Lesson Title	Adaptations
Length of Lesson	50 minutes
Created By	Claire Babineaux
Subject	General Science
Grade Level	8th
State Standards	3.a,d,e
DOK Level	2,3
DOK Application	2: classify, observations, construct 3: construct, compare, revise, critique
National Standards	C
Graduate Research Element	Although adaptations are not necessarily the main focus of the graduate student's research, adaptations are an important area of focus. For example, the organisms in the sand that is being replaced with glass can adapt to the environment.

Student Learning Goal:
The learning goal for the students in this lesson is to understand what the adaptations are, where they occur, the processes by which adaptations occur, and the connection to heredity and diversity. The main focus of this lesson will be the defining terms and processes by which adaptations occur.

State Standards:
3. Compare and contrast the structure and functions of the cell, levels of organization of living things, basis of heredity, and adaptations that explain variations in populations.

a) Analyze how adaptations to a particular environment (e.g., desert, aquatic, high altitude) can increase an organism's survival and reproduction and relate organisms and their ecological niches to evolutionary change and extinction. (DOK 3)

d) Describe heredity as the passage of instructions from one generation to another and recognize that hereditary information is contained in genes, located in the chromosomes of each cell. (DOK 2)

- How traits are passed from parents to offspring through pairs of genes
- Phenotypes and genotypes
- Hierarchy of DNA, genes, and chromosomes and their relationship to phenotype
- Punnett square calculations

e) Explain energy flow in a specified ecosystem. (DOK 2)

- Populations, communities, and habitats
- Niches, ecosystems and biomes
- Producers, consumers and decomposers in an ecosystem

National Standards:
C: Life Science

- (Reproduction and Heredity) Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another.
- (Reproduction and Heredity) The characteristic of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.
- (Populations and ecosystems) A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.

Materials Needed (supplies, hand-outs, resources):
Worksheet

Lesson Performance Task/Assessment:
The task/assessment for the students will be a PowerPoint lesson showing an example of taxonomy, a guided discussion on the processes that are associated with how adaptations occur, and an activity in which the students report on the taxonomy of an organism.

Lesson Relevance to Performance Task and Students:
Being in the Southeastern United States in Central Mississippi, the students are in a region where the organisms preserved in the rock and fossil record have adapted to their environments over time. There are many outcrops in the area.

Anticipatory Set/Capture Interest:
In order to capture the interest of students, the teacher can show a video about adaptations and lead a discussion.

Guided Practice:
Depending on the stopping point of the lesson, whether this is a continuation of a lesson or the first day of the lesson, the teacher will lead the students in a discussion about adaptations and the following questions may be considered:

1. What is an adaptation?
2. What can adaptations tell scientists about an organism?
3. Describe an adaptation
4. Who is Charles Darwin?
5. What did he study?

After the discussion, the teacher will guide the students through the directions and then allow them to complete the activity.

Independent Practice:
For independent practice, the students will complete the adaptations worksheet.

For homework or lesson extension, the students will then create a phylogenetic (branching tree) for the bugs in the worksheet.

Remediation and/or Enrichment:
Remediation: Individual IEP will be followed. Additionally, the teacher may have the students work together in pairs.

Enrichment: The teacher may implement an extra credit assignment for the students to present their branching trees and to describe what they have learned about adaptations. The teacher may also assign the students the task of completing the assignment with using only one bug for the common ancestor.

Check(s) for Understanding:
In order to check for a thorough understanding of the concepts presented in this lesson, the following questions can be considered:

1. What is natural selection?
2. Are there any relationships presented with the bugs from the worksheet?
3. Describe another adaptation.

Closure:
The closure for this lesson can be a teacher led discussion on adaptations and the study of adaptations at Mississippi State University, not only in the STEM areas provided by GK12 but also in biological sciences.

Possible Alternate Subject Integrations:
Biology: study of evolutionary changes, Darwin's work.
Math: calculate rates

Teacher Notes:
The activity provided by this lesson is based on the bugs created by Dr. Joseph Camin from the University of Kansas. Also, this lesson is an abbreviated version of Dr. Camin's work to introduce students to the principles of evolution and adaptations over time.