Introduction

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination2025. By 2025, 

- 80% of our students will graduate from high school college or career ready
- 90% of students will graduate on time
- 100% of our students who graduate college or career ready will enroll in a post-secondary opportunity

In order to achieve these ambitious goals, we must collectively work to provide our students with high-quality, College and Career Ready standards-aligned instruction. Acknowledging the need to develop competence in literacy and language as the foundation for all learning, Shelby County Schools developed the Comprehensive Literacy Improvement Plan (CLIP). The CLIP ensures a quality balanced literacy approach to instruction that results in high levels of literacy learning for all students across content areas. Destination 2025 and the CLIP establish common goals and expectations for student learning across schools. CLIP connections are evident throughout the science curriculum maps.

The Tennessee State Standards provide a common set of expectations for what students will know and be able to do at the end of a grade. College and Career Ready Standards are rooted in the knowledge and skills students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curriculum provides instructional planning designed to help students reach these outcomes. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. The standards for science practice describe varieties of expertise that science educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in science education. The Science Framework emphasizes process standards of which include planning investigations, using models, asking questions and communicating information.
First Nine Weeks

Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. Throughout the year, students should continue to develop proficiency with the eight science practices. Crosscutting concepts can help students better understand core ideas in science and engineering. When students encounter new phenomena, whether in a science lab, field trip, or on their own, they need mental tools to help engage in and come to understand the phenomena from a scientific point of view. Familiarity with crosscutting concepts can provide that perspective. A next step might be to simplify the phenomenon by thinking of it as a system and modeling its components and how they interact. In some cases it would be useful to study how energy and matter flow through the system, or to study how structure affects function (or malfunction). These preliminary studies may suggest explanations for the phenomena, which could be checked by predicting patterns that might emerge if the explanation is correct, and matching those predictions with those observed in the real world.
Science Curriculum Maps

This curriculum map is designed to help teachers make effective decisions about what science content to teach so that, our students will reach Destination 2025. To reach our collective student achievement goals, we know that teachers must change their instructional practice in alignment with the three College and Career Ready shifts in instruction for science.

To ensure that all student will be taught science content and processes in a comprehensive, consistent, and coherent manner, Science Curriculum Maps are provided. Foundation texts for the maps include Shelby County Schools Framework for Standards Based Curriculum, Science Curriculum Frameworks-K-12 (State of Tennessee Board of Education, and National Science Education Standards).

Teachers function most effectively and students learn best within an “aligned” curriculum delivery system. An aligned system begins with a concerted effort to implement the state curriculum frameworks. Many districts have developed curriculum guides built around these frameworks to ensure that what is taught in particular grades and courses is closely linked with student Learning Expectations found in the state standards. Classroom teachers use these locally-generated curriculum guides to plan and implement their individual grade or course Pacing Guides. Expectations for student performance are clear and carefully tied to daily instructional events and classroom assessment practices. In theory, a fully aligned system closes the loop between state standards and student learning. Additionally, a coherent instructional/assessment system offers the potential for heightening student learning as reflected by their performance on state-mandated standardized tests. Our collective goal is to ensure our students graduate ready for college and career.

