4-5)

### **Developing and Using Models**

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs. (MS-ETS1-4)

## **Disciplinary Core Ideas (DICs):**

### **LS4.A: Evidence of Common Ancestry and Diversity**

- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (MS-LS4-1)
- Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (MS-LS4-2)
- Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the fully-formed anatomy. (MS-LS4-3)

### **LS4.B: Natural Selection**

- Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
- In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)

### **LS4.C: Adaptation**

- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more



common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

**ETS1.B: Developing Possible Solutions**

- Models of all kinds are important for testing solutions. (MS-ETS1-4)

**ETS1.C: Optimizing the Design Solution**

- The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4)

**Crosscutting Concepts:**

**Patterns**

- Patterns can be used to identify cause and effect relationships. (MS-LS4-2)
- Graphs, charts, and images can be used to identify patterns in data. (MS-LS4-1), (MS-LS4-3)

**Cause and Effect**

- Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability. (MS-LS4-4), (MS-LS4-5), (MS-LS4-6)

***Connections to Engineering, Technology, and Applications of Science***

**Interdependence of Science, Engineering, and Technology**

- Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems. (MS-LS4-5)

***Connections to Nature of Science***

**Scientific Knowledge is Based on Empirical Evidence**

- Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-LS4-1)

**Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS4-1), (MS-LS4-2)

**Science Addresses Questions About the Natural and Material World**

- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)

**Unit Essential Questions:**

- Why are variations in organisms important?



- Why are variations important for change in a population over time?
- How do genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment?
- How does natural selection lead to increases and decreases of specific traits in populations over time?
- How does geographic isolation contribute to evolution?
- What is the evidence for evolution?
- How do these evidences show evolutionary changes within a species?
- How are anatomical similarities and differences among modern organisms and between fossil organisms used to infer evolutionary relationships?
- How are patterns of similarities in the embryological development across multiple species used to identify relationships not evident in the fully formed anatomy?
- How can a new species of an organism evolve?
- How are genetics and the theory of evolution related?
- What are Darwin's principles of natural selection?
- What characteristics do all primates share?
- What evidence suggests that all primates might have shared a common ancestor?

#### **Unit Enduring Understandings:**

- Evolution is one of the central ideas of biology. It explains how living things have changed in the past and is a basis for predicting how they might change in the future.
- Charles Darwin and other scientists observed that species change over time by different methods.
- Individual organisms with certain traits are more likely than others to survive and have offspring in particular environments. The advantages or disadvantages of specific characteristics can change when the environment in which they exist changes. Extinction of a species occurs when the environment changes and the characteristics of a species are insufficient to allow survival.
- Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.
- Anatomical evidence supports evolution and provides additional detail about the sequence of branching of various lines of descent.
- Embryological development of different species also reveals similarities that show relationships not evident in the fully formed anatomy.
- The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.



- Scientists find clues about evolution by studying fossils, development of embryos, anatomical structures of organisms, and DNA.
- Evidence indicates that the ancient ancestor of present-day humans appeared on Earth 4-6 million years ago.
- Organisms better suited for the environment are more likely to survive and reproduce and pass their traits to future generations.
- Members of a species separated by some geographic barrier can change over time into two different species.
- Genetics provides the inheritance mechanism for evolution to work in a population. If traits were not inherited, there could be no evolution.

### **Unit Learning Targets:**

*Students will....*

- Demonstrate the process of natural selection by simulating birds and their prey.
- Explain how certain variations are better for survival.
- Identify why variations in organisms are important.
- Distinguish between punctuated equilibrium and gradualism.
- Demonstrate how a trait evolves within a species.
- Design an experiment to demonstrate that variations exist in a population.
- Compare absolute dating with relative dating.
- Model radioactive dating.
- Identify the importance of fossils.
- Explain how DNA can provide some evidence of evolution.
- Identify characteristics that all primates share.
- Identify 5 different evidences for evolution.
- Create a timeline of human ancestors.
- Describe three kinds of evidence suggesting that all primates might have shared a common ancestor.



### Evidence of Learning

**Summative Assessment:** (Approximately 5 days for each project/lab activity)

- The “variations” portion of this unit will culminate with the Bean Lab that demonstrates how variations within a population are important for survival.
- The overall unit will culminate with stations that demonstrate knowledge of evidence for evolution, geologic time, and human evolution.

**Equipment Needed:** iPads, Playing cards, Beans, Clay, Colored pencils, Glue, Scissors, Pennies

**Teacher Resources:** Various Google sites, Class Website, Textbook.

#### **Formative Assessments:**

- Exit Forms
- Homework worksheets
- Quizzes
- Discussion



### Lesson Plans

| Lesson                                                                                        | Time Frame |
|-----------------------------------------------------------------------------------------------|------------|
| Lesson 1: Natural Selection                                                                   | 5 days     |
| Lesson 2: Variations                                                                          | 5 days     |
| Lesson 3: Evolution Stations                                                                  | 5 days     |
| Curriculum Development Resources/Technology Resources:<br><a href="#">Evolution Resources</a> |            |



### Lesson Plan 1 Template

Content Area: Science      Lesson Title: Natural Selection      Time Frame: 5 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☐ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

**Equipment Needed:** iPads, Evolution within a Species materials

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                           | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                               | Formative Assessment<br>Tasks                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Demonstrate the process of natural selection by simulating bird's finding/eating their prey.</li> <li>• Explain how certain variations are better for survival.</li> <li>• Infer that camouflage is an adaptation used for survival in certain environments.</li> <li>• Identify Darwin's factors of natural selection.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: A population of organisms is observed over multiple "generations" in a simulation where environmental conditions suddenly change (food source, temperature, predators), and within a short time the population begins to shift in visible traits—even though no new organisms are introduced from outside.</li> <li>2. Read "Peppered Moth and Natural Selection" on Evolution page of the website.</li> </ol> | <ul style="list-style-type: none"> <li>• Complete homework reinforcement worksheets.</li> <li>• Participation in class discussions and activities.</li> <li>• Complete the exit card.</li> <li>• Take the quiz on natural selection and vocabulary.</li> </ul> |



