The Variable Population of Our Texas Symbols

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INTRODUCTION

Being a Texas native, I have always been fond of my Texas heritage and our state symbols. One of my fondest memories growing up was taking a day trip with my family to the outskirts of Houston during springtime. My father would drive our family car along the Texas highways while my mother and I would gaze out the window at all of the beautiful Texas wildflowers. We would stop at state parks, at wildflower reserves, and on the shoulder of the highway simply to take a closer look at these Texas beauties. My parents would teach me the names of the wildflowers we encountered: dogwoods, honeysuckles, paintbrushes, daisies, and, my favorite, the bluebonnet.

My love for the bluebonnet grew as we studied Texas history and culture in the seventh grade. We had a wildflower project to complete in our science class, and had to pick our favorite Texas wildflower and describe its common name, its scientific name, its origin, its habitat, and its size. We were also required to list five facts about the wildflower as well as and include a picture. I was the only person in my class to earn a score of 100 on the project! I guess this outcome is part of the reason I have always been fond of the bluebonnet, since it did earn me a 100 in science class. Studying about the bluebonnet and other Texas symbols in school sparked my interest in other Texas symbols, especially the pecan tree and the mockingbird.

Growing up in Houston's suburbs, we had several beautiful pecan trees in our yard. My mother would gather up the pecans from the tree and use them in almost every meal. During all that time, I never fully understood the impact that pecans and the pecan tree had on Texas culture and the economy. Prior to our Texas history field trip in the seventh grade, our history teacher had us learn about all of the Texas symbols and their impact on the state. I will never forget studying the economic impact the pecan tree has on Texas. It was not until I started conducting research for this unit that I actually understood the importance that the pecan tree plays in the Texas economy. Part of my goal in this unit is to encourage my students to learn the historical, scientific, and economic impact the pecan tree has on the state of Texas.

Every night in the springtime, I used to lie awake and listen to the calls of the mockingbird. I will never forget the time I heard a baby cry in our backyard. I was so upset that I ran to the door to go into the backyard in order to search for the baby. As it turned out, the cry came from a mockingbird. After that night, I always had a new respect for the mockingbird. I thought it was so interesting that that bird is able to mimic so many sounds. Coincidentally enough, when this occurred, we were studying adaptation in science. I remember thinking that the copycat calls of the mockingbird

were an adaptive quality that aids in the survival of the species. I figured, "If a bird can imitate the call of so many other birds, wouldn't that help it survive by aiding in defending its territory, keeping predators away, finding food, and protecting its young?" I hope that my students will be able to make the same connections that I did through the use of this unit.

As a student in a small private school, we had the wonderful opportunity to go on field trips to look at our Texas symbols. We would view bluebonnets, mockingbirds, and pecan trees in their natural habitats and study why our Texas symbols are important. As both Houston and I grew, I noticed less and less of our Texas symbols in the city. I want my students to learn about the Texas symbols as I did. In addition, I want them to find an answer to the question: why are our symbols decreasing?

The Rationale

I received a degree in elementary education to teach grades one through eight. Throughout my education classes, I was taught the importance of integration of subject matter. I will never forget my mentor telling us that in order to be a great teacher, you must show the students that the information they are learning is real. My mentor went on to state that nothing is just math or just science. Everything we learn is related to something else. I try to integrate her philosophy into my teaching, which is something seldom seen in middle school. I receive numerous groans from the students when we read or write in science class. I want my students to realize that the concepts they are learning about in Texas history relate to mathematics and science.

Teaching seventh grade science is a great way for me to integrate my three favorite Texas symbols into our school's science curriculum. While the students are learning about Texas history and culture in their history class, I want them to understand that these symbols they are learning about in history also have a scientific and mathematical impact on their learning. I want my students to realize that the information we are teaching them in school is all related. I want my students to think about how population changes of these species can affect both Texas culture and economy. I want the students to learn how these three species survive the encroachment of urbanization on their territory, how they have adapted to the changes in their habitat, and the impact that they have on us and our daily lives.

