Science Curriculum

Grade Eight Unit Two:
FOSS Heredity & Adaptations
# Course Description

The students in the eighth grade Science course will develop a conceptual understanding of Science topics using hands-on instruction, interactive notebooking, observations of and interactions with natural phenomena and the use of engineering and design processes to identify problems, plan, test and revise possible solutions. In Life Science, students will explore the interaction of human body systems to maintain stability, how growth and development can be affected by genetic factors in sexually reproducing organisms, and how organisms have changed over time due to environmental and genetic factors both by examining the fossil record and examining structural similarities between organisms. In Physical Science, students will explore wave motion, as well as how the force of gravity affects the kinetic energy of object on Earth’s surface. In Earth Science, students will explore Earth’s place in the Universe, as well as the unique characteristics of other celestial bodies.

Teachers may choose from a variety of instructional approaches that are aligned with 3 dimensional learning to achieve this goal. These approaches include:

<table>
<thead>
<tr>
<th>Inquiry Kit Instruction (modified)</th>
<th>Challenge Based Instruction</th>
<th>5 E Instructional Model (BSCS)</th>
<th>Culturally Relevant Instruction</th>
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<tbody>
<tr>
<td>Project-Based Instruction</td>
<td>Tinkering Pedagogy</td>
<td>Learning Progressions</td>
<td>Knowledge Integration</td>
</tr>
<tr>
<td>Model-based Reasoning</td>
<td>Place-based Instruction</td>
<td>Meaningful Expertise Instruction</td>
<td>Emergent Investigations (RSS)</td>
</tr>
</tbody>
</table>

## ESL Framework
This ESL framework was designed to be used by bilingual, dual language, ESL and general education teachers. Bilingual and dual language programs use the home language and a second language for instruction. ESL teachers and general education or bilingual teachers may use this document to collaborate on unit and lesson planning to decide who will address certain components of the SLO and language objective. ESL teachers may use the appropriate leveled language objective to build lessons for ELLs which reflects what is covered in the general education program. In this way, whether it is a pull-out or push-in model, all teachers are working on the same Student Learning Objective connected to the Common Core standard. The design of language objectives are based on the alignment of the World-Class Instructional Design Assessment (WIDA) Consortium’s English Language Development (ELD) standards with the Common Core State Standards (CCSS). WIDA’s ELD standards advance academic language development across content areas ultimately leading to academic achievement for English learners. As English learners are progressing through the six developmental linguistic stages, this framework will assist all teachers who work with English learners to appropriately identify the language needed to meet the requirements of the content standard. At the same time, the language objectives recognize the cognitive demand required to complete educational tasks. Even though listening and reading (receptive) skills differ from speaking and writing (expressive) skills across proficiency levels the cognitive function should not be diminished. For example, an Entering Level One student only has the linguistic ability to respond in single words in English with significant support from their home language. However, they could complete a Venn diagram with single words which demonstrates that they understand how the elements compare and contrast with each other or they could respond with the support of their home language (L1) with assistance from a teacher, para-professional, peer or a technology program.

http://www.state.nj.us/education/modelcurriculum/ela/ELLOverview.pdf

Pacing Chart

Please note that pacing is based upon 240 minutes per 6 day cycle.
<table>
<thead>
<tr>
<th>Unit 1</th>
<th>FOSS Human Systems Interactions</th>
<th>30 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>PBL Task with Integrated Science &amp; Engineering Practices</td>
<td>5-6 days</td>
<td></td>
</tr>
<tr>
<td>Unit 2</td>
<td>FOSS Heredity &amp; Adaptations</td>
<td>30 days</td>
</tr>
<tr>
<td>PBL Task with Integrated Science &amp; Engineering Practices</td>
<td>5-6 days</td>
<td></td>
</tr>
<tr>
<td>Unit 3</td>
<td>FOSS Planetary Science</td>
<td>35 days</td>
</tr>
<tr>
<td>PBL Task with Integrated Science &amp; Engineering Practices</td>
<td>5-6 days</td>
<td></td>
</tr>
<tr>
<td>Unit 4</td>
<td>FOSS Waves</td>
<td>30 days</td>
</tr>
<tr>
<td>PBL Task with Integrated Science &amp; Engineering Practices</td>
<td>5-6 days</td>
<td></td>
</tr>
<tr>
<td>New Jersey Student Learning Assessment Science Review</td>
<td>10 days</td>
<td></td>
</tr>
<tr>
<td>Final Assessment</td>
<td>10 days</td>
<td></td>
</tr>
</tbody>
</table>

**Effective Pedagogical Routines/Instructional Strategies**

- Collaborative Problem Solving
- Connect Previous Knowledge to New Learning
- Making Thinking Visible
- Develop and Demonstrate Mathematical Practices
- Inquiry-Oriented and Exploratory Approach
- Multiple Solution Paths and Strategies

- Analyze Student Work
- Identify Student’s Mathematical Understanding
- Identify Student’s Mathematical Misunderstandings
- Interviews
- Role Playing
- Diagrams, Charts, Tables, and Graphs
Grade Eight Unit Three: FOSS Heredity & Adaptations

Instructional Days: 36

- Use of Multiple Representations
  - Explain the Rationale of your Math Work
    - Quick Writes
    - Pair/Trio Sharing
    - Turn and Talk
    - Charting
    - Gallery Walks
- Small Group and Whole Class Discussions
  - Student Modeling

- Anticipate Likely and Possible Student Responses
  - Collect Different Student Approaches
    - Multiple Response Strategies
  - Asking Assessing and Advancing Questions
    - Revoicing
    - Marking
    - Recapping
    - Challenging
  - Pressing for Accuracy and Reasoning
  - Maintain the Cognitive Demand

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Educational Technology Standards

8.1.8.A.1, 8.1.8.A.5, 8.1.8.D.1, 8.1.8.E.1, 8.2.8.B.1

- Technology Operations and Concepts
  - Create professional documents (e.g., newsletter, personalized learning plan, business letter or flyer) using advanced features of a word processing program.
  - Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.
Grade Eight Unit Three: FOSS Heredity & Adaptations

Instructional Days: 36

- Digital Citizenship
  - Model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics.
- Research and Information Literacy
  - Gather and analyze findings to produce a possible solution for a content-related or real world problem using data collection technology.
- Design: Critical Thinking, Problem Solving, and Decision Making
  - Design and create a product using the design process that addresses a real world problem with specific criteria and constraints.