3. Read an informational text about peppered moths and analyze how environmental changes led to shifts in moth population coloration, demonstrating understanding of natural selection as a mechanism of evolution.
4. Perform the simulation lab on the students' iPads.
5. Use an interactive computer simulation to model natural selection by observing how organism traits change over generations in response to environmental pressures and predation.
6. Complete the lab data sheet.
7. Play the natural selection game on the students' iPads.
8. Engage in an interactive game where they make decisions about organism traits and environmental conditions, observe the consequences of their choices, and apply natural selection concepts to predict population outcomes.
9. Complete the Evolution within a Species hands-on activity.
10. Investigate how species adapt and change over



|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                      |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|                                                                                                                                                                                                                                                                                                                                                    | time through natural selection, analyze examples of variation within populations, and explain how beneficial traits become more common while disadvantageous traits become less common in a species. |  |
| <b>Differentiation:</b> Provide a simplified "Peppered Moth" text with highlighted key vocabulary and a graphic organizer; use a guided simulation lab with step-by-step instructions and a partially completed data sheet with visual prompts; offer a simplified natural selection game with fewer variables and clear cause-and-effect visuals. |                                                                                                                                                                                                      |  |
| <b>Resources Provided:</b> <ul style="list-style-type: none"> <li>• <a href="#">Evolution</a></li> <li>• Various worksheets</li> <li>• Evolution within a Species Activity</li> </ul>                                                                                                                                                              |                                                                                                                                                                                                      |  |

### Lesson Plan 2 Template

|                                                                                                                                                                                                                                                                                                                                                                                            |                          |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------|
| Content Area: Science                                                                                                                                                                                                                                                                                                                                                                      | Lesson Title: Variations | Time Frame: 5 days |
| <b>Lesson Components</b>                                                                                                                                                                                                                                                                                                                                                                   |                          |                    |
| <b><u>21<sup>st</sup> Century Themes</u></b>                                                                                                                                                                                                                                                                                                                                               |                          |                    |
| <input checked="" type="checkbox"/> Global Awareness <input type="checkbox"/> Financial, Economic, Business and Entrepreneurial Literacy<br><input type="checkbox"/> Civic Literacy <input type="checkbox"/> Health Literacy                                                                                                                                                               |                          |                    |
| <b><u>21<sup>st</sup> Century Skills</u></b>                                                                                                                                                                                                                                                                                                                                               |                          |                    |
| <input checked="" type="checkbox"/> Creativity and Innovation <input checked="" type="checkbox"/> Critical Thinking and Problem Solving <input type="checkbox"/> Information Literacy<br><input type="checkbox"/> Life and Career Skills <input checked="" type="checkbox"/> Communication and Collaboration <input type="checkbox"/> Media Literacy <input type="checkbox"/> ICT Literacy |                          |                    |
| <b>Interdisciplinary Connections:</b> Mathematics                                                                                                                                                                                                                                                                                                                                          |                          |                    |
| <b>Integration of Technology:</b> iPads (Recording data and writing lab report), PhET, Gizmos                                                                                                                                                                                                                                                                                              |                          |                    |
| <b>Equipment Needed:</b> iPads, beans, various lab items (determined by students)                                                                                                                                                                                                                                                                                                          |                          |                    |

| Goals/Objectives                                                                                        | Learning Activities/<br>Instructional Strategies                        | Formative Assessment<br>Tasks                                                                                                                    |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Collect data to determine variations</li> </ul> | Lesson Sequence<br>1. Anchoring Phenomenon: A group of nearly identical | <ul style="list-style-type: none"> <li>• Graphs.</li> <li>• <a href="#">WoolyBooger Lab</a></li> <li>• <a href="#">Variations Lab</a></li> </ul> |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>within their own species.</p> <ul style="list-style-type: none"><li>• Generate both bar and pie graphs to display their data.</li><li>• Analyze their data and draw conclusions.</li><li>• Demonstrate how bird beaks have adapted to the specific foods.</li><li>• Design an experiment to demonstrate that variations exist in a population.</li><li>• Form a hypothesis about a trait found in a population of beans.</li><li>• Conduct their experiment using appropriate equipment.</li><li>• Collect and analyze data.</li><li>• Form conclusions.</li></ul> | <p>organisms shows unexpected differences in survival and reproduction when placed in the same environment, and students are presented with data suggesting that some traits consistently increase survival while others disappear without any direct intervention.</p> <ol style="list-style-type: none"><li>2. Choose a characteristic/trait and collect data</li><li>3. Select a human trait from a provided list, follow standardized data collection procedures, and gather measurements or observations from classmates to create a dataset showing variation within the species.</li><li>4. Generate and analyze graphs to display data.</li><li>5. Create appropriate graphs (bar graphs, histograms, or scatter plots) to visualize collected data and identify patterns of variation within the population.</li><li>6. Write a paragraph explaining variation within a species.</li><li>7. Write a cohesive paragraph explaining the causes of natural variation observed in their data and discuss</li></ol> | <ul style="list-style-type: none"><li>• Participate in class discussions.</li></ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|



- how genetic and environmental factors contribute to trait differences within a species.
8. Woollybooger Natural Selections Lab activity.
  9. Observe the Woollybooger Natural Selection Lab to understand how different traits affect an organism's survival in changing environments and how advantageous variations increase in populations over time.
  10. Design and conduct an experiment to investigate a testable question
  11. Formulate a testable question about human variation (e.g., "Does height affect jumping ability?"), develop a hypothesis, design an experiment with appropriate materials and procedures, and collect quantitative data following the scientific method.
  12. Analyze data, draw conclusions and explain findings in terms of Natural Selection
  13. Analyze experimental results, draw evidence-based conclusions about the relationship between variables, and explain how observed variations might



|  |                                                                                                            |  |
|--|------------------------------------------------------------------------------------------------------------|--|
|  | provide survival advantages in specific environments, connecting findings to natural selection principles. |  |
|--|------------------------------------------------------------------------------------------------------------|--|

**Differentiation:** Provide a pre-selected list of simple traits with pictures; use a guided data collection sheet with checkboxes and visual examples; and offer pre-made graph templates with partially filled data points for students to complete. Supply a simplified Woolybooger lab with step-by-step visual instructions and a worksheet with sentence frames to explain trait advantages; provide a testable question already written for students, along with a hypothesis template and a materials checklist to guide experiment setup and data collection. Offer a partially completed data analysis chart with visual prompts; provide a conclusion writing template with sentence starters; and supply a graphic organizer connecting experimental findings to natural selection concepts with visual examples.

