

MS African Elephant Literature Dive Lesson Plan

At a Glance

Students practice reading scientific articles to better understand the current scientific research related to the African elephant.

Advance Preparation

- Decide how you want students to view articles (on a computer/tablet or printed out).
- The following resources are meant to support your teaching of scientific readings, and are laid out in order of student reading level from youngest to oldest:
 1. *The Vocabulary of Science*: <https://www.readingrockets.org/article/vocabulary-science>
 2. *Supporting Literacy in the Science Classroom*: <https://www.edutopia.org/article/supporting-literacy-science-classroom>
 3. The *How to Read a Scientific Paper* infographic can be read individually or gone through as a class. <https://www.elsevier.com/connect/infographic-how-to-read-a-scientific-paper>

Objectives

- Learn the process of reading a scientific article
- Learn how to pull out relevant information from scientific articles to share with others

Materials

- PDF's of articles for each student to read
- “Check for Understanding” questions for each student (online or print-out)

Lesson

- Introduce your students to the process of reading a scientific paper, article, or blog utilizing the links provided or any other documents that you find helpful.
- Provide your students with the two articles related to the polar bear, starting with the Pre-Lesson Article.
- There are vocabulary words provided in the Teacher Summary section. You can introduce them before or after students read the articles, whenever you feel it fits best in the lesson for your students.
- Provide each student with the “Check for Understanding” questions. These questions could be done while reading the article (worksheet style) or after students are done reading the articles (quiz style). We suggest going through the “Check for Understanding” questions as a class after students have completed individually to see if there are any concepts in the questions that need more clarification.

Teacher Summary

Pre-Lesson Article 1: King (2015) Using Honey Bees to Save Elephants - How can studying animal behavior help create a sustainable solution to reduce human-elephant conflict in Africa?¹

Optional Supplemental Pre-Lesson Article 2: King & Raja (2016) Busy and buzzing on the frontline of human-elephant conflict.²

KEY POINTS:

- Electric fences constructed to keep elephants out of farmlands disrupt migratory routes for all wildlife, concentrating large herbivores in small tracts of land and leading to over foraging .
- When threatened, elephants use alarm calls specific to the threat, including one for bees and Samburu warriors.
- Bee-hive fences decrease elephant crop-raiding by 80% and help farmers produce “elephant-friendly honey”, an additional source of income, while also increasing pollination for their fields. Fence posts are also made from a native tree that re-grows once planted, meaning that they sprout into new trees and provide shade and forage for the bees!

Vocabulary:

- Referential signaling - different call types that refer to different threat levels in an animal’s environment⁴
- Sustainable livelihoods - A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base.⁵
- Infrasonic rumbles - the low-frequency vocalizations made by large animals, principally by elephants⁴
- Migration corridors - protected strips of natural habitat that allow animals to move safely between one protected area and another⁴
- Pollination - the transfer of pollen to a stigma, ovule, flower, or plant to allow fertilization⁴

Check for Understanding Questions: (Answers are bolded for teacher reference)

1. Bee-hive fences have been shown to decrease elephant crop-raiding by:

- A. **80%**
- B. 60%
- C. 40%
- D. 20%
- E. I don't know

2. Elephants use:

- A. one alarm call for all threats
- B. an alarm call for bees
- C. an alarm call for local warriors
- D. **a different alarm call for both bees and local warriors**
- E. I don't know

3. When elephants hear bees, they may:

- A. dust themselves
- B. shake their heads
- C. run away
- D. **all of the above**
- E. I don't know

4. What are some of the benefits to farmers when they install bee-hive fences?

Answer: Benefits to farmers include: reduction in crop-raiding by elephants, production of “elephant-friendly honey” (and possibly beeswax candles and lip balm!) to sell in addition to their traditional crops, and an increase in crop yield due to the pollination services provided by the bees.

5. How are electric fences negatively affecting African wildlife?

Answer: Electric fences contribute to “fortressing” of national parks and reserves. While the fences are good at keeping elephants out of farmlands and in protected areas, they limit their ability to migrate and force them to over forage, contributing to deforestation in these areas. Elephants in these fortified national parks also breed very successfully, often overpopulating an area quickly, again leading to deforestation and other wildlife conflict, and resulting in culling, which sends a mixed-conservation message.

Post-Lesson Article: Poole et al. (2005). Animal behaviour: elephants are capable of vocal learning.³

KEY POINTS:

- calls converge as animals form social bonds
- vocal imitation has been observed in bats, birds, marine mammals, primates, and elephants
- this is the first time vocal imitation has been observed in a non-primate terrestrial mammal

Vocabulary:

- Fission-fusion - In ethology, a fission–fusion society is one in which the size and composition of the social group change as time passes and animals move throughout the environment; animals merge into a group (fusion)—e.g. sleeping in one place—or split (fission)—e.g. foraging in small groups during the day.⁶
- Individual-specific bonds - social bonds formed between two individuals⁴
- Imitation - a thing intended to simulate or copy something else⁴
- Spectrogram - a photographic or other visual or electronic representation of a spectrum⁴
- Frequency - the rate at which a vibration occurs that constitutes a wave, either in a material (as in sound waves), or in an electromagnetic field (as in radio waves and light), usually measured per second⁴

Check for Understanding Questions: (Answers are bolded for teacher reference)

1. Mlaika, a ten-year-old African elephant, was recorded making vocal imitations of a:
 - A. truck**
 - B. bee
 - C. airplane
 - D. hornbill
 - E. I don't know
2. A spectrogram of elephant vocalizations usually shows:
 - A. frequency of vocalizations
 - B. duration of vocalizations
 - C. frequency and duration of vocalizations**
 - D. none of the above

E. I don't know

3. Vocal imitation has been observed in:

A. primates

B. bats

C. marine mammals

D. all of the above

E. I don't know

4. Why is vocal imitation thought to be important for social animals?

Answer: It is a useful form of acoustic communication that helps to maintain individual-specific bonds within chaining social groupings.

5. Using Figure 2a, describe how the sounds produced from the African elephant Calimero differ from typical African elephant vocalizations.

Answer: Calimero was raised with two female Asian elephants in Switzerland, and only produces chirping sounds that are typical of Asian elephants. In figure 2a, his calls are seen as pink circles, and follow the same duration as the red circles of Asian elephants. While the Asian elephant calls have a higher frequency than his, Calimero's calls are more similar to them than to typical African elephant calls, which are much lower in frequency and much longer in duration.

References

1. King (2015) Using Honey Bees to Save Elephants - How can studying animal behavior help create a sustainable solution to reduce human-elephant conflict in Africa?
2. King & Raja (2016) <http://elephantsandbees.com/wp-content/uploads/2016/07/SWARA-2016-Busy-and-Buzzing-on-the-frontline-of-Human-elephant-conflict.pdf>
3. Poole, J. H., Tyack, P. L., Stoeger-Horwath, A. S., & Watwood, S. (2005). Animal behaviour: elephants are capable of vocal learning. *Nature*, 434(7032), 455.
4. <https://en.oxforddictionaries.com/>
5. https://www.sida.se/contentassets/bd474c210163447c9a7963d77c64148a/the-sustainable-livelihood-approach-to-poverty-reduction_2656.pdf
6. https://ipfs.io/ipfs/QmXoypizjW3WknFiJnKLwHCnL72vedxjQkDDP1mXWo6uco/wiki/Fission-fusion_society.html