Career Ready Practices

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

CRP1, CRP2, CRP3, CRP4, CRP5, CRP6, CRP7, CRP8, CRP9, CRP10, CRP11, CRP12

- CRP1. Act as a responsible and contributing citizen and employee

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
Example(s):

- Seek regularity, punctuality, attendance.
- Follow rules, regulations, policies, procedures.
- Awareness of one’s action impacts others.
- Participate as an active and ethical member of class discussions and projects.
- Apply knowledge and skills to enhance productivity.

- **CRP2. Apply appropriate academic and technical skills.**

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

Example(s):

- Time management
- Understanding academic text
  - Communicating effectively in discussions and academic writing
  - Critical thinking, analytical thinking, problem solving research skills

- **CRP3. Attend to personal health and financial well-being.**

Career-ready individuals understand the relationship between personal health, workplace performance and personal well-being; they act on that understanding to regularly practice healthy diet, exercise and mental health activities. Career-ready individuals also take regular action to contribute to their personal financial wellbeing, understanding that personal financial security provides the peace of mind required to contribute more fully to their own career success.

Example(s):
Suggested ways of handling stress are breathing exercises, journaling ideas/thoughts
Seek ways to become financially independent

- CRP4. Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others’ time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

Example(s):

- Communicating effectively in discussions, debates and presentations
- Communicating effectively in academic writing with supporting evidence/facts and sound reasoning
- Effective listening skills such as have an open mind, do not interrupt, be attentive, look at the speaker

- CRP5. Consider the environmental, social and economic impacts of decisions.

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

Example(s):

- Employ environmentally friendly and positive practices holistically.
  - Students can explore how decision making and behaviors can impact the broader community in specific science related examples, such as limiting littering, choosing to recycle, etc.
- Utilize technology towards the benefit of society.
CRP6. Demonstrate creativity and innovation.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

Example(s):
- Think “out of the box”.
- Take risks on trying new ideas.
- Create a model or plan for your new idea.

CRP7. Employ valid and reliable research strategies.

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use a reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

Example(s):
- Use the hierarchy of credibility of sources (peer-reviewed, editorially reviewed, unreviewed)
- Stay away from blogs

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to
introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

Example(s):

- Get to the root cause of problems; observe the cause of the problem.
- Think multiple solutions for the problem/issue.
- Apply relevant scientific study to situations.
- Propose solutions to problems.

- CRP9. Model integrity, ethical leadership and effective management.

Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others’ action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management’s actions and attitudes can have on productivity, morals and organizational culture.

Example(s):

- Demonstrate honesty, good character and respect for others while working independently and collaboratively.
- Recognize the skills of individual team members and share the learning experience with everyone.

- CRP10. Plan education and career paths aligned to personal goals.

Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths
require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.

Example(s):

- Seek opportunities for personal development and academic growth (enrichment camps, courses, workshops, industrial visits).
- Evaluate new technologies and their capabilities to better living standards.
- Visit a location that allows you to observe a career-interest you have for the future.

- CRP11. Use technology to enhance productivity.

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks—personal and organizational—of technology applications, and they take actions to prevent or mitigate these risks.

Example(s):

- Utilize Google Apps for Education suite to access and complete assignments. The teacher can use Google Classroom to identify age and subject appropriate resource materials that can be linked directly. A variety of apps or web based platforms (Tellagami, PowToons, Glogster, Padlet) can be used to generate multimedia content.

- CRP12. Work productively in teams while using cultural global competence.

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Example(s):

- Students must be given regular opportunities to work with groups in a variety of settings for discussion, projects, etc.
- Encourage teamwork to create collegial relationships for increased productivity.
- Lead and model good work ethics with discipline, tolerance and productivity.
<table>
<thead>
<tr>
<th>WIDA Proficiency Levels</th>
<th>At the given level of English language proficiency, English language learners will process, understand, produce or use:</th>
</tr>
</thead>
</table>
| **6- Reaching**         | - Specialized or technical language reflective of the content areas at grade level  
                          - A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse as required by the specified grade level  
                          - Oral or written communication in English comparable to proficient English peers |
| **5- Bridging**         | - Specialized or technical language of the content areas  
                          - A variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays or reports  
                          - Oral or written language approaching comparability to that of proficient English peers when presented with grade level material. |
| **4- Expanding**        | - Specific and some technical language of the content areas  
                          - A variety of sentence lengths of varying linguistic complexity in oral discourse or multiple, related sentences or paragraphs  
                          - Oral or written language with minimal phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written connected discourse, with sensory, graphic or interactive support |
| **3- Developing**       | - General and some specific language of the content areas  
                          - Expanded sentences in oral interaction or written paragraphs  
                          - Oral or written language with phonological, syntactic or semantic errors that may impede the communication, but retain much of its meaning, when presented with oral or written, narrative or expository descriptions with sensory, graphic or interactive support |
<table>
<thead>
<tr>
<th>Grade Eight Unit Three: FOSS Heredity &amp; Adaptations</th>
<th>Instructional Days: 36</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2- Beginning</strong></td>
<td>• General language related to the content area</td>
</tr>
<tr>
<td></td>
<td>• Phrases or short sentences</td>
</tr>
<tr>
<td></td>
<td>• Oral or written language with phonological, syntactic, or semantic errors that often impede of the communication when presented with one to multiple-step commands, directions, or a series of statements with sensory, graphic or interactive support</td>
</tr>
<tr>
<td><strong>1- Entering</strong></td>
<td>• Pictorial or graphic representation of the language of the content areas</td>
</tr>
<tr>
<td></td>
<td>• Words, phrases or chunks of language when presented with one-step commands directions, WH-, choice or yes/no questions, or statements with sensory, graphic or interactive support</td>
</tr>
</tbody>
</table>
# Language Development Supports For English Language Learners

To Increase Comprehension and Communication Skills

## Environment

- Welcoming and stress-free
- Respectful of linguistic and cultural diversity
- Honors students' background knowledge
- Sets clear and high expectations
- Includes routines and norms
- Is thinking focused vs. answer seeking
- Offers multiple modalities to engage in content learning and to demonstrate understanding
- Includes explicit instruction of specific language targets
- Provides participation techniques to include all learners