**Resources Provided:**

- [Variations Within a Species Activity](#)
- [Woolybooger Natural Selection Lab Activity](#)



### Lesson Plan 3 Template

Content Area: Science      Lesson Title: Evolution Stations      Time Frame: 5 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness      ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☒ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation      ☒ Critical Thinking and Problem Solving      ☒ Information Literacy  
☐ Life and Career Skills      ☒ Communication and Collaboration      ☐ Media Literacy      ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

**Equipment Needed:** iPads, Stations, Colored Pencils, Glue, Scissors, Pennies, Boxes

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                              | Formative Assessment Tasks                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>• Compare absolute-dating with relative-dating by making a timeline.</li> <li>• Demonstrate radioactive decay.</li> <li>• Create a visual organizer to show the timeline of human ancestors.</li> <li>• Create a placemat to show 5 different bits of evidence for evolution.</li> <li>• Identify characteristics that all primates share.</li> <li>• Create fossils by making molds/casts.</li> <li>• Show a condensed history of life on earth (Geologic Time Scale).</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>1. Anchoring Phenomenon: Students rotate through a series of fossil records, genetic data sets, and comparative anatomy models that all point to a single species changing over time, but the evidence is incomplete and sometimes contradictory, forcing them to determine whether the same organism is actually evolving or whether multiple explanations are possible.</li> <li>2. Primate &amp; Human Evolution Station</li> </ol> | <ul style="list-style-type: none"> <li>• Quiz on evidences</li> <li>• Various worksheets</li> <li>• <a href="#">Dino Discoveries</a></li> <li>• Exit cards</li> </ul> |



3. List characteristics that primates share. Collect pictures/drawings. Identify the purpose of characteristics helping the primates in their Biomes.
4. Tape thumbs and attempt tasks.
5. Complete timeline.
6. Radioactive Pennies Station
7. Create a data table and perform activity.
8. Create a line graph on Excel.
9. Evidence of Evolution Station
10. Use given resources to create a placemat of all 5 evidences of evolution.
11. History of Life on Earth Station
12. Use a packet of information to complete the Geologic Time Scale.
13. Add pictures for each Era.
14. Relative vs. Absolute Dating Station
15. Using the adding tape paper, create a timeline of your own life by distinguishing relative and absolute dates.
16. Add pictures to the timeline.

**Differentiation:** The Evolution Stations include different learning styles. Worksheets are also modified to differentiate material.

**Resources Provided:**

- [Evolution](#)
- Evolution Stations



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately or Weakly* meets the criteria below.**

| Lesson Activities                                                                                                    | Strongly                            | Moderately                          | Weakly                   |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

### Curriculum Design Template

|                              |                       |                                                              |
|------------------------------|-----------------------|--------------------------------------------------------------|
| <b>Content Area:</b> Science | <b>Grade Level:</b> 7 | <b>Unit Title:</b> Biological Evolution: Unity and Diversity |
| <b>Created:</b> 2026         |                       | <b>Board Approved on:</b>                                    |



### Unit Overview Template

**Content Area:** Science **Grade Level:** 7 **Unit Title:** Ecosystems: Interactions, Energy, and Dynamics

**Unit Summary:** In this unit, students will learn about relationships between living and nonliving things in populations, communities, and ecosystems. Students will explore the connection between living and nonliving things in their environment. Students will explore how cycling of materials affects populations of organisms. Students will investigate predatory relationships, competitive relationships, food webs and human impact on biodiversity. Students will construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

**Primary Interdisciplinary Connections:** Mathematics

**21<sup>st</sup> Century Themes** ☒ Creativity and Innovation ☒ Critical Thinking and Problem Solving ☐ ICT Literacy  
☒ Information Literacy ☐ Life and Career Skills ☒ Communication and Collaboration ☒ Media Literacy

#### Unit Rationale:

This unit will utilize scientific tools to gain an understanding of how ecosystems function and relate to other concepts in Life Science.

#### Career Readiness (Standard 9):

9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions.

9.4.8.CI.2: Repurpose an existing resource in an innovative way.

9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective.

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.

9.4.8.TL.3: Select appropriate tools to organize and present information digitally.

### Learning Targets

**Standards:** MS-LS2

**Content Statements:** Ecosystems: Interactions, Energy, and Dynamics

**CPI#:**

**Cumulative Progress Indicator (CPI):**

MS-LS2-1

Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-2

Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.



|             |                                                                                                                                             |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| MS-LS2-3    | Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.                      |
| MS-LS2-4    | Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. |
| MS-LS2-5    | Evaluate competing design solutions for maintaining biodiversity and ecosystem services.                                                    |
| 8.2.8.ED.1  | Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.       |
| 8.2.8.ED.2  | Identify the steps in the design process that could be used to solve a problem.                                                             |
| 8.2.8.ED.3  | Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).     |
| 8.2.8.ED.5  | Explain the need for optimization in a design process                                                                                       |
| Math.7.RP.A | Analyze proportional relationships and use them to solve real-world and mathematical problems.                                              |

### Science and Engineering Practices:

#### Developing and Using Models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Develop a model to describe phenomena. (MS-LS2-3)

#### Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to provide evidence for phenomena. (MS-LS2-1)

#### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena. (MS-LS2-2)

#### Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-LS2-4)
- Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-LS2-5)



## **Disciplinary Core Ideas (DICs):**

### **LS2.A: Interdependent Relationships in Ecosystems**

- Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
- Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

### **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems**

- Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

### **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**

- Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
- Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS-LS2-5)

### **LS4.D: Biodiversity and Humans**

- Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

### **ETS1.B: Developing Possible Solutions**

- There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (secondary to MS-LS2-5)



### **Crosscutting Concepts:**

#### **Patterns**

- Patterns can be used to identify cause and effect relationships. (MS-LS2-2)

#### **Cause and Effect**

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-LS2-1)

#### **Energy and Matter**

- The transfer of energy can be tracked as energy flows through a natural system. (MS-LS2-3)

#### **Stability and Change**

- Small changes in one part of a system might cause large changes in another part. (MS-LS2-4), (MS-LS2-5)

### ***Connections to Engineering, Technology, and Applications of Science***

#### **Influence of Science, Engineering, and Technology on Society and the Natural World**

- The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus, technology use varies from region to region and over time. (MS-LS2-5)

### ***Connections to Nature of Science***

#### **Scientific Knowledge Assumes an Order and Consistency in Natural Systems**

- Science assumes that objects and events in natural systems occur in consistent patterns that are understandable through measurement and observation. (MS-LS2-3)

#### **Science Addresses Questions About the Natural and Material World**

- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS2-5)

#### **Knowledge is Based on Empirical Evidence**

- Science disciplines share common rules of obtaining and evaluating empirical evidence. (MS-LS2-4)

### **Unit Essential Questions:**

- How are organisms and or populations of organisms dependent on environmental interactions with both living and nonliving things?
- What do organisms compete for in their ecosystem? What else is competing for those resources?



- What are the ways that the population's growth is limited?
- What are the beneficial interactions in the ecosystem?
- Why is biodiversity important?
- What does the biodiversity rating tell you about the health of the ecosystem?
- How are humans affected by a decrease in biodiversity?
- What positive and negative effects do humans have on biodiversity?
- What keeps us and other organisms alive on Earth?
- How does a system of living and nonliving things operate to meet the needs of organisms in an ecosystem?
- How and why do organisms interact with their environment, and what are the effects of these interactions?
- How do organisms obtain and use matter and energy?
- How does matter and energy move through an ecosystem?
- How do organisms interact with other organisms in the physical environment to obtain matter and energy?
- How do organisms interact with the living and non-living environment to obtain matter and energy?
- How do organisms "fit" together in an ecosystem?
- How do the organisms in any ecosystem interact with each other?
- How do changes in the environmental conditions affect the survival of organisms?
- How is the function of any system dependent on each of its parts?
- How do organisms depend on each other?
- What do organisms need to be successful?
- How do decomposers influence the flow of energy?