UNIT BACKGROUND

This unit is a month-long study of three different Texas symbols: the pecan tree, the mockingbird, and the bluebonnet. The unit should last four weeks for 55 minutes a day, five days a week at the end of the school year. It is a cumulative unit, drawing from science, math, language arts, history, art, and music concepts that are taught throughout the year. I want all of the teachers on my team to take part. This will be perfect to use in the classroom during the last month of school when the students' and teachers' textbooks

and supplemental materials are taken from them. The unit will not only integrate other subject matter into the science curriculum, but will also pull information from sixth, seventh, and eighth grade science concepts, making it useful (with slight modifications) for each science grade level (HISD).

I want my students to recognize that these symbols are found all around them; in order to see a bluebonnet, mockingbird, or a pecan tree, they do not have to leave their neighborhood. Many students truly believe that nature is only found in the country and cannot be found in an urban area like Houston. Throughout this unit, I intend for my students to realize that nature is all around them and that living in a large city does not mean living free of nature. Furthermore, I have found that many students are not familiar with Texas' rich history and culture. I want my students to not only identify nature that lives in their neighborhood but also be able to see that this nature is part of our Texas culture. I hope that my students will embrace the nature that makes Houston and Texas so unique.

In this unit we will explore the population trends of some of our most cherished Texas symbols. The students will examine and explore population changes of the five species of bluebonnets, our state flower; the northern mockingbird, our state bird; and the pecan tree, our state tree.

During the first week of the unit, we will learn about these three Texas symbols and about their importance to our culture. We will study why these symbols were chosen to represent Texas, the legislative acts that declared them our state symbols, and how they represent us in today's culture. Once the students have a taste of the three Texas symbols, it is time to take an in-depth look at each symbol. Students will learn the characteristics of wildflowers, birds, and trees in general before learning about the unique characteristics of bluebonnets, mockingbirds, and pecan trees. They will learn about their habitat and the environment these organisms need in order to survive.

OUR SYMBOLS

In picking the three symbols to study, I wanted symbols that my students would be familiar with from their history class as well as symbols that were well represented in Houston's nature. The mockingbird, bluebonnet, and pecan tree are all visible around my school. In an undeveloped field near my middle school grows a patch of wild bluebonnets that are visible every spring. The students can clearly see the differences in each bluebonnet's color and size. They can also observe the habitat of the bluebonnet and even take soil samples to analyze the quality of the soil in it. Mockingbirds are always seen flying around our courtyard, singing their repetitive songs. My students will have to opportunity to hear the call of a mockingbird and see how the bird is gray with a white belly. They can also observe the mockingbird's habitat and view the area in which the bird resides. Behind our campus lives a pecan tree. The students can observe the tree through all of their senses. They can feel the rough, scaly, bark and taste the pecan nuts

from the tree. The students will gain much more knowledge through their physical interactions with these symbols than they would from lectures alone. I have found that the best way to learn something is to interact with it first hand. With the close proximity of these three symbols, my students will be able to make meaningful, real-life connections to the information presented.

Mockingbird

A fighter for the protection of his home, falling, if need be, in its defense, like any true Texan . . .

- Resolution for picking mockingbird as Texas state bird (*Texas: Symbols*).

Anatomy

Since students finish the seventh grade by learning about human anatomy and physiology, avian anatomy will be the easiest place to begin our unit. When studying the anatomy of the mockingbird, the students will need to know some basic bird biology. The students will first study the skeletal structure of the bird and learn how the structure enables birds to fly. They will then study the structure and function of different bird beaks and claws to learn how these structures help birds in their environment. After learning basic bird anatomy the students will learn about the characteristics of the northern mockingbird.

The Northern Mockingbird, the state bird of Texas, is about 23-28 cm long from head to tail as an adult. The tail of the northern mockingbird encompasses about half of its length. Both the male and female northern mockingbirds have a dark gray plumage with light gray to white under parts. The northern mockingbird has four toes to help aid in climbing or nesting ("Northern Mockingbird"). Showing the student pictures of the northern mockingbird from the Chipper Woods Birds Observatory (CWBO) website will help the students understand the information provided.