- Integrates learning centers and games in a meaningful way
- Provides opportunities to practice and refine receptive and productive skills in English as a new language
- Integrates meaningful and purposeful tasks/activities that:
  - Are accessible to all students through multiple entry points
  - Are relevant to students' lives and cultural experiences
  - Build on prior mathematical learning
  - Demonstrate high cognitive demand
  - Offer multiple strategies for solutions
  - Allow for a language learning experience in addition to content

## Sensory Supports*

- Real-life objects (realia) or concrete objects
- Physical models
- Manipulatives
- Pictures & photographs
- Visual representations or models such as diagrams or drawings
- Videos & films
- Newspapers or magazines
- Gestures
- Physical movement
- Music & songs

## Graphic Supports*

- Graphs
- Charts
- Timelines
- Number lines
- Graphic organizers
- Graphing paper

## Interactive Supports*

- In a whole group
- In a small group
- With a partner such as *Turn and Talk*
- In pairs as a group (first, two pairs work independently, then they form a group of four)
- In triads
- Cooperative learning structures such as *Think Pair Share*
- Interactive websites or software
- With a mentor or coach

## Verbal and Textual Supports

- Labeling
- Students' native language
- Modeling
- Repetition
- Paraphrasing
- Summarizing
- Guiding questions
- Clarifying questions
- Probing questions
- Leveled questions such as *What*? *When*? *Where*? *How*? *Why*?
- Questioning prompts & cues
- Word banks
- Sentence starters
- Sentence frames
- Discussion frames
- Talk moves, including *Wait Time*

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# Building Equity in Your Teaching Practice

**How do the essential questions highlight the connection between the big ideas of the unit and equity in your teaching practice?**

<table>
<thead>
<tr>
<th>CONTENT INTEGRATION</th>
<th>KNOWLEDGE CONSTRUCTION</th>
<th>PREJUDICE REDUCTION</th>
<th>EQUITABLE PEDAGOGY</th>
<th>EMPOWERING SCHOOL CULTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers use examples and content from a variety of cultures &amp; groups.</td>
<td>Teachers help students understand how knowledge is created and influenced by cultural assumptions, perspectives &amp; biases.</td>
<td>Teachers implement lessons and activities to assert positive images of ethnic groups &amp; improve intergroup relations.</td>
<td>Teachers modify techniques and methods to facilitate the academic achievement of students from diverse backgrounds.</td>
<td>Using the other four dimensions to create a safe and healthy educational environment for all.</td>
</tr>
</tbody>
</table>

This unit / lesson is connected to other topics explored with students.

There are multiple viewpoints reflected in the content of this unit / lesson.

The materials and resources are reflective of the diverse identities and experiences of students.

The content affirms students, as well as exposes them to experiences other than their own.

This unit / lesson provides context to the history of privilege and oppression.

This unit / lesson addresses power relationships.

This unit / lesson help students to develop research and critical thinking skills.

This curriculum creates windows and mirrors* for students.

This unit / lesson help students question and unpack biases & stereotypes.

This unit / lesson help students examine, research and question information and sources.

This unit / lesson challenges dominant perspectives.

The instruction has been modified to meet the needs of each student.

Students feel respected and their cultural identities are valued.

Additional supports have been provided for students to become successful and independent learners.

Opportunities are provided for student to reflect on their learning and provide feedback.

There are opportunities for students to connect with the community.

My classroom is welcoming and supportive for all students?

I am aware of and sensitive to the needs of my students and their families.

There are effective parent communication systems established. Parents can talk to me about issues as they arise in my classroom.

*Windows and mirrors are terms used in educational and cultural studies to describe teaching methods that allow students to see themselves and others in diverse perspectives.
## Culturally Relevant Pedagogy Examples

<table>
<thead>
<tr>
<th>Building Relationships</th>
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</thead>
<tbody>
<tr>
<td>- Learn about your students’ individual cultures.</td>
</tr>
<tr>
<td>- Adapt your teaching to the way your students learn.</td>
</tr>
<tr>
<td>- Develop a connection with challenging students.</td>
</tr>
<tr>
<td>- Communicate and work with parents/guardians on a regular basis (email distribution, newsletter, phone calls, notes, meetings, etc.)</td>
</tr>
<tr>
<td>- Everyone has a voice: Create a classroom environment where students know that their contributions are expected and valued.</td>
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<tr>
<td>- Norms for sharing are established that communicate a growth mindset.</td>
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<tr>
<td>- All students are capable of expressing scientific thinking and contributing to the classroom community.</td>
</tr>
<tr>
<td>- Students learn new ways of looking at problem solving by working with and listening to each other.</td>
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<tr>
<td>- Encourage student leadership.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Curriculum</th>
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</thead>
<tbody>
<tr>
<td>- Incorporate student-centered stories, vocabulary and examples.</td>
</tr>
<tr>
<td>- Incorporate aspects of students’ lives they can relate to.</td>
</tr>
<tr>
<td>- Create lessons that connect the content to your students’ culture and daily lives.</td>
</tr>
<tr>
<td>- Incorporate instructional materials that relate to a variety of cultures.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instructional Delivery</th>
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</thead>
<tbody>
<tr>
<td>- Establish an interactive dialogue to engage all students.</td>
</tr>
<tr>
<td>- Continuously interact with students and provide frequent feedback.</td>
</tr>
</tbody>
</table>
Use frequent questioning as a means to keep students involved.

- Intentionally address visual, tactile and auditory learners.
- Present real world problems students can relate to.

Incorporate a place-based education model this allows for productive discourse among students about issues that are relevant to their school and or community.