A district-wide, K-12, standards-based curriculum is implemented in science. This curriculum is articulated in the form of individual SCS curriculum maps for each grade and subject. These SCS curriculum maps enable the district to implement a single curriculum that emphasizes specific standards. Since Shelby County has a high rate of mobility among the student population, the SCS curriculum maps ensure that all students receive the same program of high-level instructional content and academic expectations, regardless of which school they attend. The utilization of a district-wide standards-based curricular program ensures that students in SCS are engaged in hands-on inquiry based activities as teachers implement the curriculum maps.
<table>
<thead>
<tr>
<th>State Standards</th>
<th>Embedded Standards</th>
<th>Outcomes</th>
<th>Adopted Resources</th>
<th>Core Ideas</th>
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</thead>
<tbody>
<tr>
<td><strong>Unit 1.1 Population Ecology and Energy Flow – 3 Weeks</strong></td>
<td></td>
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<tr>
<td><strong>Vocabulary:</strong> population, population growth curve, population density, non-native species, carrying capacity, birth-rate, climate changes, habitat degradation, mortality rate</td>
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<tr>
<td>CLE 3210.2.2 Analyze and interpret population data, graphs, or diagrams.</td>
<td>CLE 3210 Inq. 4 – Apply qualitative and quantitative measures to analyze data and draw conclusions that are free of bias. CLE 3210.Math 1 – Understand the mathematical principles associated with the science of biology. CLE 3210.Math 2 – Utilize appropriate mathematical equations and processes to understand biological concepts.</td>
<td>Analyze a human population distribution graphs to predict the impact on global resources, society, and the economy. Construct and maintain a model of an ecosystem. Monitor and evaluate changes in a yeast population. Investigate an outdoor habitat to identify the abiotic and biotic factors, plant and animal populations, producers, consumers, and decomposers.</td>
<td>Glencoe – Chapter 4 – pgs. 90 – 113 Encyclopedia of Earth Population activities Data Analysis – Recognize Cause and Effect TE p. 98 Mini Lab – Evaluate Factors TE p. 101 Bio Lab – do Plants of the Same Species Compete with One Another TE p. 107 Prentice Hall Chapter 5 pages 119-132</td>
<td></td>
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<tr>
<td><strong>CLIP</strong> Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically into words.</td>
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<tr>
<td><strong>Math Practice. MP5</strong> Use appropriate tools strategically</td>
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<tr>
<td>Vocabulary: aerobic respiration, anaerobic respiration, ATP synthesis, catalyst, cellular respiration, chemical bond energy, chemosynthesis, energy flow, energy transformation, fermentation, high-energy compound, phosphate bond, photosynthesis</td>
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</tbody>
</table>
| **CLE 3210.3.1** Analyze the flow of energy through an ecosystem. | **CLE 3210.T/E. 4** – Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems. | **Analyze energy flow through an ecosystem.**
**Describe how energy flows through an ecosystem from producers through the different levels of consumers.**
**Describe the sequence of events associated with biological succession.**
**Track energy flow through an ecosystem.** | **Glencoe – Chapter 2 – pgs. 41-57** Fast File and Technology Resources, TE p. 30B
Data Analysis TE p. 39
**Prentice Hall** Chapter 8 pages 201-203
**Activities/Labs**
SE: Inquiry Act, p200
Diagram of Energy Flow
**GIZMOS:**
Food Chain | **CLIP**
Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically into words. Create a foldable that outlines the levels of organization beginning with an organism and ending with the biosphere.

**Math Practice MP4** Model with mathematics.

**NGSS Practices**
2. Developing and using models.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking. |

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| CLE 3210.2.4 Describe the sequence of events associated with biological succession. | Describe a sequence of events that illustrates biological succession. Describe how energy flows through an ecosystem from producers through the different levels of consumers. Describe the sequence of events associated with biological succession. | **Glencoe** – Chapter 3 – pgs 62 - 64
Data Analysis Lab. P.63
TE Resources p. 58
**Humans affecting Aquatic Ecosystems**
**How Humans affect the Ecosystem**
Prentice Hall Chapter 4 pages 90-97

**Activities/Labs**
TE: Demo, p92
SE: QuickLab, p91
Build Science Skills, p96 | **NGSS Practices**
8. Obtaining, evaluating, and communicating information. |
| --- | --- | --- | --- |
| CLE 3210.3.4 Describe the events which occur during the major biochemical cycles. | CLE 3210.Inq. 3 – Use appropriate tools and technology to collect precise and accurate data | Construct models of the carbon, oxygen, nitrogen, phosphorous, and water cycles. | **Glencoe** – Chapter 2 – pgs. 45 – 57
Mini Lab. TE p. 48
Formative Assessment TE p. 49
BioLab TE p. 51
**The Water Cycle PowerPoint**
**The Nitrogen Cycle PowerPoint**
**Carbon Oxygen Cycle PowerPoint**
**Water Cycle Worksheets**
Prentice Hall Chapter 3 pages 74-80

**Activities/Labs**
TE: *Make Connections, p76
*Build Science Skills, p78 |
| **CLIP**
Create a poster that illustrated how the biogeochemical cycles interact. |
| **NGSS Practice**
2. Developing and using models. |
## Curriculum and Instruction – Office of Science -- Curriculum Map Biology

<table>
<thead>
<tr>
<th>Vocabulary: autotroph, biological community, biological succession, dynamic equilibrium, ecosystem, habitat, heterotroph, population change, trophic levels</th>
</tr>
</thead>
</table>

### CLE 3210.2.1
Investigate how the dynamic equilibrium of an ecological community is associated with interactions among its organisms.