Habitat/ Range

After learning about the mockingbird's anatomy and how it enables birds to survive in a particular environment, the students will learn about the mockingbird's habitat. The mockingbird is most commonly found in the southern United States, but it can live as far south as Mexico and as far north as Canada (Texas Parks and Wildlife, "Texas Birds and their Habitat*"* sec. 3). Mockingbirds live year round in Texas and can be found in both urban and rural areas nesting in the understory, an area from ground level to 50 feet above ground (Texas Parks and Wildlife, "Texas Birds and their Habitat*"* sec. 3). The northern mockingbird used to live in "scrublands and canyons," but can now be found in urban gardens and parks ("Northern Mockingbird").

To provide a visual representation of the range of mockingbirds, the students can access the "Where Can You See a Mockingbird?" website, which provides a color-coded map that shows the range and distribution of the mockingbird in North America (Hull, et al.).

Food

Part of studying the habitat of an animal involves learning about the food found in the habitat. The understory, which includes shrubs and trees, is home to the mockingbird's food. The mockingbird eats fruit, berries, and small insects such as the grasshopper. The mockingbird will also eat birdseed if it is available ("Northern Mockingbird").

Adaptation

Mockingbirds have adapted to living with humans in an urban area. Since the mockingbird lives in an area that is near to the ground, it cannot avoid human interaction. Mockingbirds can live in most urban gardens nesting and feeding in the scrubs and lower branches of trees ("Northern Mockingbird").

The call of the mockingbird is also a unique adaptation that enables the bird to survive in unknown areas. The mockingbird is able to mimic the songs of 39 other birds as well as the sounds of pianos, dogs, cats, humans, frogs, hens, and squeaky hinges so precisely that even electronic analysis cannot decipher the difference (Texas Parks and Wildlife, "Texas Birds and their Habitat*"* sec. 3).

The unique call of the mockingbird occurs in patterns of three sounded in rapid succession (*Lone Star Junction*). To aide in our bird watching experience and to enable my students to learn about the mockingbird's unique adaptation, we will listen to the songs of a mockingbird through an audio CD. This will allow the students to hear how closely the mockingbird's call mimics other sounds and enable them to learn how mimicry may benefit the mockingbird.

Population

The population of the northern mockingbird is expanding according to the CWBO and Texas Parks and Wildlife Department (TPWD). Northern mockingbirds were once found in only the southern United States and Mexico; however, now they can be found as far north as Canada and even in Hawaii (Texas Parks and Wildlife, "Texas Birds and their Habitat*"* sec. 3). Texas has the highest population density of the northern mockingbird as they are usually found year round due to Texas' mild winter temperature ("Northern Mockingbird"). Due to climate changes resulting from global warming, the northern mockingbird has extended its range further north.

To study population trends and differences of the northern mockingbird my students will need to understand what a population is. According to their science textbook, "all the members of one species in a particular area are referred to as a population" (Padilla et al., *Sixth Grade* 269). To determine population size, scientists use four methods: direct observation, where scientists counts all members of a population; indirect observation, where they observe the signs of the organism; sampling, where they estimate the number of a population by counting the number of organisms that live in a small area; and mark-and-recapture studies, where they tag and release the organism back to nature (Padilla et al. *Sixth Grade* 274). To introduce the students to these different methods, the students will participate in two labs found in the sixth grade Prentice Hall science textbook, "What is the Bean Population" and "Counting Turtles" (Padilla et al., *Grade Six* 273, 279). The bean population lab allows the students to take a sampling of a population and the turtle counting lab allows the students to participate in a mark-and-recapture method to determine a population size (Padilla et al., *Sixth Grade* 273, 279).

The CWBO website contains data on the number of northern mockingbirds that are branded and how their make-and-recapture data is used to determine the mockingbird population. Between 1955 and 2000, 57,418 northern mockingbirds were banded and 1,454 have been found in areas that were outside where they were branded, showing the movement of the mockingbird to the north ("Northern Mockingbird").

Since it is believed that the mockingbird has moved north due to global warming, students need to understand the impact of global warming on the environment. The students will participate in a lab, "What is the Greenhouse Effect?" In this lab, the students will create two lands, one with a plastic covering, and one without. After leaving the two lands under a light source for 15 minutes, the students will compare the temperature readings of the two boxes. This lab enables the students to learn about global warming and its effects on the land (Padilla et al. *Seventh Grade* 541). "Global warming is the gradual increase in Earth's temperature" (543). Global warming is caused by the addition of carbon dioxide and other greenhouse gases into the atmosphere. These gases then trap the sun's energy, leading to an increase in temperature. Over the past 120 years, the average temperature on Earth has risen .5 degrees Celsius (543). This increase in temperature is what is causing the population of the mockingbird to increase and it is why the mockingbird can be found as far north as Canada.