#### **Unit Enduring Understandings:**

- People benefit from biodiversity and use their knowledge of biodiversity to make decisions about their surroundings.
- An ecosystem is a complex interaction of living and nonliving components.
- Materials are constantly cycling through ecosystems and get re-used in the environment.
- There are limited resources that contribute to the success of an organism.
- Humans have the power to influence an ecosystem more than any other living thing.
- Organisms survive in environments where their needs are met.
- All living organisms and ecosystems on Earth have interconnections and are interdependent.
- Symbiotic relationships exist among organisms in an ecosystem.
- The continuing diversity of living things on Earth (biodiversity) is dependent on the nature of the environmental condition of the planet.
- The uninterrupted flow of matter and energy through the physical environment is necessary to support the diversity of life.
- Human beings have both positive and negative effects on environmental conditions.
- Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.



**Unit Learning Targets:**

***Students will....***

- Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- Evaluate competing design solutions for maintaining biodiversity and ecosystem services.



### Evidence of Learning

**Summative Assessment:** Students will participate in a PBL “Endangered Species.” Students form groups of three to research and develop a recovery plan for an endangered species. The first part of the activity has the students taking the role of a zoologist, an ecologist and a conservationist to research the animal. The groups combine information to create an infographic on the animal and present a recovery plan to their peers.

**Equipment Needed:** iPad, lab materials

**Teacher Resources:** iPad, lab materials

#### Formative Assessments:

- Concept map of terms
- Student conference
- Teacher observations
- Exit cards
- Quizzes
- Interactive notebook pages right and left sides
- Writing frames- cause and effect/compare and contrast, sequence
- Worksheets
- Reading assignments
- Homework
- Graphic organizers
- Lab reports



### Lesson Plans

| Lesson                                                                                                                                                                                                                                     | Time Frame    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <b>Lesson 1: Biotic and Abiotic Factors in an ecosystem</b>                                                                                                                                                                                | <b>6 days</b> |
| <b>Lesson 2: Competition for Resources</b>                                                                                                                                                                                                 | <b>6 days</b> |
| <b>Lesson 3: Balance within an Ecosystem</b>                                                                                                                                                                                               | <b>6 days</b> |
| <b>Teacher Notes:</b><br>Reading-<br><a href="#">Food webs &amp; Ecosystems</a><br><a href="#">Interactions of Life reading</a>                                                                                                            |               |
| <b>Curriculum Development Resources/Technology Resources:</b><br><i>Click the links below to access additional resources used to design this unit:</i><br><a href="#">Gizmos - Coral Reefs</a><br><a href="#">Environmental Challenges</a> |               |



### Lesson Plan 1 Template

Content Area: Science Lesson Title: Abiotic and Biotic Factors Time Frame: 6 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy    ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☐ Information Literacy  
☐ Life and Career Skills ☒ Communication and Collaboration    ☐ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

#### **Integration of Technology:**

Students will use the Gizmo lab to explore a coral reef to see the living and nonliving factors, how living things interact with each other. Students will be able to model the effects of temperature change, pH levels, and human interaction with an ecosystem.

#### **Equipment Needed:**

Students will need access to the “explore” learning site (Gizmo) and iPads.  
 Stations for biotic and abiotic.

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                       | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                            | Formative Assessment<br>Tasks                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>Describe the feeding relationship between 10 important organisms in a coral reef ecosystem.</li> <li>Model the effects of changing ocean conditions on a coral reef.</li> <li>Define the terms biotic and abiotic factors.</li> <li>Describe the interactions between the biotic and abiotic factors.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>Anchoring Phenomenon: A once-stable ecosystem is shown undergoing rapid change after a single environmental shift (such as drought, introduction of a new species, or habitat disruption), and students are presented with conflicting data sets showing some populations collapsing while others unexpectedly increase, raising questions about what is actually controlling the system.</li> </ol> | <ul style="list-style-type: none"> <li>Monitor progress</li> <li>Exit card</li> <li>Discussion questions</li> <li>Gizmo lab sheet</li> <li>Claims, evidence and conclusion sheet</li> <li>Stations sheets from biotic and abiotic stations</li> </ul> |



2. Explore the terms biotic and abiotic parts of the ecosystem.
3. Complete a tarsia puzzle to learn the terminology
4. 8 stations lab
5. Explore abiotic/biotic factors within a Biome. Each lab station points to a different Biome.
6. Feeding habits and predator- prey relationships for 10 coral reef organisms.
7. Focus on the eating habits of predators within the Biome. Identify keystone species.
8. Investigate the impacts of storms, temperature, and pH on coral reef ecosystems.
9. Read current events about climate change and how it impacts coral reefs. Compare reef images (10 years increments) over the last 50 years to identify changes.
10. Investigate the impacts of logging, and agriculture on the coral reef ecosystem.
11. Create an alternate plan to lessen current logging/agricultural practices.

**Differentiation:**

Students will have their choice of how to interact with the ecosystem.  
Gizmo sheet will have a modified form.

**Resources Provided:**



- [Gizmo lab- Coral reefs – abiotic factors](#)
- [Biotic/abiotic factors lab](#)
- [Analyzing an ecosystem](#)
- [Biotic and abiotic factors](#)



### Lesson Plan 2 Template

Content Area: Science    Lesson Title: Competition for Resources    Time Frame: 6 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness    ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy    ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☐ Creativity and Innovation    ☒ Critical Thinking and Problem Solving    ☒ Information Literacy  
☐ Life and Career Skills    ☒ Communication and Collaboration    ☒ Media Literacy    ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

**Integration of Technology:** Gizmos and PhET Simulations

#### **Equipment Needed:**

iPad; "Good buddies" – a game to recognize symbiotic relationships; "Invasive species" – a game to determine the effects of invasive species in an area; Gizmo lab- food chains: What does the food pyramid look like?