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### Differentiated Instruction

#### Accommodate Based on Students Individual Needs: Strategies

<table>
<thead>
<tr>
<th>Time/General</th>
<th>Processing</th>
<th>Comprehension</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Extra time for assigned tasks</td>
<td>- Extra Response time</td>
<td>- Precise processes for conceptual model</td>
<td>- Teacher-made checklist</td>
</tr>
<tr>
<td>- Adjust length of assignment</td>
<td>- Have students verbalize steps</td>
<td>- Short manageable tasks</td>
<td>- Use visual graphic organizers</td>
</tr>
<tr>
<td>- Timeline with due dates for reports and projects</td>
<td>- Repeat, clarify or reword directions</td>
<td>- Brief and concrete directions</td>
<td>- Reference resources to promote independence</td>
</tr>
<tr>
<td>- Communication system between home and school</td>
<td>- Mini-breaks between tasks</td>
<td>- Provide immediate feedback</td>
<td>- Visual and verbal reminders</td>
</tr>
<tr>
<td>- Provide lecture notes/outline</td>
<td>- Provide a warning for transitions</td>
<td>- Small group instruction</td>
<td>- Graphic organizers</td>
</tr>
</tbody>
</table>
## Grade Eight Unit Three: FOSS Heredity & Adaptations

### Instructional Days: 36

### Assistive Technology
- Computer/whiteboard
- Tape recorder
- Video Tape

### Tests/Quizzes/Grading
- Extended time
- Study guides
- Shortened tests
- Read directions aloud

### Behavior/Attention
- Consistent daily structured routine
- Simple and clear classroom rules
- Frequent feedback

### Organization
- Individual daily planner
- Display a written agenda
- Note-taking assistance
- Color code materials

## Interdisciplinary Connections

**Model interdisciplinary thinking to expose students to other disciplines.**

### ELA Connection:
- Cite specific textual evidence to support analysis of science and technical texts. **RST.6-8.1**
- Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. **RST.6-8.2**
- Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. **RI.6.8**
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources **WHST.6-8.1**
- Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. **WHST.6-8.2**
- Draw evidence from informational texts to support analysis, reflection, and research. **WHST.6-8.9**
- Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. **WHST.6-8.7**
- Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not. **RI.6.8**
- Write arguments focused on discipline content. (MS-LS1-3) **WHST.6-8.1**
- Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. **WHST.6-8.8**

### Examples:
Following the procedures on the notebook sheets.
Reading complex text in the FOSS student resource books.
Completing graphic organizers while reading to organize information, thoughts and questions.
Responding to the focus question using evidence from the data collection, notebook recordings and informational text.
FOSS multimedia videos
Word walls
Discussion Circles
Classroom Notebook

Math Connection:
- Model with mathematics. (MS-LS3-2), (MS-LS4-6) MP.4
- Summarize numerical data sets in relation to their context. (MS-LS3-2), (MS-LS4-4),(MS-LS4-6) 6.SP.B.5
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1),(MS-LS4-2) 6.EE.B.6
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4),(MS-LS4-6) 6.RP.A.1
- Recognize and represent proportional relationships between quantities. (MS-LS4-4),(MS-LS4-6) 7.RP.A.2

Examples:
- Recording, calculating, analyzing and interpreting data on the notebook sheets.
- Using mathematical and computational thinking with models
- Using formulas and equations to measure the states, properties and behavior of matter.
- Math Extensions (if available)
## Enrichment

### What is the purpose of Enrichment?

- The purpose of enrichment is to provide extended learning opportunities and challenges to students who have already mastered, or can quickly master, the basic curriculum. Enrichment gives the student more time to study concepts with greater depth, breadth, and complexity.
  - Enrichment also provides opportunities for students to pursue learning in their own areas of interest and strengths.
  - Enrichment keeps advanced students engaged and supports their accelerated academic needs.
  - Enrichment provides the most appropriate answer to the question, “What do you do when the student already knows it?”

### Enrichment is...

- Planned and purposeful
- *Different*, or differentiated, work – not just *more* work
- Responsive to students’ needs and situations
- A promotion of high-level thinking skills and making connections within content
  - The ability to apply different or multiple strategies to the content
  - The ability to synthesize concepts and make real world and cross-curricular connections.
  - Elevated contextual complexity
- Sometimes independent activities, sometimes direct instruction
  - Inquiry based or open ended assignments and projects
- Using supplementary materials in addition to the normal range of resources.

### Enrichment is not...

- Just for gifted students (some gifted students may need intervention in some areas just as some other students may need frequent enrichment)
- Worksheets that are more of the same (busywork)
- Random assignments, games, or puzzles not connected to the content areas or areas of student interest
  - Extra homework
  - A package that is the same for everyone
- Thinking skills taught in isolation
- Unstructured free time
● Choices for students
  ● Tiered/Multi-level activities with
  ● Flexible groups (may change daily or weekly)

### Assessments

#### Suggested Formative/Summative Classroom Assessments

- Describe Learning Vertically
- Identify Key Building Blocks
- Make Connections (between and among key building blocks)
- Short/Extended Constructed Response Items
- Multiple-Choice Items (where multiple answer choices may be correct)
  - Drag and Drop Items
  - Use of Equation Editor
  - Quizzes
  - Journal Entries/Reflections/Quick-Writes
  - Accountable talk
  - Projects
Standards for the Course

**MS-LS3: Heredity: Inheritance and Variation of Traits**

Students who demonstrate understanding can:

- **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.

[Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]
• MS-LS3-1  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. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]
<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>LS3.B: Variation of Traits</strong></td>
<td></td>
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<tr>
<td></td>
<td>- 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)</td>
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<tr>
<td></td>
<td>- 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)</td>
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</tr>
<tr>
<td>Science and Engineering Practices</td>
<td>Disciplinary Core Ideas</td>
<td>Crosscutting Concepts</td>
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</tr>
<tr>
<td><strong>Developing and Using Models</strong></td>
<td><strong>LS1.B: Growth and Development of Organisms</strong></td>
<td></td>
</tr>
<tr>
<td>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.</td>
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</tr>
<tr>
<td>▪ Develop and use a model to describe phenomena. (MS-LS3-1), (MS-LS3-2)</td>
<td>▪ Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. <em>(secondary to MS-LS3-2)</em></td>
<td><strong>Cause and Effect</strong></td>
</tr>
<tr>
<td><strong>LS3.A: Inheritance of Traits</strong></td>
<td>▪ 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)</td>
<td>▪ Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)</td>
</tr>
<tr>
<td>▪ 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)</td>
<td><strong>Structure and Function</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ 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)</td>
<td></td>
</tr>
</tbody>
</table>
**Connections to other DCIs in grades 6–8:**

- **MS.LS1.A** (MS-LS3-1)
- **MS.LS4.A** (MS-LS3-1)