Cultural Significance

In 1927, the Texas legislature officially named the northern mockingbird the state bird at the request of the Texas Federation of Women's Clubs (*Texas: Symbols*). "Legend has it when Texas chose the mockingbird as its state bird, the resolution stated that the bird is 'a fighter for the protection of his home, falling, if need be, in its defense, like any true Texan . . .'" (*Texas: Symbols*). The legislature picked a bird that represented the Texan spirit, one that was beautiful in song, but fierce in fight.

Bird Watching

After learning the basics of the mockingbird, we will become birdwatchers. Since my school is located in a suburban area, my students and I have the wonderful opportunity to go around the school and look for mockingbirds. Finding them around school should not be a problem, as I have spotted them several times in the area. In addition, we are near Buffalo Bayou, and we have a small field behind our school; these resources may offer other sites to examine the mockingbird. To get ready for bird watching, my class will learn how to use a pair of binoculars. I will teach the students how to focus on an object by observing different objects at varying distances in my room. We will then learn how to use a field guide to identify unknown birds. Golden Field Guides provides a wonderful introduction on how to use a field guide (Robbins et al. 6). Prior to our walk around the school, I will review all the unique characteristics we have learned about the mockingbird, including its call and color; I will also review how to observe nature using all five senses.

Bluebonnet

It's not only the state flower but also a kind of floral trademark almost as well known to outsiders as cowboy boots and the Stetson hat.

- Jack Maguire (Parsons et al.)

Structure

The Texas bluebonnet, *Lupinus subcarnosus*, is branched at the base, six to 16 inches long, and has five to six notched leaflets and a silky underside (Venning 112). *Lupinus texensis* has pointed leaflets with white tips and a flowering stalk (Venning 111). *Lupinus Havardii* can have flowering spikes up to three feet with seven leaflets (Venning 112). *Lupinus concinnus* is one of the smaller bluebonnets, ranging in height from two to seven inches (Venning 111). *Lupinus plattensis* is the only perennial species in the state, and it grows to about two feet tall (Venning 112).

Habitat/ Range

Bluebonnets are found throughout Texas from the dry, desert-like conditions of West Texas, to the icy regions of the panhandle, to the warm, humid areas of East Texas. *Lupinus subcarnosus*, the original Texas bluebonnet, is only found in Texas (Parsons et al.).

Adaptations

Bluebonnets are one of Texas' toughest wildflower because they can resist tough Texas droughts and Texas freezes, and because they can grow in any soil type in Texas. Legend

has it that the bluebonnets were called, "wolf flowers" because they grew in areas of dry, nutrient-depleted soil (Parsons et al.). It was believed that the bluebonnet removed the nutrients from the soil, making it dry and barren, when in fact it was quite the opposite. Bluebonnets are part of the legume family, the nitrogen fixers. Bluebonnets can add nitrogen back into the soil, acting as a natural fertilizer (Parsons et al.). This adaptation of the bluebonnet is what allows it to grow in the harshest soil types, eventually making the soil rich in nutrients again.

While studying this adaptation of the bluebonnet, students will need to learn about the nitrogen cycle. The nitrogen cycle is a way in which nitrogen fixation occurs. "Although the air is 78% nitrogen, most organisms can not use nitrogen" (Padilla et al., *Sixth Grade* 285). Nitrogen needs to be fixed or combined with other elements in order to be used by organisms. The process by which nitrogen is combined with other elements is called nitrogen fixation, and it occurs through the nitrogen cycle. The nitrogen cycle is the process by which nitrogen is moved from the air into the soil, fixed by the bacteria in plant roots, consumed by living things, and then released back into the air (Padilla et al., *Sixth Grade* 285). Bluebonnets can fix nitrogen into compounds that can be used by consumers.

