Bio/Diversity Project

Lesson Title: Culture and the Environment

Teacher: Gricelda Meraz

Grade Level: *6th*

Time: *80 minutes*

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| **AZ State Science Standard:** | *6.L2U3.11*   * *Use evidence to construct an argument regarding the impact of human activities on the environment and how they positively and negatively affect the competition for energy and resources in ecosystems.* |
| **Content Objective:**  Math, Reading, Science, Writing, Other: | * *Students will be able to define the term heirloom plant.* * *Students will be able to explain how native plants are better for the environment* * *Students will use observations to identify different beans* * *Students will learn about and use dichotomous keys* |
| **Language Objective:** (Optional) | N/A |
| **Scientist of the Week:** | *This is basic information about your diverse scientist of the week. This should be in kid-friendly language. Here you should list:*   * Ynés Enriquetta Julietta Mexía * She was a botanist known for her collection of novel plant specimens from areas of Mexico and South America. * Mexia began traveling and collecting specimens in 1925 on a trip to Mexico. She continued her collecting throughout South America, including Brazil, Peru, Ecuador, Bolivia, Argentina, and Chile |

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| **Vocabulary** | | | **Materials** | | |
| Provide a bulleted, alphabetized list of words that students will hear, speak, write, and/or read about in the lesson. These words are integral to developing content understanding:   * Ethnobotany * Plant diversity * Dichotomous Key | | | Provide a bulleted list of relevant materials for the lesson.   * Cooked Beans * Magnifying Glass * Pencils * Plastic Knives * Rulers * Crayons or colored pencils * Worksheet | | |
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| **Seasonality:** No specific seasonality required. | | | | | |
| *Monsoons*  July-Sept. | *Autumn*  Oct.-Nov. | *Winter*  Dec.- Feb. | | *Spring*  Mar.-Apr. | *Dry Summer*  May-June |
| **Guiding Questions:**   * What is the importance of cultural diversity? * What is ethnobotany? * How are dichotomous keys useful? | | | | | |

**Engagement/Introductory Activity:**

This is what you will do to get the students engaged in and excited about the topic of the lesson! It should also provide an opportunity for you to get an idea of what they do (and do not) already know, and the assumptions that they have going into the lesson.

* Begin discussion to assess degree of familiarity with desert plant diversity. Ask participants to list as many cactus types as they can. Ask if they are familiar with any uses of these cacti. Ask how many different types of beans they have eaten or are familiar with. This leads into a discussion of genetic diversity and the importance of maintaining diversity in crops. The negative effects of monoculture can be taught.
* Monoculture refers to large plantations with the cultivation of a single species, with the same patterns, resulting in genetic similarity, using the same cultivation methods for the entire plantation (pest control, fertilization and high standardization of production), which makes large-scale production more efficient.
* But by not diversifying what is cultivated, there may be a rapid spread of diseases (when the crop is uniform it is more susceptible to pathogens). Another implication of the lack of variability in the crop is that it cannot support animals that previously inhabited that site and they cannot feed, find shelter or reproduce. On the other hand, some insects find constant food, few predators, and they reproduce intensely, thus becoming pests. The soil undergoes nutrient depletion and eventually begins to erode. This is because in most crops the entire plant is removed, thus disrupting the natural recycling process of the soil. The soil becomes impoverished and loses productivity for which the addition of fertilizers is necessary.
* We will also touch on how culture, specifically the Tohono O’Odham culture is connected with the environment. (We would like to attempt to narrate this excerpt in Spanish)
  + In the traditional farming village Ge Oidag (Big Fields), the floodwaters no longer arrived in the fields. Years before, the U.S. Army Corps of Engineers had built an earthen damn to prevent flooding in the village. Yet those floodwaters were the entire reason for the village’s existence; without them, farming was impossible. Hauling water to the field by hand, Mr. Lewis was the only person in the village – perhaps on the entire Tohono O’odham Nation – still growing traditional crops on family land. When he died a few years later, all such production ceased. Given the nature of Tohono O’odham agri/culture it should come as no surprise that the near total destruction of the Tohono O’odham food system led to a dramatic damage to the vitality of Himdag. By the time Delores Lewis dropped the last seed in the ground, only a tiny portion of the O’odham community participated in any of the ceremonies for making rain, growing crops, hunting, and celebrating the harvest that are the central communal expressions of Himdag. In 1997, the most central of these – the jujkida (rain ceremony) – was only held in two villages, and many elders complained that it had lost its sacred character, simply becoming another reason to drink heavily. There were no communal ceremonies for the growth of plants orhunting. Although a few women played toka during the annual rodeo and fair, there was no athletic competition or harvest feast.The reason for this decline is relatively simple: almost no Tohono O’odham produced their own food. Grocery stores and federal commodity programs – rather than the desert – had becomethe source of food.
  + Health Impacts of the Loss of Food Sovereignty
    - As recently as the early 1960’s, diabetes was virtually unknown among the Tohono O’odham. Today, more than 50% of the population develops the disease,the highest rate in the world. In the 1990's, the crisis intensified, with the childhood onset of type -II diabetes becoming common. Adult-onset diabetes has even begun to appear in children as young as six years-ol

Excerpts from:

Reader, T. (2017) ‘Thereby We Shall Live’: Tohono O’odham Food Sovereignty and the Confluence of Quantum Leadership, Cultural Vitality, Public Health, and Economic Hybridity. PhD Dissertation. Coventry, England: Coventry Universit

**Exploratory Activity:**

Provide step-by-step instructions on what the students will do to in this activity to gain new skills and/or knowledge. Attach worksheets, PowerPoints, video links, or other material used to this section, or reference it here and then attach it to the lesson plan when you have completed it.