| Goals/Objectives                                                                                                                                                                                                                                                                                                                                                 | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Students will: <ul style="list-style-type: none"> <li>Define levels of organization in an ecosystem.</li> <li>Differentiate between autotrophs and heterotrophs.</li> <li>Demonstrate the effects of organisms competing for resources.</li> <li>Explain the types of symbiotic relationships</li> <li>Explain how energy moves through an ecosystem.</li> </ul> | Lesson Sequence <ol style="list-style-type: none"> <li>Anchoring Phenomenon: Two species that rely on the same limited resource begin to change in population size in opposite directions across multiple simulated environments, even when conditions appear identical, suggesting that competition alone may not fully explain the observed outcomes.</li> <li>Review over the needs of organisms.</li> <li>Review habits, circadian rhythms and food requirements.</li> <li>Discuss predator/prey models.</li> </ol> | <ul style="list-style-type: none"> <li>Graphic organizer on the needs of living things.</li> <li>Reading/ questions</li> <li>Balance of predator/prey in an area.</li> <li>Create a food pyramid for an ecosystem of your choice.</li> <li><a href="#">Predator/prey relationship</a></li> <li>Good buddies sheet</li> <li>Quizzes</li> <li>Homework</li> </ul> |



- |  |                                                                                                                                                                                                                                                                                                                   |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ol style="list-style-type: none"><li>5. Identify the predator and prey in biomes using food webs.</li><li>6. Discuss and create food pyramids.</li><li>7. Generate a personal food pyramid.</li><li>8. Discuss symbiotic relationships.</li><li>9. Identify a symbiotic relationship within each Biome</li></ol> |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Differentiation:**

Reduce amount of examples needed  
Student choice of animation/ videos  
Student choice of food pyramid

**Resources Provided:**

- [Gizmo lab- Food Chain](#)
- [Good buddies card](#)
- [Energy pyramid](#)
- [Build an energy pyramid](#)
- [Symbiotic relationships](#)



### Lesson Plan 3 Template

Content Area: Science      Lesson Title: Balance in an Ecosystem      Time Frame: 6 days

### Lesson Components

#### 21<sup>st</sup> Century Themes

- ☒ Global Awareness      ☐ Financial, Economic, Business and Entrepreneurial Literacy  
☐ Civic Literacy      ☐ Health Literacy

#### 21<sup>st</sup> Century Skills

- ☒ Creativity and Innovation      ☒ Critical Thinking and Problem Solving      ☒ Information Literacy  
☒ Life and Career Skills      ☒ Communication and Collaboration      ☒ Media Literacy      ☐ ICT Literacy

**Interdisciplinary Connections:** Mathematics

#### **Integration of Technology:**

Students will use iPads for research and creative presentations.

#### **Equipment Needed:**

iPads, material for bottle ecosystems

| Goals/Objectives                                                                                                                                                                                                                                                                     | Learning Activities/<br>Instructional Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Formative Assessment<br>Tasks                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Students will:</b> <ul style="list-style-type: none"> <li>Explain the levels from species to biome</li> <li>Explore the different biomes</li> <li>Explain how a balanced and unbalanced ecosystem function</li> <li>Determine the pros and cons of an invasive species</li> </ul> | <b>Lesson Sequence</b> <ol style="list-style-type: none"> <li>Anchoring<br/>Phenomenon: A long-term ecosystem simulation shows repeated cycles of population booms and crashes that do not stabilize as expected, even when no additional external changes are introduced, challenging students to determine what hidden interactions might be driving the imbalance.</li> <li>Explore the connections within an ecosystem</li> <li>Build a known ecosystem and identify how the organisms are interrelated.</li> </ol> | <ul style="list-style-type: none"> <li><a href="#">Build/observe/maintain a bottle "ecosystem"</a></li> <li>PSA for stopping an invasive species</li> <li><a href="#">Compare the different biomes</a></li> <li>What would happen if... (predict biome changes)</li> <li>Define levels in an ecosystem</li> <li>Quizzes</li> </ul> |



- |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ol style="list-style-type: none"><li>4. Compare and contrast the different biomes</li><li>5. Playing the Biome match-up game, students will use evidence to identify the similarities and differences among the biomes.</li><li>6. Explore how an invasive species can interrupt an ecosystem</li><li>7. complete a wanted poster for an invasive species and determine how dangerous the species is to native organisms and biomes.</li><li>8. Build a model ecosystem</li><li>9. Using recycled materials construct a known Biome and generate a new species that could survive there.</li></ol> |  |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**Differentiation:**

Students have choices on how to present information, and how to get information.

**Resources Provided:**

- [Plankton Food Web Activity](#)
- [Biomes of the world](#)
- [Invasive species worksheet](#)
- [Invasive species project](#)



### Lesson Reflection

**Reflect on the lesson you have developed and rate the degree to which the lesson *Strongly, Moderately or Weakly* meets the criteria below.**

| <b>Lesson Activities</b>                                                                                             | <b>Strongly</b>                     | <b>Moderately</b>                   | <b>Weakly</b>            |
|----------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| Are challenging and require higher order thinking and problem solving skills                                         | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Allow for student choice                                                                                             | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide scaffolding for acquiring targeted knowledge/skills                                                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate global perspectives                                                                                        | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Integrate 21st century skills                                                                                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| Provide opportunities for interdisciplinary connection and transfer of knowledge and skills                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Foster student use of technology as a tool to develop critical thinking, creativity and innovation skills            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are varied to address different student learning styles and preferences                                              | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are differentiated based on student needs                                                                            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Are student-centered with teacher acting as a facilitator and co-learner during the teaching and learning process    | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide opportunities for student reflection and self-assessment                                                     | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |
| Provide data to inform and adjust instruction to better meet the varying needs of learners                           | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/> |

### Curriculum Design Template

|                              |                           |                                                                   |
|------------------------------|---------------------------|-------------------------------------------------------------------|
| <b>Content Area:</b> Science | <b>Grade Level:</b> 7     | <b>Unit Title:</b> Ecosystems: Interactions, Energy, and Dynamics |
| <b>Created:</b> 2026         | <b>Board Approved on:</b> |                                                                   |



## SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS

### IEP AND 504 ACCOMMODATIONS AND MODIFICATIONS FOR EARLY CHILDHOOD AND ELEMENTARY SCHOOL STUDENTS:

Large print textbooks  
Textbooks for at-home use  
Additional time for assignments  
Review of directions  
Use of mnemonics  
Have student restate information  
Concrete examples  
Adaptive writing utensils  
Support auditory presentations with visuals  
Use of a study carrel  
Assistance in maintaining uncluttered space  
Weekly home-school communication tools (notebook, daily log, phone calls or email messages)  
Space for movement or breaks  
Study sheets and teacher outlines  
Extra visual and verbal cues and prompts  
Math sheets with highlighted instructions  
Graph paper to assist in organizing or lining up math problems  
Use of computers and calculators  
Books on tape  
Graphic organizers  
Quiet corner or room to calm down and relax when anxious  
Preferential seating  
Alteration of the classroom arrangement  
Reduction of distractions  
Answers to be dictated  
Hands-on activities  
Use of manipulatives  
No penalty for spelling errors or sloppy handwriting  
Follow a routine/schedule  
Alternate quiet and active time  
Teach time management skills  
Rest breaks  
Verbal and visual cues regarding directions and staying on task  
Agenda book and checklists  
Adjusted assignment timelines  
Visual daily schedule