Population

Over the past 15 years, the bluebonnet population has decreased due to an invasive ryegrass, early mowing by the Texas Department of Transportation (TxDOT), and branched broomrape (Denney). Ryegrass was planted to help control erosion and according to Dennis Markwardt, director of vegetation for TxDOT, it cannot be classified as a pest since it is used to feed cattle (Denney). The ryegrass grows easily and quickly, taking the needed light and nutrients away from the bluebonnets and eventually destroying the population (Denney). The branched broomrape, a parasitic wildflower, has a similar effect on bluebonnets: "The broomrape attaches itself to the bluebonnet and robs its host of water and nutrients" (Denney). In addition to trying to survive these parasites, the bluebonnet is also being mowed down prior to seed germination. Markwardt admits that TxDOT does engage in premature mowing, "Obviously, some years we eventually have to mow, because of safety when the grass gets too high" (Denney).

The students need to realize the impact that humans have on the bluebonnet. Our practice of planting ryegrass to stop erosion along the highways has led to a decrease in the bluebonnet population. The students will participate in labs that will focus on to survive and how humans can alter an organism's environment. These labs will focus on how an organism can live in a human environment. Labs will come from the grade eight vista, *Be Constant and Change*, in which students will create an environment full of pesticides (using household cleaners and bluebonnet seeds) and observe how pesticides affect germination (*Be Constant and Change* 17). The students will discuss how mowing can effect the population of bluebonnets and will learn about efforts that TxDOT and

Lady Bird Johnson have made to protect the bluebonnet population (*Be Constant and Change* 14).

Economic Significance

Planting wildflowers along state highways – something Texas has been doing since 1927 – can provide economic relief to some states (Holcomb and Kerr). According to the US Department of Agriculture, for every $100 of Federal highway landscaping funds, 25 cents must be used to plant wildflowers. Besides adding natural beauty to the highways, these wildflowers reduce maintenance costs since many of these wildflowers are resistant to drought and other harsh weather conditions (Holcomb and Kerr). Not only do bluebonnets add natural beauty to our highways, but they actually reduce the amount of money the state has to allocate to highway landscaping.

Cultural Significance

Bluebonnets are so important to the Texas culture that the state has officially adopted six species of the bluebonnet to represent the state flower (Parsons et al.). In 1901, the Texas legislature formally adopted *Lupinus subcarnosus*, otherwise known as the buffalo clover or bluebonnet. However, many Texans wished for *Lupinus texensis* to be the state flower since it is the most abundant bluebonnet in Texas. This debate lasted until 1971, when legislature added *Lupinus texensis* and "any other variety of bluebonnet not heretofore recorded," bringing our current bluebonnet total to six (Parsons et al.).

Pecan Tree

"The recent release of information about the health benefits of nuts, especially pecan, may advance grower prices . . ." (Pena 4).

Structure

The pecan tree is an angiosperm and is also a fruit-bearing tree with two seed leaves (Trait). The pecan tree is usually 70 to 100 feet tall and can live to be 150 years old (*Lone Star Junction*). These tall trees produce an edible pecan nut that is encased in a one- to two-inch, hard case (*Texas: Symbols*). The pecan tree is covered in a hard, pale gray, scaly bark that protects the tree from predators (*Texas: Symbols*).

Habitat/ Range

Pecan trees are found in regions with sandy, loamy sandy, sandy loam, and silt loan soil, which allow water to drain well (Herrera 1). The soil in these areas must also have a pH that is slightly acidic or neutral in order to facilitate life for the pecan tree. Students can use maps from the Texas Parks and Wildlife Fact Sheets (*Nature: Wildlife Fact Sheets*),

the eco-regions of Texas, and the Texas Agricultural Experiment Station soil maps to determine where pecans trees can be found in Texas.

Adaptation

The pecan tree has a natural predator, the pecan scab. The pecan scab, caused by the fungus, *Cladosporium caryigenum*, is responsible for destroying $22 million worth of pecan crops (Weaver 8). The pecan scab was first discovered in 1888, but it did not become a significant problem until the 1900s, when the pecan tree was domesticated (Weaver 8). Pecan scab causes lesions and defoliation, and it destroys developing fruit (Weaver 8). Unfortunately for Texas, the pecan scab is a problem in moist and humid climates such as Texas' central and coastal regions (Weaver 8). Recently, there has been a new pecan tree that can naturally resist the pecan scab fungus. Nacono, a cross between Cheyenne and Sioux, can naturally resist the fungus (McGraw). This new pecan tree allows the pecan industry to flourish in coastal regions of East Texas, saving farmers money on pesticides and damaged crops.