- **Predict how population changes of organisms at different trophic levels affect an ecosystem.**
- **Investigate how the dynamic equilibrium of an ecological community is associated with interactions among its organisms.**
- **Investigate how changes in environmental conditions affect the organisms in a model ecosystem.**
- **Analyze human population distribution graphs to predict the impact on global resources, society, and the economy.**

### Glencoe – Chapter 2 – pgs 30 - 57
- Fast File and Technology Resources, TE p. 30B
- Informal Writing TE P. 33
- Critical Thinking TE p. 35
- Data Analysis Lab TE p. 39
- Formative Assessment TE p. 40
- Mini Lab – Construct a Food Web TE p. 42
- MiniLab – Test for Nitrates TE p. 48

### Prentice Hall
- Chapter 3 pages 63-65 and Chapter 4 pages 90-105

### SECTION 3-1
**Activities/Labs**
- SE: Inq. Act, p62

### SECTION 4-2
**Activities/Labs**
- TE: Demo, p92, 94
- SE: *QuickLab, p91
  - *Build Science Skills, p96
  - *Exploration, p113

### SECTION 4-3
**Activities/Labs**
- TE: Build Science Skills, p103
- IF: Investigation 2

### GIZMOS: Microevolution

### NGSS Practices
4. Analyzing and interpreting data.
6. Constructing explanations (for science) and designing solutions (for engineering).

### CLE 3210.2.3
Predict how global climate change, human activity, geological events, and the introduction

- **Conduct research on how human influences have changed an ecosystem and communicate findings.**

### Glencoe – Chapter 5 – 122 – 143
- Fast File and Technology Resources, TE p. 114B

### CLIP
Assess the extent to which the reasoning and evidence in a text support the author’s claim
of non-native species impact an ecosystem.

well a theory predicts and compare opposing theories.

CLE 3210.Inq. 5 – Compare experimental evidence and conclusions with those drawn by others about the same testable question.

CLE 3210.T/E. 1 – Explore the impact of technology on social, political, and economic systems.

CLE 3210.T/E. 4 – Describe the dynamic interplay among science, technology, and engineering within living, earth-space, and physical systems.

through written or oral presentations extinction of a particular species

predict how global climate change, human activity, geologic events, and the introduction of non-native species impact an ecosystem.

Make inferences about how a specific environmental change can affect the amount of biodiversity.

Predict how a specific environmental change may lead to the extinction of a particular species.

Explain how human activities can directly impact ecosystems both positively and negatively.

Formative Assessment TE p. 121

MiniLab – Investigate Threats to Biodiversity TE p. 121

MiniLab – Survey Leaf Litter Samples TE p. 127

Carrying Capacity Stages of Ecological Succession

Prentice Hall Chapter 4 pages 87-89 and Chapter 5 pages 124-127

Activities/Labs

GIZMOS:
Greenhouse Effect
Water Pollution Pond Ecosystem

or a recommendation for solving a scientific or technical problem.

Create a foldable of your choice on the types of succession.

CCSS.Math.Practice.MP4 Model with mathematics.

CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.

NGSS
1. Asking questions (for science) and defining problems (for engineering).

