

30-50 Minute Interactive Lesson Plan

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Goal: Students will be able to take action by becoming citizen scientists where they commit to building biodiversity in their neighborhood through planting or building a bee habitat. Additionally, they may be inspired to conduct research and analyze data.

Sample of National Science Standards which may align in this lesson:

HS-ESS3-3, HS-LS2-2, HS-LS2-6, HS-LS2-7, ESS3.C, LS2.A, LS2.C

Classroom Requirements: access to a/v, printing or viewing handouts online, google form to submit questions and survey.

- Students watch [Ted Talk](#) by Noah Wilson-Rich (12 min)
“How you can help save the bees, one hive at a time.”
- Classroom discussion with teacher about the video (5 min)
 - a. What surprised you in this video?
 - b. What information shared in the video from 2018 is still relevant?
 - c. Based on what you already know on this topic, what should future Ted Talks address?
- Subject Based Research Questions (can be done in class or assigned for at home) (add 10 min)
 - a. **BIOLOGY QUESTIONS**
 - i. **What does it mean for honeybees to be an indicator species?**
Bees are known as indicator species. Honeybees are one of 20,000 species of bees and 200,000 species of pollinators. They are considered an indicator species because their health correlates to pollinator health overall. Honeybees in particular are a great species to study because they return to their hives each night and are extremely docile. The honey that is produced can tell us a lot about the biodiversity of the local habitat. ([more here](#))
 - ii. **What does HoneyDNA tell us?**
HoneyDNA is the process of identifying the exact percentage of various pollen species found in honey through advanced genomic sequencing. Understanding where bees foraged reveals which plants best feed pollinators in the local environment. ([more here](#))
 - b. **CHEMISTRY QUESTIONS**
 - i. **How do chemical compounds influence pollination?**
In several highly specialized plant-insect interactions, scent-mediated specificity of pollinator attraction is directed by the emission and detection of volatile organic compounds (VOCs). Although some plants engaged in such interactions

emit singular compounds, others emit mixtures of VOCs commonly emitted by plants. ([more here](#))

- ii. **Describe the chemistry of honey and how it relates to our digestive system.**
Honey is a complex natural product produced by bees from flower nectar or tree and plant exudates, usually involving plant-sucking insects. This product has been used since ancient times mainly as a sweetening agent but has also been used for its therapeutic capacity [1]. Honey is a mixture of carbohydrates, especially glucose and fructose (60–85%), water (14–22%) and minority compounds including phenolic compounds, minerals, proteins, enzymes, free amino acids, organic acids and vitamins [2]. Phenolic compounds, especially phenolic acids and flavonoids, are important for their functional properties, and their concentration shows a large variation depending on the botanical origin of honey [3]. ([more here](#))

c. MATH/STATS QUESTIONS

- i. **Complete a statistical analysis of colony collapse disorder.** ([more here](#)).
- ii. **What is the mathematical relationship between bee hives and hexagons?**
The hexagonal shape of the honey bee cells has attracted the attention of humans for centuries. It is now accepted that bees build cylindrical cells that later transform into hexagonal prisms through a process that is still debated. The early explanations involving the geometers' skills of bees have been abandoned in favor of new hypotheses involving the action of physical forces, but recent data suggest that mechanical shaping by bees plays a role. ([more here](#))

d. HUMANITIES QUESTIONS

- i. In your opinion, what does it mean to be a “citizen scientist”?
- ii. What are some recent controversies in the media surrounding bees?
- iii. How can we make local bees more culturally relevant?
- iv. What are some ways your family uses honey?

- Think, Pair, Share (5 min) - question and answer handout
- Print additional handouts or show on screen (adds 10-15 minutes if done in classroom)
Use handouts for discussion, classroom activity, group project assignment, or extra credit.
- Q&A (5 min) - [What's your big idea?](#)
Encourage students or classrooms to share their questions and ideas with us!
Includes a short survey. **Bonus, raffle! Every BIG IDEA shared will be entered for a \$100 Amazon Gift card that can be used for the classroom.** Entry details can be found in the form.