Population

Due to pecan scab disease and increasing soil pH resulting from acid rain, the population of pecan trees has declined over the past years (Weaver 9). However, with the new Nacono tree that is able to naturally withstand the pecan scab, and with the new data supporting the benefits of pecans, the population of pecan trees should increase over the next couple of years (Pena 4).

Economic Significance

The pecan is the only commercially sold nut in all of Texas, and it brought in nearly $448 million dollars in revenue in 1999 (Evans). The earliest known records indicate that the pecan was exported from Texas as early as 1850. Texas is the leader in the pecan industry and with the new advances in irrigation and the Nacono tree, Texas is able to increase the areas in which pecan trees may be farmed (Evans).

In order for students to understand the economic impact the pecan tree has on Texas, they can create graphs from the data on the Texas State Historical Association website of the revenue the pecan tree has brought in since 1850. The students can then deduce the factors that cause the changes in revenue.

Cultural Significance

The pecan tree was named the state tree of Texas in 1919 (*Texas: Symbols*). It is believed the tree was adopted as the official tree of Texas because Texas is the largest producer of native pecans (*Lone Star Junction*). The pecan tree has also been an integral part of the

Texas economy and of many Texans' diets. Without the pecan tree, we would not have any pecan pies.

EXPECTED OUTCOMES

I hope that through this unit my students will understand that everything they are learning is interrelated and understand that the Texas symbols are related to each subject they are studying in school. The song of the mockingbird and the repetition of its song is a part of music. When we are studying statistics, interpreting and creating graphs, and calculating percents or change, we are using mathematics. When the students are creating visual dioramas of each symbol's habitat, they are using art. History is integrated into the unit as the students examine the importance of the symbols on our culture, how these symbols were picked by our Texas government, and the impact these symbols have on Texans and the Texas culture. Language arts are used when they are comparing and contrasting facts and data, creating a research paper, and conducting research. These three symbols are related to science because of the characteristics and habitats of these organisms. I hope that the students realize that most subjects are interrelated, and that it is appropriate to read and write in science class.

I trust that they will realize that Texas culture is all around them in nature and it is our job to preserve it. I expect that they will realize the impact humans have on nature and they will have gained the tools to prevent further damage to our cultural icons.

LESSON PLANS

Lesson One: What's Inside a Bird?

Objectives

When studying bird anatomy, it is imperative that the students understand that the bird's structure aids in its functions. Birds have certain beaks and feet that relate to their habitat and function. In addition to the bird's beaks and feet, the bird's skeletal structure also aids in its function. Through the lab, the student should be able to identify the different parts of the skeletal remains of a bird. Once they have identified these parts, the students should be able to identify the function of the skeletal remains. Texas Parks and Wildlife's website, <http://www.tpwd.state.tx.us/adv/bordomg/beginbird/kidbird.htm>, provides a diagram of birds' physical features and functions that will aid students throughout this lab. Carolina Biological Supply Company, <http://www.carolina.com/owls/guide/pellets.asp>, provides a diagram of a complete bird skeleton, which may also assist students in this lab.

Materials

To complete the lab students will need an owl pellet, a dissection kit, a dissection tray, safety goggles, latex gloves, glue, and a paper to glue their bird together.

Procedure
To begin the lesson we need to review what we have learned about bird anatomy. I will show the diagrams from Texas Parks and Wildlife as well as the diagram from Carolina Biological Supply Company so that we can review the structure and function of the parts of a bird. Next, I will explain to my students that owl pellets are the regurgitated remains of organisms that the owl has eaten. Owls eat their prey (birds, mice, small rodents, etc) whole and therefore have to expel the parts they cannot digest. The undigested parts are expelled in the form of an owl pellet.