4. Analyzing and interpreting data.

7. Engaging in argument from evidence.
## Unit 1.3 The History of Life and Natural Selection – 3 Weeks

<table>
<thead>
<tr>
<th>Vocabulary: convergent evolution, divergent evolution, evolution, fossil evidence, natural selection, speciation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLE 3210.5.4</strong> Summarize the supporting evidence for the theory of evolution.</td>
</tr>
<tr>
<td><strong>CLE 3210. Inq. 1</strong> – Recognize that science is a progressive endeavor that reevaluates and extends what is already accepted.</td>
</tr>
<tr>
<td><strong>CLE 3210.Inq. 5</strong> – Compare experimental evidence and conclusions with those drawn by others about the same testable question.</td>
</tr>
<tr>
<td><strong>CLE 3210.Inq. 6</strong> – Communicate and defend scientific findings</td>
</tr>
<tr>
<td><strong>Glencoe</strong> – Chapters 14 – pgs. 390 – 415</td>
</tr>
<tr>
<td>Fast File and Technology Resources, TE pp. 390 B, 416B &amp; 450B</td>
</tr>
<tr>
<td>Data Analysis TE p. 396, 406</td>
</tr>
<tr>
<td>Formative Assessment, TE pp. 400, 407</td>
</tr>
<tr>
<td>BioLab – “p. 409</td>
</tr>
<tr>
<td><strong>Prentice Hall</strong> Chapter 15 pages 369-386 and Chapter 17 pages 417-440</td>
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<tr>
<td><strong>CHAPTER 15</strong></td>
</tr>
<tr>
<td><strong>Activities/Labs</strong></td>
</tr>
<tr>
<td>TE: <em>Demos: 377, 382</em></td>
</tr>
<tr>
<td><em>Build Science Skills, p382</em></td>
</tr>
<tr>
<td>SE: <em>Inq. Act, p368</em></td>
</tr>
<tr>
<td><em>QuickLab, p379</em></td>
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<tr>
<td><strong>CHAPTER 17</strong></td>
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<tr>
<td><strong>Activities/Labs</strong></td>
</tr>
<tr>
<td>TE: <em>Demos: 417, 424</em></td>
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<tr>
<td><em>Build Science Skills: 418, 419</em></td>
</tr>
<tr>
<td>SE: <em>Inq. Act, p416</em></td>
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<tr>
<td><strong>Evolution Notes, Handouts, and PowerPoints</strong></td>
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<tr>
<td><strong>NOVA PBS-Evolution Webpage</strong></td>
</tr>
<tr>
<td><strong>CCSS.ELA-Literacy.RST.9-10.1</strong> Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</td>
</tr>
<tr>
<td><strong>CCSS.ELA-Literacy.RST.9-10.8</strong> Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.</td>
</tr>
<tr>
<td><strong>CCSS.Math.Practice.MP3</strong> Construct viable arguments and critique the reasoning of others.</td>
</tr>
<tr>
<td><strong>NGSS Practices</strong></td>
</tr>
<tr>
<td>3. Planning and carrying out investigations.</td>
</tr>
<tr>
<td>4. Analyzing and interpreting data</td>
</tr>
<tr>
<td>8. Obtaining, evaluating, and communicating information.</td>
</tr>
</tbody>
</table>
| CLE 3210.5.1 Associate structural, functional, and behavioral adaptations with the ability of organisms to survive under various environmental conditions. | Create graphic organizers to demonstrate the relationship between form and function in representative organisms. Compare and contrast the structural, functional, and behavioral adaptations of animals or plants found in different environments. | **Natural Selection and Evidence of Evolution**
Glencoe – Chapter 15 – 416 – 430
Resources TE p. 416
Data Analysis TE p. 421, 429
Assessment TE p. 422, 430
Demonstration TE. P. 425
Mini Lab TE p. 428
**Prentice Hall** Chapter 16 pages 404–410
**Activities/Labs**
SE: Analyzing Data, p408
**GIZMOS:**
Rainfall and Bird Beaks
Evolution: Mutation and Selection
Adaptations Worksheet | **NGSS Practices**
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
8. Obtaining, evaluating, and communicating information. |
## TOOLBOX

### Unit 1.1: Population Ecology and Energy Flow Plans

**Estimating Population Size** - You will be expected to estimate the size of a sample population using the mark-recapture technique. Be able to apply the technique to new population problems and compare the mark and recapture technique to other methods of population estimating.

http://www.biologycorner.com/worksheets/estimating_population_size.html

**Predator Prey Simulation**

In a stable ecosystem, the number of predators and the number of prey fluctuate, but remain relatively constant. Three factors can affect the cycling of predator and prey numbers: the reproductive rate of the prey, the number of prey eaten by each predator and the reproductive rate of the predator.

In this simulation, you will manipulate those three variables to determine how they affect the overall predator and prey populations. This simulation is located at:

http://www.biologycorner.com/worksheets/pred_prey.html

**Lesson Plans Inc: Ecology**

http://www.lessonplansinc.com/biology_lesson_plans_ecology_lab.php

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### Unit 1.1: Population Ecology and Energy Flow Background for Teachers

**Prentice Hall Student Practice**

- RSW: Sect 17-1, 17-2, 17-3, 17-4
- ARSW: Sect 17-1, 17-2, 17-3, 17-4

**Encyclopedia of Earth**

**Population Activities**
### Unit 1.1 Population Ecology and Energy Flow

#### Student Activities

- **Deer: Predation or Starvation**

- **Interpreting Ecological Data**
  - [http://www.biologycorner.com/worksheets/interpreting_data.html](http://www.biologycorner.com/worksheets/interpreting_data.html)

- **Population Biology Simulation**

- **Plant and Animal - Mini Ecosystem**
  - Purpose: In this lab you will observe the interaction of a snail and a water plant in a closed environment. The use of an indicator will allow you to observe the presence of oxygen and carbon dioxide in the environment.