## **SPRINGFIELD PUBLIC SCHOOLS**

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS**

Varied reinforcement procedures  
Immediate feedback  
Work-in-progress check  
Personalized examples

### **TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:**

Answers to be dictated  
Frequent rest breaks  
Additional time  
Oral testing  
Untimed tests  
Choice of test format (multiple-choice, essay, true-false)  
Alternate ways to evaluate (projects or oral presentations instead of written tests)  
Accept short answers  
Open-book tests  
Read test and directions to student  
Provide study outline prior to tests  
Highlight key directions  
Test in alternative site  
Use of calculator  
Extra credit option  
Preview test procedures  
Simplified test wording; rephrased test questions and/or directions

### **GENERAL ACCOMMODATIONS AND MODIFICATIONS:**

Use of alternative books or materials on the topic being studied  
Computerized spell-check support  
Word bank of choices for answers to test questions  
Provision of calculator and/or number line for math tests  
Reworded questions in simpler language  
Projects instead of written reports  
Highlighting important words or phrases in reading assignments  
Modified workload or length of assignments/tests  
Modified time demands  
Modified grades based on IEP

### **BEHAVIOR ACCOMMODATIONS MODIFICATIONS:**



## SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS

Breaks between tasks  
Cue expected behavior  
Daily feedback to student  
Have contingency plans  
Use de-escalating strategies  
Use positive reinforcement  
Use proximity/touch control  
Use peer supports and mentoring  
Model expected behavior by adults  
Have parent sign homework  
Have parent sign behavior chart  
Set and post class rules  
Chart progress and maintain data



## SPRINGFIELD PUBLIC SCHOOLS

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS

### IEP AND 504 ACCOMODATIONS AND MODIFICATIONS FOR MIDDLE AND HIGH SCHOOL STUDENTS:

Large print textbooks  
Textbooks for at-home use  
Additional time for assignments  
A locker with adapted lock  
Review of directions  
Review sessions  
Use of mnemonics  
Have student restate information  
Provision of notes or outlines  
Concrete examples  
Adaptive writing utensils  
Support auditory presentations with visuals  
Weekly or bi-weekly home-school communication  
Space for movement or breaks  
Study sheets and teacher outlines  
Extra visual and verbal cues and prompts  
Lab and math sheets with highlighted instructions  
Graph paper to assist in organizing or lining up math problems  
Use of tape recorder for lectures  
Use of Interactive notebook  
Use of a scribe  
Use of computers and calculators  
Books on tape  
Graphic organizers  
Quiet corner or room to calm down and relax when anxious  
Preferential seating  
Alteration of the classroom arrangement  
Reduction of distractions  
Answers to be dictated  
Hands-on activities  
Ability to type all assignments  
Follow a routine/schedule  
Teach time management and organizational skills  
Rest breaks  
Verbal and visual cues regarding directions and staying on task  
Agenda book and checklists  
Daily check-in with case manager or special education teacher  
Adjusted assignment timelines  
Visual daily schedule



## **SPRINGFIELD PUBLIC SCHOOLS**

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS**

Varied reinforcement procedures  
Immediate feedback  
Work-in-progress check  
Personalized examples

### **TESTING AND ASSESSMENT ACCOMMODATIONS AND MODIFICATIONS:**

Answers to be dictated  
Frequent rest breaks  
Additional time  
Oral testing  
Choice of test format (multiple-choice, essay, true-false)  
Alternate ways to evaluate (projects or oral presentations instead of written tests)  
Accept short answers  
Open-book or open-note tests  
Read test and directions to student  
Provide study guides prior to tests  
Highlight key directions  
Test in alternative site  
Use of calculator  
Extra credit option  
Pace long-term projects  
Preview test procedures  
Simplified test wording; rephrased test questions and/or directions

### **GENERAL ACCOMMODATIONS AND MODIFICATIONS:**

Allow outlining, instead of writing for an essay or major project  
Use of alternative books or materials on the topic being studied  
Computerized spell-check support  
Word bank of choices for answers to test questions  
Provision of calculator for math tests  
Film or video supplements in place of reading text  
Reworded questions in simpler language  
Projects instead of written reports  
Highlighting important words or phrases in reading assignments  
Modified workload or length of assignments/tests  
Modified time demands



## **SPRINGFIELD PUBLIC SCHOOLS**

**ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21<sup>ST</sup> CENTURY  
GLOBAL SKILLS**

Pass/no pass option  
Modified grades based on IEP

### **BEHAVIOR ACCOMMODATIONS FOR STUDENTS:**

Breaks between tasks  
Cue expected behavior  
Daily feedback to student  
Have contingency plans  
Use de-escalating strategies  
Use positive reinforcement  
Use proximity/touch control  
Use peer supports and mentoring  
Model expected behavior by adults  
Have parent sign homework  
Set and post class rules  
Chart progress and maintain data



## Accommodations and Modifications for ESL Students

- Give tests orally
- Give instructions/directions in writing and orally
- Assign a peer tutor, same language or English speaking
- Allow use of bilingual/translation dictionary
- Provide summaries of text or study guides of particular chapters
- Allow errors in speaking
- Allow errors in writing
- Accept writing in first language
- Highlight key vocabulary
- Reduce amount of work required
- Assess comprehension through demonstration or other alternative means (gestures, drawings)
- Rephrase questions, directions, and explanations
- Reduce multiple choices on assessments
- Provide study guides and/ or outlines
- Shorten reading assignments
- Allow extended time for test/project completion
- Use of audio books
- Use of graphic organizers
- Use reduced text, so that print is not dense
- Use visuals/pictures throughout lesson/unit/assignment
- Adapt homework to reflect language proficiency/home support
- Adapt homework to reflect home support
- Provide hands-on activities and explanations
- Allow extended time to answer questions, and permit drawing, as an explanation
- Use of translation dictionaries to locate words in the native language
- Use anecdotal records and portfolio of work as forms of assessment
- Use story retellings to assess comprehension

## **What Does the Gifted and Talented Experience Look Like?** *Springfield Public Schools*

### **Mission Statement**

The Gifted and Talented Program of the Springfield Public Schools aims to provide a meaningful and rigorous education that instills the value of lifelong learning and empowers all students to reach their full potential and become self-fulfilled creative leaders in accordance with the comprehensive standards of our state. We accomplish this by offering challenging, real-world experiences in a student-centered environment.

