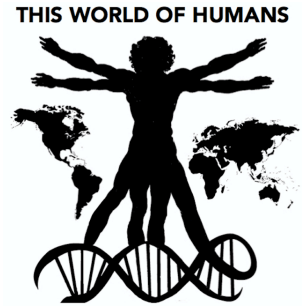

Visionlearning®
your insight into science

This World of Humans: Episode #4

Guide for Educators

Aging and Relationships in Rhesus Monkeys

These activities address NGSS LS1.A, LS2.D, and LS4.C, as well as specific Cross-Cutting Concepts and Science and Engineering Practices (see page 8). Many are also suitable for courses designated as "Writing-Intensive."

About the Article

This article builds on established scholarship in primatology to support the idea that "sociality" – the degree to which individuals assemble into social groups – improves survival of both individual members and the community as a whole. This research also offers insight into the ways in which individual survival strategies change with experience across the lifespan.

About the interview

In this interview, Drs. Angelina Ruiz-Lambides and Lauren Brent discuss the history of the macaque colony in Puerto Rico, in which the research is situated, as well as the ways in which they collect and organize data. The interview provides rich examples of the strategies and social networks described in the article.

Both the article and the interview can be found here: https://www.visionlearning.com/en/twoh/#ep4

Recommended: pair these materials with the VIsionlearning module *Understanding Scientific Journals and Articles* (see "Extension Activities" on page 5).

Use in the Classroom

These materials are useful for exploring ways in which scientists use non-human communities to understand human ones. They also assist in building understanding of the different ways in which scientific information can be conveyed depending on audience. Students should read the article before listening to the interview.

1. **Pre-reading and pre-listening activities** are provided to prompt prior knowledge and help students make connections between their own lives and the research they are learning about. Materials may be used in the classroom to generate discussion, or as homework if the article or interview will be read/listened to in-class. Having students write before speaking helps focus discussions and reading.
2. The **worksheets** are explicitly designed to walk students through the process of reading a scientific paper, as well as building disciplinary vocabulary. They serve as excellent homework assignments (if the article is read outside of class) and will direct students toward identifying important information about the research. While the answers provided can be used to check student reading, it is really an opportunity to assist students in how to read scientific material. Completed worksheets are excellent for small group discussions, allowing students to solve any discrepancies themselves, or as a debrief with the entire class.
3. **Post-reading and post-listening activities** are designed to extend student thinking and engage them more deeply with the text and interview. These questions are great for small groups, for large class discussions, or for short-answer writing assignments.

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Pre-reading and pre-listening activities

1. **Vocabulary preparation:** Provide students with the Vocabulary Worksheet and ask them to offer definitions. Clarifying terminology as a class is recommended. This worksheet is suitable for a 20-minute in-class activity if students have access to dictionaries or the internet. Many of the terms are specific to primatology, thus *context* is critical to reinforce when assigning this activity.

2. **Build a comparison infographic**: Comparison infographics are a sophisticated approach to visualizing similarities and differences among two things. In this activity, students can build an infographic in small groups or as a class, by drawing or with the use of free software (e.g., Piktochart). This activity is useful for prompting prior knowledge about the ways in which we can use animal communities (in this case, macaques) to understand human communities. Compare infographics as a class when complete. ***Instructions to students:***

   We are going to do an exercise called a 'comparison infographic'. You may recall doing compare and contrast charts in elementary or middle school. This is a more sophisticated way of creating a visual that shows the similarities between two things. Here are our steps:
   1. *Brainstorm on paper what you know about the similarities between human beings and monkeys. Don't focus on the physical, rather think about the ways in which these two groups function as a social group. Do they have families? How do they live?*
   2. *Next, brainstorm what you know about the differences between these two groups.*
   3. *Using paper and markers OR a digital software like Piktochart, create an infographic that presents the data you generated in your brainstorms.*

Post-reading and post-listening activities

1. **Revisiting vocabulary:** Using the vocabulary sheet students completed at the start, clarify as a group/class how the authors used the terms. Were they used the same? Differently? Explain.

2. **Revisit infographics:** *(Short – 10 minutes)* In what ways were the infographics representative of the information reflected in the article and interview? How did the activity prepare students for what they read and learned from the materials?

3. **Fishbowl discussions:** Fishbowl discussions are an effective means of engaging all students in a large discussion. Two to three students should sit in the center of the room, with the remainder of the class surrounding them. The students in the center have 8-10 minutes to discuss their thoughts on a question (options below). The outer ring of students should be directed to listen to this discussion and make notes about what has resonated with them, what is in conflict with their own reading/listening of the materials and personal experience, and what they have noticed might be missing from the discussion. After the initial 8-10 minutes have passed, open the conversation up to the entire class, using additional question prompts as necessary.