**Articulation of DCIs across grade levels:**

<table>
<thead>
<tr>
<th>Middle School</th>
<th>High School</th>
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</thead>
<tbody>
<tr>
<td><strong>3.LS3.A</strong> (MS-LS3-1), (MS-LS3-2)</td>
<td><strong>HS.PS1.B</strong> (MS-PS3-4)</td>
</tr>
<tr>
<td><strong>3.LS3.B</strong> (MS-LS3-1), (MS-LS3-2)</td>
<td><strong>HS.PS2.B</strong> (MS-PS3-2)</td>
</tr>
<tr>
<td><strong>HS.LS1.A</strong> (MS-LS3-1)</td>
<td><strong>HS.PS3.A</strong> (MS-PS3-1), (MS-PS3-4), (MS-PS3-5)</td>
</tr>
<tr>
<td><strong>HS.LS1.B</strong> (MS-LS3-1), (MS-LS3-2)</td>
<td><strong>HS.PS3.B</strong> (MS-PS3-1), (MS-PS3-2), (MS-PS3-3), (MS-PS3-4), (MS-PS3-5)</td>
</tr>
<tr>
<td><strong>HS.LS3.A</strong> (MS-LS3-1), (MS-LS3-2)</td>
<td><strong>HS.PS3.C</strong> (MS-PS3-2)</td>
</tr>
</tbody>
</table>
Connections to NJSLS – English Language Arts

- **RST.6-8.1**  Cite specific textual evidence to support analysis of science and technical texts. (MS-LS3-1), (MS-LS3-2)

- **RST.6-8.4**  Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. (MS-LS3-1), (MS-LS3-2)

- **RST.6-8.7**  Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS3-1), (MS-LS3-2)

- **SL.8.5**  Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-LS3-1), (MS-LS3-2)

Connections to NJSLS – Mathematics

- **MP.4**  Model with mathematics. (MS-LS3-2)

- **6.SP.B.5**  Summarize numerical data sets in relation to their context. (MS-LS3-2)
MS-LS-LS4: Biological Evolution: Unity and Diversity

Students who demonstrate understanding can:

- **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.
  [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

- **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.
  [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

- **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.
  [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

- **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.
  [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

- **MS-LS4-5** Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
  [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the impact of these technologies on populations and the environment.]


• **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.
  [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.]
  [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]
<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyzing and Interpreting Data</td>
<td><strong>LS4.A: Evidence of Common Ancestry and Diversity</strong></td>
<td><strong>Patterns</strong></td>
</tr>
</tbody>
</table>
| 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. | - 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) | - 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) |
| Using Mathematics and Computational Thinking | **LS4.B: Natural Selection**  | **Cause and Effect** |
| 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. | - 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) | - 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) |
| Constructing Explanations and Designing Solutions | **Connections to Engineering, Technology, and Applications of Science**  | **Interdependence of Science, Engineering, and Technology** |
| 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. | **Connections to Nature of Science**  | - 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) |
| | **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 knowledge assumes an order and consistency in natural systems. (MS-LS4-1) |
### Grade Eight Unit Three: FOSS Heredity & Adaptations

**Instructional Days:** 36

<table>
<thead>
<tr>
<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obtaining, Evaluating, and Communicating Information</strong></td>
<td>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)</td>
<td>Science Addresses Questions About the Natural and Material World</td>
</tr>
<tr>
<td>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)</td>
<td></td>
<td>- Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-LS4-5)</td>
</tr>
</tbody>
</table>

#### Connections to other DCIs in grades 6–8:

- **MS.LS2.A** (MS-LS4-4), (MS-LS4-6)
- **MS.LS2.C** (MS-LS4-6)
- **MS.LS3.A** (MS-LS4-2), (MS-LS4-4)
- **MS.LS3.B** (MS-LS4-2), (MS-LS4-4), (MS-LS4-6)
- **MS.ESS1.C** (MS-LS4-1), (MS-LS4-2), (MS-LS4-6)
- **MS.ESS2.B** (MS-LS4-1)

#### Articulation of DCIs across grade levels:

- **4.PS3.A** (MS-PS4-1)
- **3.LS3.B** (MS-LS4-4)
- **3.LS4.A** (MS-LS4-1), (MS-LS4-2)
- **3. LS4.B** (MS-LS4-4)
- **3.LS4.C** (MS-LS4-6)
- **4.PS3.A** (MS-PS4-1)
- **HS.LS3.S** (MS-LS4-4), (MS-LS4-5), (MS-LS4-6)
- **HS.LS4.A** (MS-LS4-1), (MS-LS4-2), (MS-LS4-3)
- **HS.LS4.B** (MS-LS4-4), (MS-LS4-6)
- **HS.LS4.C** (MS-LS4-4), (MS-LS4-5), (MS-LS4-6)
Connections to NJSL - English Language Arts

- RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions (MS-LS4-1), (MS-LS4-2), (MS-LS4-3), (MS-LS4-4), (MS-LS4-5)
- RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-LS4-1), (MS-LS4-3)
- RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-LS4-3), (MS-LS4-4)
- WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (MS-LS4-2), (MS-LS4-4)
- WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-LS4-5)
- WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research. (MS-LS4-2), (MS-LS4-4)
- SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, teacher led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly. (MS-LS4-2), (MS-LS4-4)
- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation. (MS-LS4-2), (MS-LS4-4)

Connections to NJSL - Mathematics

- MP.4 Model with mathematics. (MS-LS4-6)
- 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-LS4-4), (MS-LS4-6)
- 6.SP.B.5 Summarize numerical data sets in relation to their context. (MS-LS4-4), (MS-LS4-6)
- 6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-LS4-1), (MS-LS4-2)
- 7.RP.A.2 Recognize and represent proportional relationships between quantities. (MS-LS4-4), (MS-LS4-6)
**MS-ESS1: Earth’s Place in the Universe**

- **MS-ESS1-4** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth’s history. Examples of Earth’s major events could range from being very recent (such as the last Ice Age or the earliest fossils of Homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

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<th>Science and Engineering Practices</th>
<th>Disciplinary Core Ideas</th>
<th>Crosscutting Concepts</th>
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<tbody>
<tr>
<td>** Developing and Using Models**</td>
<td><strong>ESS1.A: The Universe and Its Stars</strong></td>
<td><strong>Patterns</strong></td>
</tr>
<tr>
<td>Modeling in 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.</td>
<td>- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)</td>
<td>- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)</td>
</tr>
<tr>
<td>• Develop and use a model to describe phenomena. (MS-ESS2-1), (MS-ESS2-6)</td>
<td>- Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)</td>
<td><strong>Cause and Effect</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)</td>
</tr>
</tbody>
</table>
### Science and Engineering Practices

- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

### Planning and Carrying Out Investigations

Planning and carrying out investigations in 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.

- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)

### Analyzing and Interpreting Data

Analyzing data in 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-ESS2-3)

### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 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.

### Disciplinary Core Ideas

<table>
<thead>
<tr>
<th>ESS1.C: The History of Planet Earth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.A: Earth’s Materials and Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Earth processes are the result of energy flowing and matter cycling within and among the planet’s systems. This energy is derived from the sun and Earth’s hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth’s materials and living organisms. (MS-ESS2-1)</td>
</tr>
<tr>
<td>The planet’s systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth’s history and will determine its future. (MS-ESS2-2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.B: Plate Tectonics and Large-Scale System Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth’s plates have moved great distances, collided, and spread apart. (MS-ESS2-3)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ESS2.C: The Roles of Water in Earth’s Surface Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water continually cycles among land, ocean, and atmosphere via evaporation, condensation, and precipitation. (MS-ESS2-2)</td>
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</table>

### Crosscutting Concepts

<table>
<thead>
<tr>
<th>Scale Proportion and Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2)</td>
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</table>

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<thead>
<tr>
<th>Systems and System Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems. (MS-ESS2-6)</td>
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<thead>
<tr>
<th>Energy and Matter</th>
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<tbody>
<tr>
<td>Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)</td>
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<thead>
<tr>
<th>Stability and Change</th>
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<tbody>
<tr>
<td>Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)</td>
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</table>

<table>
<thead>
<tr>
<th>Connections to Nature of Science</th>
</tr>
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<tbody>
<tr>
<td>Scientific Knowledge is Open to Revision in Light of New Evidence</td>
</tr>
<tr>
<td>Science findings are frequently revised and/or reinterpreted based on new evidence. (MS-ESS2-3)</td>
</tr>
<tr>
<td>Science and Engineering Practices</td>
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<tr>
<td>----------------------------------</td>
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</tbody>
</table>
| the past and will continue to do so in the future. (MS-ESS2-2) | water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)  
- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)  
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)  
- Water’s movements—both on the land and underground—cause weathering and erosion, which change the land’s surface features and create underground formations. (MS-ESS2-2) |  
ESS2.D: Weather and Climate |  
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)  
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)  
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean |
### Connections to other DCIs in grades 6–8:

- **MS.PS1.A**  (MS-ESS2-1), (MS-ESS2-4), (MS-ESS2-5)
- **MS.PS1.B**  (MS-ESS2-1), (MS-ESS2-2)
- **MS.PS2.A**  (MS-ESS2-5), (MS-ESS2-6)
- **MS.PS2.B**  (MS-ESS2-4)
- **MS.PS3.A**  (MS-ESS2-4), (MS-ESS2-5)
- **MS.PS3.B**  (MS-ESS2-1), (MS-ESS2-5), (MS-ESS2-6)
- **MS.PS4.B**  (MS-ESS2-6)
- **MS.LS2.A**  (MS-ESS2-1), (MS-ESS2-2)
- **MS.LS2.B**  (MS-ESS2-1), (MS-ESS2-1)
- **MS.LS2.C**  (MS-ESS2-1)
- **MS.LS4.A**  (MS-ESS2-3)
- **MS.ESS1.B**  (MS-ESS2-1)
- **MS.ESS3.C**  (MS-ESS2-1)

### Articulation of DCIs across grade levels:

- **3.PS2.A**  (MS-ESS2-4), (MS-ESS2-6)
- **3.LS4.A**  MS-ESS2-3
- **3.ESS2.D**  (MS-ESS2-5), (MS-ESS2-6)
- **3.ESS3.B**  (MS-ESS2-3)
- **4.PS3.B**  (MS-ESS2-1), (MS-ESS2-4)
- **4.ESS1.C**  (MS-ESS2-2), (MS-ESS2-3)
- **4.ESS2.A**  (MS-ESS2-1), (MS-ESS2-2)
- **4.ESS2.B**  (MS-ESS2-3)
- **4.ESS2.E**  (MS-ESS2-2)
- **4.ESS3.B**  (MS-ESS2-3)
- **5.PS2.B**  (MS-ESS2-4)
- **5.ESS2.A**  (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-5), (MS-ESS2-6)
- **5.ESS2.C**  (MS-ESS2-4)
- **HS.PS1.B**  (MS-ESS2-1)
- **HS.PS2.B**  (MS-ESS2-4), (MS-ESS2-6)
- **HS.PS3.B**  (MS-ESS2-1), (MS-ESS2-4), (MS-ESS2-6)
- **HS.PS4.B**  (MS-ESS2-6)
- **HS.LS1.C**  (MS-ESS2-1)
- **HS.LS2.B**  (MS-ESS2-1), (MS-ESS2-2)
- **HS.LS4.A**  (MS-ESS2-3)
- **HS.LS4.C**  (MS-ESS2-3)
- **HS.ESS1.B**  (MS-ESS2-6)
- **HS.ESS1.C**  (MS-ESS2-2), (MS-ESS2-3)
- **HS.ESS2.A**  (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-4), (MS-ESS2-6)
- **HS.ESS2.B**  (MS-ESS2-2), (MS-ESS2-6)
- **HS.ESS2.C**  (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-4), (MS-ESS2-5)
- **HS.ESS2.D**  (MS-ESS2-2), (MS-ESS2-4), (MS-ESS2-5), (MS-ESS2-6)
- **HS.ESS2.E**  (MS-ESS2-1), (MS-ESS2-2)
- **HS.ESS3.D**  (MS-ESS2-2)
Grade Eight Unit Three: FOSS Heredity & Adaptations

Instructional Days: 36

Course: Life Science
Unit: 2
Topic: Heredity and Adaptations

Connections to NJSLS – English Language Arts

- **RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5)
- **RST.6-8.7** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS2-3)
- **RST.6-8.9** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3), (MS-ESS2-5)
- **WHST.6-8.2** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)
- **WHST.6-8.8** Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5)
- **SL.8.5** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-1), (MS-ESS2-2), (MS-ESS2-6)

Connections to NJSLS – Mathematics

- **MP.2** Reason abstractly and quantitatively. (MS-ESS2-2), (MS-ESS2-3), (MS-ESS2-5)
- **6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-2)
- **6.EE.B.6** Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS2-2), (MS-ESS2-3)
- **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS2-2), (MS-ESS2-3)
Storyline:

Students use models to describe ways gene mutations and sexual reproduction contribute to genetic variation. Crosscutting concepts of cause and effect and structure and function provide students with a deeper understanding of how gene structure determines differences in the functioning of organisms.