We recognize that students come from diverse socioeconomic, cultural, and ethnic backgrounds, and the mission of the gifted and talented program is to provide opportunities for students to explore their intellectual, creative, and artistic gifts and talents within the classroom and with beyond-the-classroom experiences. It is essential to provide diverse, appropriate, and ongoing learning experiences and environments that incorporate students' academic, psychological, and social needs. Our responsibility is to provide students with educational alternatives that teach, challenge, and expand their knowledge, while simultaneously stressing the development of independent and self-directed learners who continuously generate questions, analyze, synthesize, and evaluate information and ideas.

New Jersey Administrative Code 6A:8-3.1 defines students who are gifted and talented as those students who possess or demonstrate high levels of ability in one or more content areas when compared to their chronological peers in the local district and who require modification of their educational program if they are to achieve in accordance with their capabilities.

## Goals:

To support our mission, we have established the following goals to guide our work:

- To infuse into the general education program a broad range of activities for high-level learning that will challenge all students to perform at advanced levels, and provide extended opportunities, resources, and support in particular areas where student interest or talent is demonstrated.
- To provide a continuum of gifted education services that will strengthen the total school program, offer enriching and challenging learning opportunities for all students, and provide specialized learning experiences
- To promote achievement of students' best potentials and increased ability.

Through a productive and collaborative relationship among the building principals, classroom teachers, and the Gifted and Talented teacher, our schools can create programming that will enhance the learning experience for every student and serve the unique and specialized needs of students currently demonstrating gifted behaviors.

Elements of the Schoolwide Enrichment Model, W.I.N (What I Need), differentiated instruction, advanced classes, or individual programs into a student's regular instruction program are integral to this overarching framework for gifted education in the Springfield School District.

*Reference Board Policy and Regulation 2464 – Gifted and Talented Pupils (M)*

### **Early Childhood Center** **Edward V. Walton**

#### Schoolwide Virtual Enrichment

All first and second grade students have access to the [Gifted and Talented Virtual Classroom](#). This virtual classroom is a space for students to complete various challenges and enrichment opportunities at their own pace. Students can receive feedback and additional adaptable resources to meet their individual learning needs. The virtual classroom design expands accessibility to enrichment resources and allows students to choose learning activities according to their unique interests and abilities. The purpose of the activities is to encourage problem-solving, develop critical thinking

skills, and expand curiosity and imagination. Activities are aligned to the New Jersey Student Learning Standards.

#### Gifted and Talented Teacher as a Resource

The Gifted and Talented teacher serves as a resource to all teachers within Edward V. Walton School. Teachers seeking resources for their high-ability learners will receive additional support from the Gifted and Talented teacher in various ways. This support may include additional units of study, challenging resources, and student projects.

### **Elementary Schools** **James Caldwell** **Thelma L. Sandmeier**

The goal is to engage small groups of students in intensive learning experiences through standards-based, rigorous, and relevant units of study that supplement, not supplant, the grade-level curriculum and support students' unique learning needs.

#### Enrichment Experience Grade 3

Beginning in third grade, the G&T teacher will cycle through all classrooms to work on problem-solving and enrichment tasks with students. Driven by assessment data, academic performance, student interest, and teacher observation, small groups of students will meet with the G&T teacher during W.I.N. (What I Need) periods throughout the week that the teacher is assigned to their classroom teacher. Groupings will be flexible and monitored to best meet each student's needs throughout the school year. Activities will include brain teasers, puzzles, strategic thinking, problem-solving, and STEM challenges.

#### Targeted Gifted and Talented Programing Grades 4-5

Students may become identified as Gifted and Talented in fourth grade. Students that are identified may receive support from the G&T Teacher for up to five periods (200 minutes) a week during W.I.N. (What I Need) periods. Identified students will meet to explore grade-level content while incorporating depth and complexity in a student-centered, problem-based environment. The Gifted and Talented Program aims to provide students with various advanced and challenging learning experiences across content areas to promote independent thinking skills, refine critical thinking and communication skills, cultivate joy in learning, and expand student interests through problem-solving. The instruction that students receive incorporates 21st Century Skills and advanced content that is challenging, hands-on, and relevant to the real world.

### *Strategies and Practices that Support Gifted and Talented Students*

- Adjusted Pace of Lessons
- Inquiry-Based Instruction
- Higher-Order Thinking Activities
- Interest-Based Content
- Real World Problem Solving/Problem Based Learning
- Independent Study/Passion Projects
- Units of Study with Like-Minded Peers

### Schoolwide Virtual Enrichment

All JCS and TLS students have access to grade level-specific [Gifted and Talented Virtual Classrooms](#). These virtual classrooms are a space for students to complete various challenges and enrichment opportunities at their own pace. Students are able to receive feedback and additional opportunities based on their needs. The virtual classrooms have expanded the accessibility of enrichment resources directly to the students and allows for students to choose opportunities according to their interests and abilities. The purpose of the activities is to encourage problem solving, develop critical thinking skills, and expand curiosity and imagination in conjunction with the New Jersey Student Learning Standards.

### Gifted and Talented Teacher as a Resource

In addition to classroom support, the Gifted and Talented teacher also serves as a resource to all teachers in the building. Teachers that are seeking resources for their high ability learners will receive additional support from the Gifted and Talented teacher in various ways. This may include additional units of study, challenging resources, student projects, and meeting with the G&T teacher as needed.

### Additional Enrichment Opportunities

Across all grade levels 3-5, as recommended by the classroom teacher, students exhibiting a need for additional enrichment may have the opportunity to meet with the G&T teacher as the schedule allows. Groupings will be flexible and monitored to best meet the students' needs throughout the school year. Activities will include, brain teasers, puzzles, strategic thinking activities, problem-solving challenges, and STEM challenges. Students engage in an extended process of asking questions, using resources, and developing answers that lead to thinking about what and how they are learning. Students are held accountable for how they work and use their time by demonstrating their learning through products or presentations.

Students self-select to participate in individual and/or group projects based on interest and commitment. The classroom teacher and/or the enrichment teacher will help guide and monitor student exploration of chosen topics, facilitating their learning with resources and teaching of needed skills.

**Secondary Schools**  
**Florence M. Gaudineer Middle School**  
**Jonathan Dayton High School**

Grades 6-12: Access to specific content programs with higher levels of academic challenges (i.e. Pre-Algebra, Accelerated Communication Arts, and Advanced Placement Classes)

Dual Credit Courses provide students the opportunity to obtain high school credit, and college credit, simultaneously through partnerships with several institutions.

Project Lead the Way (PLTW) students become builders of technology by engaging in real world activities. Students are empowered as design thinkers collaborating on real world projects.

