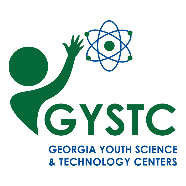
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**In-Class Field Trip:**

**Classifying Pollinators**

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| **Estimated Time:** 45 minutes | |
| **GSE Standard and elements:**  **S7L1. Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically.**   1. Develop and defend a model that categorizes organisms based on common characteristics. | |
| **Science and Engineering Practices:**  Constructing Explanations and Designing Solutions  Apply scientific ideas to construct an explanation for real-world phenomena, examples, or events. | **Disciplinary Core Idea:**    LS4.A: Evidence of Common Ancestry and Diversity  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. |
| **Crosscutting Concepts:**  Patterns  Patterns can be used to identify cause-and-effect relationships.   |  | | --- | |  | |
| **Authentic Scenario (Phenomena):**  Watching live stream footage of honeybees from [www.ega.edu/bee-cam](http://www.ega.edu/bee-cam). | **Vocabulary:**   * classification * Dichotomous Key |
| **Guiding Questions:**  How many different types of bees are there?  How do scientists compare the different types of bees?  How do scientists organize all the information about bees? |
| **Materials:**  For each group of students:   * Bee Photographs * Bee Dichotomous Key * Classifying Pollinators Recording Sheet * ruler * magnifying glass | **Safety Considerations:**   * N/A |
| **Technology Integration:**   * Device with Internet access |
| **Literacy Connections:**   * *The Bees in Your Backyard* by Joseph F. Wilson and Olivia Messinger Carril | |

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| **5E Stage** | **Student Activities**  How will students engage actively in the three dimensions throughout the lesson?    **Teacher Activities**  How will the teacher facilitate and monitor student learning? |
| **Engage** | Begin the lesson by showing the students the live stream footage of honeybees from [www.ega.edu/bee-cam](http://www.ega.edu/bee-cam).  Ask, “What do you notice? What do you wonder?”    Explain that there are over 20,000 bee species worldwide. In North America, there are 4,000 species that live in a wide range of ecosystems from forests to deserts to grasslands.  Ask, “How do you think scientists organize all the information about bees?” |
| **Explore** | Earth has an astounding amount of biological diversity. Over the course of history, humans have come up with various ways to organize or classify it. Living organisms can be classified by overall similarities, color, function, etc. The most useful way that scientists have grouped organisms is through shared evolutionary history. In this way groups are not only organized but also convey information about the groups’ evolutionary history.  All bees fall under the Kingdom - Animalia, Phylum - Arthropoda, Class - Insects, and Order - Hymenoptera. When we get to Family, there are seven different family groups that bees could fall under: Andrenidae, Apidae, Colletidae, Hailctidae, Megachilidae, Melittidae, and Stenotritidae (only in Australia).  The Apidae family is the largest family of bees with over 6,000 species including the honeybee and 300 types of bumblebees. Scientists can document that this family began between 115 and 95 million years ago, thanks to the fossil record.  Today, you are going to look at some pictures of different bee species and classify them using a dichotomous key.  Procedure:   1. Provide each group of students with a set of bee photographs, a Bee Dichotomous Key, a Classifying Pollinators Recording Sheet, a ruler, and a magnifying glass. 2. Using the Bee Dichotomous Key have students try to identify the species of bee in the picture. 3. Ask students to explain their justification for their bee identification. 4. Review actual identification with students. |
| **Explain** | In order to understand bees today, we have to learn about their origins and how they’ve changed over time. Scientists examine bee anatomy, behavior, genetic data, and explore the fossil record to do just that.  Today, we have seven species of bee families that share traits and evolutionary history. From the seven families, they are further divided into 28 subfamilies. These subfamilies are unique in anatomy and biology ich set them apart from each other. Scientists use classification to help them organize and communicate this information.  Currently, there are 542 species listed in Georgia. |
| **Elaboration** | Bees are not the only types of pollinators we have. Research another type of pollinator in Georgia, like butterflies, and see how many different species you can identify. |
| **Evaluation** | * Explain why it is important for scientists to categorize organisms based on common characteristics. * Post Test |

**Teacher Notes:**

* Adapted from: <https://escholarship.org/uc/item/7fb2588m#author>
* Bees of Georgia: <https://native-bees-of-georgia.ggc.edu/>
* Information on Bee Diversity: <https://www.museumoftheearth.org/bees/diversity>

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**Name:**

**Classifying Pollinators Recording Sheet**

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| **Bee #** | **Bee Species** | **Justification** |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 |  |  |
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