Each student group (of two to four students) will then receive a dissection tray with an owl pellet. Before receiving their dissection kit, I will explain all necessary safety precautions and model how to use each tool in the dissection kit. I will then have the students wear all safety items at this time. The students will then receive their dissection kit, and they can begin the lab.

The students will follow the posted procedures:
1. Wear all safety items throughout the lab.
2. Using the scalpel, gently cut the owl pellet in half vertically, be careful not to cut too deep or to cut yourself.
3. Pin the two halves of the pellet down using the dissection pins.
4. Using forceps or tweezers gently remove the skeletal remains from the pellet.
5. Remove excess materials form the skeletal remains, be careful not to break the skeleton.
6. Place all bird remains on your paper.
7. Once you have removed and identified all skeletal remains, glue all bird remains onto your paper forming a bird skeleton.
8. Label all parts of your skeleton.
9. Identify the function of each skeletal part and how it aids a bird.

Assessment
The students will be assessed by providing the worksheet in which they labeled and identified all skeletal remains of the bird and included how the skeletal parts aid a bird. They will also be assessed through a class discussion in which they share their findings.

Lesson Two: What Color Will I Be?

Objectives
One of the bluebonnet's unique adaptations is its ability to produce offspring of varying color. Researchers at Texas A&M University have created a maroon bluebonnet through selective breeding (Parsons et al.). To understand how selective breeding can lead to a change or a mutation of an organism's phenotype, the students will participate in a lab that will enable them to recognize how genetics plays an important role in adaptation. This lab will involve simple Mendelian genetics in which the students use Punnett squares to calculate the phenotypes and genotypes of monohybrid crosses. The students

will cross two trails, or alleles, of two different parent bluebonnets to determine the genetic make-up (genotype) and outward appearance (phenotype) of their offspring.

Materials
The students will need a writing utensil, and paper to complete the lab.

Procedure
To begin the lab the students and I will review what they have learned about genetics. We will begin discussing the fact that alleles control inherited characteristics and the idea that some alleles are dominant and others are recessive (Padilla et al., *Sixth Grade* 583). I will then review how to use a Punnett square to determine the genotype (genetic makeup) and phenotype (the physical traits) of an organism (Padilla et al., *Sixth Grade* 583). I will model with my students the first test cross.

The first test cross we are going to do is to cross a blue colored bluebonnet (BB) with a white bluebonnet (bb). After I model with the students how to do the first cross, the students will then have to find the phenotype and genotype of the next three generations of bluebonnets.

Assessment
The students will be assessed on their final three crosses. The students will also be assessed through an in-class discussion in which they will discuss the probability of their outcomes, predicted outcomes for future generations, and their results.

Lesson Three: Testing the pH of Soil

Objectives
Proper soil pH is necessary to pecan farming, a part of Texas' economy. In order to learn how pH affects plants the students will participate in a lab that will enable them to understand the importance of pH in seed germination.

Materials
To participate in this lab, students will need 500ml of potting soil, 10 radish seeds, a beaker (to contain the soil), 25ml of fertilizer, and a soil quality test kit. Soil quality test kits may be purchased at <http://www.gemplers.com>.

Procedure
To begin the lab we will need to review acids and bases and the pH scale. I will start by using pH indicator paper to determine if substances in our classroom are acidic or basic. We will then read the pH scale to determine if the object is a strong acid or a base. Since we have learned that pecan trees can only survive in neutral to slightly acidic soil, we are going to model how soil of above average acidity can upset seed germination.

The students will complete the lab through the following procedures:

1. Wear eye goggles at all times
2. Place 250 ml of potting soil into two separate beakers. Label one beaker with "A" for acidic soil. Test the pH of both beakers with the soil quality test kit to get an initial pH reading. Record the pH.
3. Add 25 ml of fertilizer to the soil in the beaker marked "A."
4. Add 5 radish seeds to each beaker
5. Once a day for the next 4 days observe the seeds. Record all observations
6. After day 5, test the pH of both soils with the soil quality test kit.

Assessment
The students will be assessed through their recorded observations, a formal lab write-up, and an in-class discussion on their findings.