Students formulate an answer to the question, “How do living organisms pass traits from one generation to the next?”

Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species. They use fossil records and anatomical similarities of the relationships among organisms and species to support their understanding. Crosscutting concepts of pattern and structure and function contribute to the evidence students can use to describe biological evolution.

Students formulate an answer to the question, “How do organisms change over time in response to changes in the environment?”

Standards
NJSLS:

**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-LS3-1** 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-LS4-1** 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-ESS1-4** Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6-billion-year-old history.
Developing and Using Models
- Develop and use a model to describe phenomena. (MS-LS3-1),(MS-LS3-2)

Analyzing and Interpreting Data
- 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)

Constructing Explanations and Designing Solutions
- 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
- 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)

Using Mathematics and Computational Thinking

LS1.B: Growth and Development of Organisms
- 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)

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)

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
- Cause and effect relationships may be used to predict phenomena in natural systems. (MS-LS3-2)
- 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)

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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)
<table>
<thead>
<tr>
<th>Grade Eight Unit Three: FOSS Heredity &amp; Adaptations</th>
<th>Instructional Days: 36</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Use mathematical representations to support scientific conclusions and design solutions. (MS-LS4-6)</td>
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</tbody>
</table>

**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)

**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.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

**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)
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)

<table>
<thead>
<tr>
<th>Learning Objective and Standard</th>
<th>Essential Questions</th>
<th>Content Related to DCI’s</th>
<th>Sample Activities</th>
<th>Resources</th>
</tr>
</thead>
</table>
| 1. *Investigation 1 Part 1: The Fossil Record* | What does the fossil record tell us about the history of life on Earth? | ● The chronological fossil record documents the existence, diversity, extinction, and change of life-forms throughout the history of life on Earth. | **Benchmark Assessment:** Entry-Level Survey  
Students make observations of similarities and differences of fossils, construct a geologic timeline showing the chronology of fossils | Science Resources  
Book: “Fossil Dating”  
“Mass Extinctions”  
Videos and Slide Shows: |
**Grade Eight Unit Three: FOSS Heredity & Adaptations**

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| **MS-LS4-1, MS-LS4-2, MS-ESS1-4** | ● The fossil record is incomplete because of the nature of fossilization. ● Structural similarities between ancient and modern organisms are one piece of evidence from which we can infer relatedness. | and investigate the causes of mass extinctions. **Embedded Assessment:** Science notebook entry | **Biodiversity slide show**  
**Fossils slide show** |
| **2. Investigation 1 Part 2: Transitions** | What does the fossil record tell us about how life has changed over time? | Students collect evidence regarding why organisms moved to land during the Devonian period, speculate on a gap filling organism, compare the structure of human limbs to that of other organisms. **Embedded Assessment:**  
Response Sheet | **Science Resources Book:**  
“An Interview with Jennifer Clack”  
“Transitions”  
**Videos and Slide Shows:**  
*Fish with Fingers*  
*Great Transitions: The Origin of Tetrapods*** |
| **3. Investigation 2 Part 1: Lines of Descent** | How can a model help us understand the relationships among organisms? | Students examine a human family tree and then build a vertebrate cladogram. They learn about common ancestors and deduce that the more recent common ancestor organisms share, the more closely related they are. **Embedded Assessment:**  
Science notebook entry | **Science Resources Book:**  
“Tree Thinking” |
<p>| <strong>MS-LS3-1, MS-LS3-2, MS-LS4-2, MS-LS4-4</strong> | ● A cladogram is a model that demonstrates evolutionary relationships among organisms. ● Embryo development can be used to identify relationships not evident in adults of different species. ● Heredity explains why organisms are similar but | | |</p>
<table>
<thead>
<tr>
<th>4. <strong>Investigation 2 Part 2: Inheriting Traits</strong></th>
<th>What leads to variation in a population?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students determine trait distribution within a given population.</td>
<td></td>
</tr>
<tr>
<td><strong>MS-LS3-1, MS-LS3-2, MS-LS4-2, MS-LS4-4</strong></td>
<td></td>
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</tbody>
</table>

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<tr>
<th>5. <strong>Investigation 2 Part 3: Modeling Heredity</strong></th>
<th>How can we model how genetic information passes from generation to generation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students use simulations to model and predict variance in the inheritance of certain traits in a given population.</td>
<td></td>
</tr>
<tr>
<td><strong>MS-LS3-1, MS-LS3-2, MS-LS4-2, MS-LS4-4</strong></td>
<td></td>
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</tbody>
</table>

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<tr>
<th>6. <strong>Investigation 2 Part 4: Punnett Squares</strong></th>
<th>How can we predict the distribution of traits in a future generation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students compare probabilities in individual offspring and across populations using Punnett Squares.</td>
<td></td>
</tr>
<tr>
<td><strong>MS-LS3-1, MS-LS3-2, MS-LS4-2, MS-LS4-4</strong></td>
<td></td>
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</table>

Students determine trait distribution within a given population.

Not identical to their parents.

- Genes on DNA code for proteins that are responsible for an organism’s traits.
- Variation of traits in a population is established in part as a result of sexual reproduction.
- A Punnett square is a model used to predict the probability of inheriting genotypes.

Students explore the variation of four features to determine what traits they have. They determine the distribution of the traits in the class. Students then study a population of larkeys (a made up animal) to analyze their traits.

**Embedded Assessment:** Science notebook entry

Students look at inheritance of traits in the larkey population using an online simulation.

**Embedded Assessment:** Response Sheet

Students use the Punnett square model to predict the probability of inheritance of a given trait when the genotypes of parents are known.