* Prepare the dry beans by soaking overnight. If possible provide several different types of beans so participants can try activity several times if needed.
* Provide some background information about beans.
* Discuss what a hypothesis, experiment, and observations are by defining the terms.
* Provide a bean, knife, Bean Dissection Lab sheet, and other tools to each participant.
* Have them examine bean using a magnifying lens and measuring tape.
* Have the participants record their observations on the lab sheet. If possible have the participants share their observations.
* Provide the bean diagram sheet after they have completed the first part of the lab or ask participants to not look at last page of lab worksheet. If participants are unable to write provide bean diagram for them to color.

**Explain:**

What questions or prompts will you use to get students to explain their observations or to explain what the outcomes of the activity that they participated in were? This should provide an opportunity for students to communicate their new understandings, as well as to articulate what they still do not understand.

* Did you know the variety of beans available in the Sonoran desert?
* How does this source of food and its variety help humans survive in the Sonoran Desert?
* What advantages do native foods have over other types of crops?

**Extension Activity/Questions:**

This section provides an opportunity for students to connect the knowledge that they have gained to other contexts – can they take what they learned and logically expand upon it, or apply it to alternate situations? Provide one or two additional ideas for activities that students can use to expand upon the new knowledge that they have gained.

* This activity we will introduce participants to the use of a dichotomous key.
* Explain first what a dichotomous key is and why it is used.
* Give the students a copy of the bean dichotomous instructions and dichotomous key. Carefully go over the instructions and provide an example on how to use the dichotomous key
* Distribute the beans to each participant or work in pairs of two
* Have the participants identify the beans by using the key
* Glue the beans to the card provided and label them with their common name.
* worksheet from: <http://www.eebweb.arizona.edu/Courses/Ecol464_564/SDD-Ethnobotany-lessonplan-f2009.pdf>

**Evaluation Activity:**

How will you evaluate whether or not the students have achieved the learning objective(s) of the lesson?

* If students have time have them play a jeopardy game to see whether they understood the terms.

Adapted from: <http://www.eebweb.arizona.edu/Courses/Ecol464_564/SDD-Ethnobotany-lessonplan-f2009.pdf>

**DICHOTOMOUS BEAN KEY**

This activity introduces participants to the use of a dichotomous key.

**Dichotomous Keys:**

A dichotomous key is a tool used to identify unknown things in the natural world. Keys consist of a series of statements describing characteristics of a particular living thing that eventually lead to its identification. The statements usually begin with broad characteristics which become more specific as you go through the key. Identification of unknown organisms are simplified by dichotomous keys and botanists and other scientists use these types of tools frequently.

Tips to understanding and using a dichotomous key

* 1) Always read both choices
* 2) Understand the descriptive terms in the key
* 3) If possible try to work with more than one sample
* 4) Keep notes on which statement you followed so if you make a mistake you can  
  go back and you can also check your answer
* 5) If you are unsure which statement to choose, try both until it is apparent that one  
  choice is obviously wrong
* 6) When measurements are given, use a measuring tool, do not guess
* 7) Once you have an answer, check this answer by looking for it in a reference  
  book; a book with pictures is always helpful

**Activity:**

Using the beans provided, use the dichotomous key to identify each type of bean. Glue the beans to the card provided and label them with their common name. Don’t forget to record your observations and use the tips to guide you through the key successfully. Compare your findings with the answer key when finished to see how well you did.

Photographs of Beans:

**Dichotomous Bean Key:**

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| --- | --- | --- |
| 1a. | Is the bean black | Black turtle Bean,Aztec Black Bean,Tampico |
| 1b. | Is the bean not black | Go to 2. |
| 2a. | Is the bean mottled and approximately a half inch long. | Go to 3a. |
| 2b. | Does the bean look mottled. | Go to 4a. |
| 3a. | Is the bean brown and black | Scarlet Runner Bean |
| 3b. | Is the bean one colored | Go to 5a. |
| 4a. | Is the bean purple and white | Anasazi Bean |
| 4b. | Is the bean tan and white | Zuni Gold Bean |
| 5a. | Is the Bean white | Aztec White Runner Bean, Bordal Bean, Mortgage Lifter |
| 5b. | Is the brown yellow with a small white eye. | Yellow Indian Woman Bean |

Place your bean onto the correct spot and glue down each bean when finished.

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| Black turtle Bean,Aztec Black Bean,Tampico | Scarlet Runner Bean | Anasazi Bean | Zuni Gold Bean | Aztec White Runner Bean, Bordal Bean, Mortgage Lifter |