Lesson Four: Creating a Habitat

Objectives
A great hands-on activity that the students will use, and through which they can integrate art, involves having them create dioramas of the organism's habitat. This concept is a wonderful visual representation of the organism's habitat and the environment it needs in order to survive. The students can also gather materials for the diorama in the area around the school from the organism's actual habitat (Kemsley).

Materials
In order to create a diorama, a three-dimensional model, the students will need a shoebox. Also, the students will need materials from the environment to create a habitat such as twigs, leaves, soil, and grass. Students will also need construction paper, scissors, glue (or tape), and any other material that will enable them to create their model.

Procedure
The student will pick the bluebonnet, the mockingbird, or the pecan tree. The student will then use the library and the Internet to research the habitat of their organism. Based on their research findings, the student will gather materials from the environment that will be used to create their organism's habitat. After gathering the materials, the student will create a three-dimensional model of the organism's habitat contained in the shoebox.

Assessment
The students will be assessed on the accuracy of their diorama in relation to real-life.

Lesson 5: Research Project

Objectives
Language arts will be used in this lesson to help the students learn about the Texas symbols in a fun and exciting manner. I also want the students to develop the necessary skills to conduct valid research, which is a necessary tool in science.

Materials
In order to create a research paper, the students will need a computer with Internet access, access to an on-line database, and access to research books.

Procedure
I will read the students stories about legends of bluebonnets, such as Tommy DePaola's *Legend of the Bluebonnet*. Although this story is written for younger children, the students can still learn about the Native-American legend that surrounds the bluebonnet. I will also read an excerpt from Silverthorne's *Legends and Lore of Texas Wildflowers.* Afterwards, the students will write a research paper comparing and contrasting these legends to the facts that they have discovered about the bluebonnet. They will be responsible for researching several other legends and well-known facts and compiling all their information into a paper. Prior to writing their research paper, I will introduce the I-Search method for conducting research. The I-Search method for conducting research enables the student to develop their own questions, seek answers through interviews and research, and record information researched in an organized manner. The I-Search method also enables students to produce and present projects based on their research and also evaluate their final product (Duncan and Lockhart xii). The students will be responsible for using the I-Search method to develop and create a research paper complete with a bibliography (Duncan and Lockhart xiii).

Assessment
The students will be assessed formally through a teacher-generated rubric and through a self-evaluation.

Lesson 6: Population and Maps

Objectives
I want the students to create a thematic map for each of the three symbols (*Texas: Population*). I want them to map the range of each organism in Harris County. The students can create one large map with overlays that examine the ranges of our organisms. For an extension, students can create maps that show the expansion of Houston each census year (1970, 1980, 1990, and 2000). They can then compare this map to the current map of the three symbols in order to determine if urbanization affects the population of our beloved symbols (*State Quickfacts*).

This lesson will also help the students develop skills in analyzing and interpreting data such as maps, graphs, and statistics. Although my focus is not to prepare them for the TAKS test, analysis of data is a major component of that test (Texas Education Agency). Not only are the students going to gain an understanding of population, environment, urbanization, and habitats, but also they are going to learn how to read and interpret graphs.

Materials
The students will need a current map of Harris County, range maps of the three symbols from each Census year, chart paper, markers, and tissue paper. For the extension they will also need maps of Houston from each Census year.

Procedure
The students will study population and how the population of a species can change and affect the range of an organism. The students will be divided into three groups; each will be assigned one organism to study. The students will research the population and range of each symbol for the past 20 years, noting any changes. After studying the ranges of the organisms, the students will create a thematic map, mapping the ranges of the organism over the past 20 years. The students will create an overlay with the current range on tissue paper and lay that on top of the past data. Through the creation of a thematic map, the students will see population and range changes of their species over the past 20 years.

Assessment
Students will be assessed through their completed map and a teacher- generated rubric.

Classroom Extensions

I would like the students to take a field trip to view the pecan trees and bluebonnets that are harder to find around our school. Since they have studied famous Texas places during their Texas history class, I intend on taking them to Washington on the Brazos, an important site in Texas history that is home to bluebonnets, pecan trees, and mockingbirds (*Washington-on-the-Brazos*). I would also like my students to take a field trip to the Houston Arboretum and Nature Center in order to examine our symbols in a real-life setting (Houston Arboretum and Nature Center).

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