**Embedded Assessment:** Science notebook entry

**Benchmark Assessment:** *Investigation 2 I-Check*

Science Resources Book:
- “Understanding Heredity”
- “A Larkey Yammer”

Slide Show:
- *Heredity*

Online Activities:
- “A Model for Predicting Genetic Variation”
- “Larkey Impossible Traits”

Science Resources Book:
- “Mendel and Punnett Squares”
- “Mapping the Human Genome”

Online Activities:
- “Larkey Punnett Square”
### Grade Eight Unit Three: FOSS Heredity & Adaptations

**Instructional Days:** 36

<table>
<thead>
<tr>
<th></th>
<th>How do genetic mutations lead to variation in a population?</th>
<th>How do populations change over time?</th>
<th></th>
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</thead>
</table>
| 7. **Investigation 3 Part 1:** Adaptation | ● Variation in a population can occur due to random genetic mutations, which can have harmful, helpful, or no effects. | | Science Resources Book:  
“Adaptation”  
Online Activities:  
“Walking Sticks: Eat Insects” |
|   | ● An adaptation is an inherited trait that increases an organism’s chances of surviving in an environment long enough to pass on its genes. |   |   |
|   | ● Natural selection is a process by which individuals best adapted to their environment tend to survive and pass their traits to subsequent generations. |   |   |
|   | ● Change in populations by means of natural selection is the basis for the theory of evolution, which best explains the biodiversity on Earth. |   |   |
|   | ● Humans use genetic technologies to influence inheritance. |   |   |
|   | Students determine whether mutations are adverse, advantageous or neutral for given organisms. |   |   |
|   | **Embedded Assessment:**  
Science notebook entry |   |   |
| 8. **Investigation 3 Part 2:** Natural Selection |   | Using online activities, students track a population of walking sticks over five generations. They consider how natural selection affects the incidence of walking stick color over time. | Science Resources Book:  
“Natural Selection”  
“What Makes a Scientific Theory?”  
Online Activities:  
“Walking Sticks: Find Insects in Three Environments”  
“Larkey Natural Selection”  
Videos and Slide Show:  
*The Making of the Fittest: Natural Selection and Adaptation*  
*The Origin of Species: The Beak of the Finch*  
*Biodiversity* slide |
|   | Students will gather evidence regarding how natural selection can affect a given population over several generations. | **Embedded Assessment:**  
Response Sheet  
**Benchmark Assessment:**  
Investigation 3 I-Check |   |
|   | **MS-LS3-1, MS-LS4-4, MS-LS4-5, MS-LS4-6** |   |   |
|   | **MS-LS3-1, MS-LS4-4, MS-LS4-5, MS-LS4-6** |   |   |
9. **Investigation 3 Part 3: Genetic Technology**

   Students present their research on genetic technologies and judge how they might address current genetic issues.

   *MS-LS3-1, MS-LS4-4, MS-LS4-5, MS-LS4-6*

| How are humans influencing inheritance? | Students will research various genetic technologies and assess how they might address current genetic issues. |

**Embedded Assessment:**
- Performance assessment

**Benchmark Assessment:**
- Posttest

**Science Resources Book:**
- “Influencing Evolution”

**Online Activity:**
- “Genetic Technology Resources”
Grade Eight Unit Three: FOSS Heredity & Adaptations  Instructional Days: 36
In some cases, the student learning objective cannot be used as your daily lesson objective. The SLO may be so extensive that it will require unpacking into smaller parts. Based on the lesson, you will need to create an objective that is aligned to the content you will teach in a science period or in a block.

### Unit Vocabulary

<table>
<thead>
<tr>
<th>atom</th>
<th>trilobite</th>
<th>genome</th>
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<tbody>
<tr>
<td>body fossil</td>
<td>allele</td>
<td>genotype</td>
</tr>
<tr>
<td>brachiopod</td>
<td>characteristic</td>
<td>heredity</td>
</tr>
<tr>
<td>era</td>
<td>chromosome</td>
<td>heterozygous</td>
</tr>
<tr>
<td>evolution</td>
<td>cladogram</td>
<td>homozygous</td>
</tr>
<tr>
<td>fossil record</td>
<td>common ancestor</td>
<td>human genome</td>
</tr>
<tr>
<td>fossil</td>
<td>descendant</td>
<td>infer</td>
</tr>
<tr>
<td>geologic time</td>
<td>DNA (deoxyribonucleic acid)</td>
<td>inheritance</td>
</tr>
<tr>
<td>geologist</td>
<td>dominant</td>
<td>inherited characteristic</td>
</tr>
<tr>
<td>isotope</td>
<td>evolve</td>
<td>most recent common ancestor</td>
</tr>
<tr>
<td>organism</td>
<td>F1 generation</td>
<td>mutation</td>
</tr>
<tr>
<td>paleontologist</td>
<td>F2 generation</td>
<td>parent generation (p generation)</td>
</tr>
<tr>
<td>particle</td>
<td>feature</td>
<td>phenotype</td>
</tr>
<tr>
<td>principle of superposition</td>
<td>filial</td>
<td>population</td>
</tr>
<tr>
<td>radioactive isotope</td>
<td>gene</td>
<td>sedimentary rock</td>
</tr>
<tr>
<td>sediment</td>
<td>generation</td>
<td>trace fossil</td>
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</table>

- **neuron**
- **neurotransmitter**
- **photoreceptor**
- **pressure**
- **reaction time**
- **rod**
- **sense of hearing**
- **sense of sight**
- **sense of smell**
- **sense of taste**
- **sense of touch**
### Grade Eight Unit Three: FOSS Heredity & Adaptations

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### References & Suggested Instructional Websites

- **FOSSweb**
  - [www.fossweb.com](http://www.fossweb.com)

- **Defined (STEM) Learning**
  - [https://www.definedlearning.com/](https://www.definedlearning.com/)

- **The Concord Consortium**
  - [https://concord.org/ngss/](https://concord.org/ngss/) and [https://concord.org/resources](https://concord.org/resources)

- **Newsela**
  - [www.newse.com](http://www.newse.com)

- **Readworks.org**
  - [https://www.readworks.org/](https://www.readworks.org/)
Grade Eight Unit Three: FOSS Heredity & Adaptations

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PBS Learning Media
http://pbslearningmedia.org

OpenSciEd
https://www.openscied.org/

Education.com
https://www.education.com/

Natural Inventions Hall of Fame
https://www.invent.org/at-home-learning-resources

Field Trip Ideas

American Museum of Natural History