**Gifted and Talented Identification Criteria**

The Springfield Schools Gifted and Talented Program recognizes that students require differentiated learning experiences beyond the core curriculum being taught because of their advanced abilities in one or more content areas. These students may also have other cognitive qualities such as curiosity, creativity, motivation, leadership, and passion that require modifications to their academic experience.

**Multiple Measures of Eligibility**

Kindergarten through grade twelve identification process for gifted and talented students includes multiple measures. Multiple measures may include but are not limited to: achievement test scores; grades; student performance or products; intelligence testing; parent, student, and/or teacher recommendation; and other appropriate measures. The identification methodology is developmentally appropriate, non-discriminatory, and related to the programs and services offered by the Springfield School District. The identification procedures are reviewed annually.

*According to N.J.A.C. 6A:8-3.1, all public school districts must have a board-approved gifted and talented identification process and provide services for identified students enrolled in the grades of that school district. The regulations require that identification and services be made available to students in grades K-12.*

When students are recommended for the Gifted and Talented Program there are multiple measures that are considered to determine if services are necessary and appropriate. The assessments used are as follows:

- Cognitive Abilities Test (CogAT)
- Classroom Performance/Student Portfolios
- DRA2 Level
- iReady Diagnostic Scores
- Gifted Indicators Checklist
- Start Strong/NJSLA Assessment Data

The N.J.A.C. requires that students be compared to their chronological peers in the local school district. The New Jersey Department of Education has not established state-level criteria for identifying students who are gifted, such as mandated tests or assessments, grade point averages, or IQ scores. Local school districts must use multiple measures to identify students.

#### Procedures

<https://www.straussesmay.com/seportal/Public/DistrictPolicy.aspx?policyid=2464&id=b8a33a9f505e4998a6db3fb8e1de778b>

### Gifted and Talented Program Identification Matrix

**Minimum Score Required for Consideration: 14 Points**

| 1 Point                                                     | 2 Points                                          | 3 Points                                                    |
|-------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------|
| Cogat Assessment<br>Overall Stanine Score of a 7            | Cogat Assessment<br>Overall Stanine Score of an 8 | Cogat Assessment<br>Overall Stanine Score of a 9            |
| iReady Math Assessment<br>Just Below Current Grade<br>Level | iReady Math Assessment<br>On Grade Level          | iReady Math Assessment<br>½ Year + Above Current<br>Level   |
| iReady ELA<br>On Grade Level                                | iReady ELA<br>½ Year Above Current Level          | iReady ELA<br>One Full Grade Level +<br>Above Current Level |
| NJSLA Math<br>Approaching Expectations                      | NJSLA Math<br>Met Expectations                    | NJSLA Math<br>Exceed Expectations                           |
| NJSLA ELA<br>Approaching Expectations                       | NJSLA ELA<br>Met Expectations                     | NJSLA ELA<br>Exceed Expectations                            |
| HOPE Teacher Rating Scale<br>Raw Score: 11 - 29             | HOPE Teacher Rating Scale<br>Raw Score: 30 - 49   | HOPE Teacher Rating Scale<br>Raw Score: 50-66               |

Team meetings present the opportunity to review data and assess the educational needs of all students. Teacher provides examples of student work exhibiting above and beyond grade level expectations, creativity, leadership, critical and abstract thinking. Programs for gifted and talented students will be periodically evaluated for their continuing efficacy and adjusted accordingly. The parent of any student identified as gifted or talented shall be consulted regarding any program designed to address the student's particular needs.

#### Resource Links

[https://riversideinsights.com/cognitive\\_abilities\\_test](https://riversideinsights.com/cognitive_abilities_test)

<https://www.curriculumassociates.com/programs/i-ready-learning>

<https://www.nj.gov/education/assessment/resources/>

<https://www.routledge.com/HOPE-Teacher-Rating-Scale-Involving-Teachers-in-Equitable-Identification/Gentry-Pereira-Peters-McIntosh-Fugate/p/book/9781618214522#:~:text=The%20HOPE%20Teacher%20Rating%20Scale,making%20it%20easy%20to%20use.>

Gifted and talented student: The "[\*Strengthening Gifted and Talented Education Act\*](#)" defines a gifted and talented student as a "student who possesses or demonstrates a high level of ability in one or more content areas when compared to their chronological peers in the school district and who require modifications of their educational program if they are to achieve in accordance with their capabilities."

Twice-exceptional (2E) students: A twice-exceptional (2E) student is defined as "a student who is both gifted and a student with a disability. These students may also be referred to as having dual exceptionalities or as being gifted with learning disabilities (GT/LD). This also applies to students who are gifted with ADHD or gifted with autism" (New Jersey Association for Gifted Children, [www.nagc.org](http://www.nagc.org)).

Instructional adaptation: An adjustment or modification to instruction enabling a student who is gifted and talented to participate in, benefit from, and demonstrate knowledge and application of the New Jersey Student Learning Standards in one or more content areas at the instructional level of the student, not just the student's grade level.

Identifying gifted and talented students: The focus of identification is to provide programming and services in which students' specific learning needs and potential are appropriately addressed and met. In every New Jersey school district, there are students who require modifications to the general education curriculum if they are to achieve in accordance with their abilities. By identifying a student's general intellectual ability, creativity, or specific academic area aptitudes, we are acknowledging that they need programming and services outside of the general education/grade level curriculum to advance their learning.

NJDOE Fast Facts

<https://www.nj.gov/education/standards/gifted/>

<https://www.nj.gov/education/standards/gifted/legislation.shtml>

**Supplemental Resources/Programming for Gifted Students**

Edward V. Walton

- PETS Program – Primary Education Thinking Skills
- Group Solutions/Group Solutions 2 – Cooperative Logic Activities
- Lollipop Logic
- Beginning Thinking Skills
- AIMS Education Programming

James Caldwell and Thelma L. Sandmeier

*Math/ELA*

- Project M3: Mentoring Mathematical Minds
- Junior Great Books
- AIMS Education Programming
- Borenson Hands on Equations
- BizWorld
- Perplexors
- Advanced Math Explorations grade 3-5
- Challenging Units for Gifted Learners (ELA and Math)
- Creative Curriculum Extenders
- Differentiated Lessons & Projects
- Challenge Math Grades 4+
- Differentiating Instruction with Menus (All Content Areas)
- Jacob's Ladder
- Genius Hour/Passion Project
- Spatial Reasoning
- Logic Puzzles, Brain Games, Analogies

*STEM*

- Engineering is Elementary
- Engineer Throughout the Year
- PBS Design Squad
- DefinedSTEM
- Project Lead the Way (PLTW)

### Enrichment Events

Experience for all students to be enriched through events related to the curricular or extracurricular activities. Examples include after school clubs, PTA-sponsored events, leadership opportunities, visual and performing arts, and community service opportunities.