- **Elements of Biology: Ecosystems- Organisms and Their Environments**

- **Scientific Argumentation in Biology NSTA Press**
  - Activity 9 Surviving Winter in a Dust Bowl

- **Scientific Argumentation in Biology NSTA Press**
  - Activity 26 Misconceptions About Interactions That Take Place Between Organisms

#### Other Resources

- **Biome Map Coloring**
  - [http://biologycorner.com/worksheets/biome_map.html](http://biologycorner.com/worksheets/biome_map.html)

- **Environmental Action**
  - as a group, allocate resources to different “causes”

- **Scientific Argumentation In Biology by the NSTA Press**
  - [http://strandmaps.nsdl.org/](http://strandmaps.nsdl.org/)
  - Interactive Sites for Education
# Curriculum and Instruction – Office of Science -- Curriculum Map Map Biology

| Unit 1.2 Principles of Ecology and Biodiversity Plans | Lesson Planet – Biochemical Cycles  
http://www.lessonplanet.com/lesson-plans |
| --- | --- |
| Unit 1.2 Principles of Ecology and Biodiversity Background for Teachers | Succession: A Closer Look  
http://www.nature.com/scitable/knowledge/library/succession-a-closer-look-13256638  
Biochemical Cycles  
http://www.rpd.net/sciencetips_v2/E12C3.htm  
Biogeochemical Cycling and the Phosphorus Cycle  
| Unit 1.2 Principles of Ecology and Biodiversity Student Activities | What is your biodiversity IQ?  
http://www.biologycorner.com/worksheets/environmentalaction.html  
GIZMOS: Greenhouse Effect  
Scientific Argumentation in Biology NSTA Press Activity 7 Decline in Saltwater Fish Populations |
| Unit 1.2 Principles of Ecology and Biodiversity Other Resource | Biochemical Cycles  
Scientific Argumentation In Biology by the NSTA Press  
http://strandmaps.nsdl.org/  
Interactive Sites for Education |
| Unit 1.3 The History of Life and Natural | Elements of Biology: Evolution  
Who Was Charles Darwin? |
## Selection Plans

**Unit 1.3 The History of Life and Natural Selection**

**Background for Teachers**

**What is the Evidence of Evolution?**


**Unit 1.3 The History of Life and Natural Selection**

**Student Activities**

**Important Events in the History of Life**

http://evolution.berkeley.edu/evosite/evo101/IIE2Importantevents.shtml

**Common Misconceptions of Evolution**

http://evolution.about.com/od/Overview/tp/5-Common-Misconceptions-Of-Evolution.htm

**What is Evolution?**


**How Did Life Begin?**

http://www.pbs.org/wgbh/nova/evolution/how-did-life-begin.html

**Online Lessons for Learning Evolution**

**Darwin Great Voyage of Discovery**

**The Biology Corner --- The Peppered Moth Simulation or The Peppered Moth Simulation (Kit)**

http://www.biologycorner.com/worksheets/pepperedmoth.html

**The Biology Corner --- Natural Selection Simulation**

http://www.biologycorner.com/worksheets/naturalselection.html

**Ecology Scavenger Hunt (Web Quest)**

**Evidence of Evolution” Web Quest**


**Scientific Argumentation in Biology NSTA Press** Activity 3 Desert Snakes

**Scientific Argumentation in Biology NSTA Press** Activity 25 Misconception About Life of Earth

**Lesson Plans Inc. -- Evolution Lesson Plans**
The History of Life and Natural Selection

Other Resources

The Biology Corner --- The Theory of Evolution
http://evolution.berkeley.edu/evosite/evo101/IIE2Importantevents_text.shtml

Scientific Argumentation in Biology NSTA Press

Explore Learning GIZMOS
http://strandmaps.nsdl.org/

Interactive Sites for Education