   - *Using the article and interview as a reference, in what ways are we able to make claims (or suggestions) about humans based on the study of macaques?*

- *In what ways did the researchers take advantage of their rich data base (including archives)? How does this contribute to their understanding of the social networks macaques build?*
- *The authors use macaques to identify factors that may affect the lifespan of individual humans. In what ways does this work, and in what ways does this* not *work? (In other words, discuss the complications with this approach.)*
- *In the interview, Dr. Brent provides an example of how the social network with female macaques works to protect the group from male aggressive behavior, particularly in mating season. Can you generate examples of similar structures in* human *behavior?*
- (For a focus on language and discourse) *How did the authors describe the research in the interview differently than in the article? Which was easier for you to understand, and why?*
- *Based on this research, does it seem fair to say that people who fill their lives with relationships will live longer? What other factors may not be taken into account with this claim?*

4. **Write a microtheme:** A "microtheme" is an essay so short that it can be typed on a single five-by-eight inch notecard (about 150 words). It is a type of assignment where a small bit of writing is preceded by a great deal of thinking.[1] Microthemes can be used in a variety of ways – for examining data, for example, or writing an evidence-based opinion. For this activity, use it to summarize the published article.

   When writing a summary, it should be directed toward imagined readers who have not read the article being summarized, but have some familiarity in the topic area. (Students might think of this person as one of their peers.) The purpose of the summary is to give these persons a clear overview of the article's main points. The criteria for a summary are (1) accuracy of content, (2) comprehensiveness and balance, and (3) clear sentence structure with good transitions.

   What a summary *does not* include is the student's opinion on the author's writing style, the validity of their evidence, or anything else that is subjective. Students may benefit in knowing that "microthemes" are an excellent way to chronicle the literature they have read over time, as well as build annotated bibliographies.

5. **Translate a paragraph:** Communicating scientific research to communities at large is often a challenge. Authors must consider what information is necessary to include so that the reader will understand the findings, as well as what information may be unnecessarily complicated. While this activity can be done with any paragraph from the article, some are easier than others.

   For this activity, ask students to read closely the first paragraph in section "(b) Measuring family network size" (page 2). When they believe they understand what the authors did, ask them to write a paragraph presenting this same information to a lay-audience. This audience could be their peers, but by age – not discipline. Alternatively, they could consider the audience to be a grandparent or younger sibling.

[1] See John C. Bean, Dean Drenk, and F.D. Lee, "Microtheme Strategies for developing Cognitive Skills," in *Writing across the Curriculum: A Critical Sourcebook.* Eds. Terry Myers Zawacki and Paul M. Rogers. New York: Bedford St. Martin's, 2012. 146 – 157.

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Have students share their rewritten paragraphs in small groups or as a whole class. Ask them to reflect on the way they approached the content. What did they include or omit? How did they select terms to explain what was done? What do they notice about the different audiences and how that changed the writing?

Extension activities – for use with the learning module *Understanding Scientific Journals and Articles.* (http://visionlearning.com/en/library/Process-of-Science/49/Understanding-Scientific-Journals-and-Articles/158)

Vocabulary Worksheet

Below are a list of terms and phrases that you will encounter while reading the article and listening to the interview. Using a dictionary, provide definitions for each term or phrase. If you cannot find a formal definition, write down what you *think* the term or phrase might mean. Keep in mind that the meanings of these terms *in science* may be different from the way we used them in common speech.

(For expected answers to these questions, see https://www.visionlearning.com/en/twoh/request)

Philopatric

Nepotistic

Agonistic

Probabilistic Inference

Affiliative Relationships

Kin-preferences

Relatedness Coefficient

Discrimination

Covariates

Primatology

Despotic

Reading Guide and Worksheet: Part 1

This worksheet is meant to help you understand the structure of scientific articles. Using the article *Understanding Scientific Journals and Articles* as a guide, answer the following questions with as much specificity as possible. Think of this almost as a reverse-outline. What are the authors *doing* with each sentence/section? (http://visionlearning.com/en/library/Process-of-Science/49/Understanding-Scientific-Journals-and-Articles/158)

(For expected answers to these questions, see https://www.visionlearning.com/en/twoh/request)

1. What information is contained in the Abstract of the article?

2. What information do the authors provide in the introduction? In what ways, specifically, do they support their claims?

3. What information is contained in the "Materials and methods" section on pages 2 and 3? What reason do you think the authors had for the subsections labelled "(a)", "(b)", "(c)" and "(d)"?

4. How do the authors present the results of their study? How do the data visualizations help or hinder your understanding of the research?

5. What information do the authors present in the "Discussion"? Are their claims supported by the data they provide in the earlier sections? How so, or not?

6. What questions are raised or otherwise left unanswered by this study?

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Reading Guide and Worksheet: Part 2

This worksheet is meant to help you delve deeper into the ways in which scientists use language in scientific articles – in this case, primatology. Below is some information about the different rhetorical moves scientists often use when presenting research. Using this as a guide, examine the article to identify at least 3 moments where the authors are doing these things.

(For expected answers to these questions, see https://www.visionlearning.com/en/twoh/request)

Definition	**How does the author use each of these (if they do) to develop their purpose?**
Ethos: Ethical appeals establish the credibility and goodwill of the author or of the sources used to support an argument. Where and how does the author explain his or her related background or establish the credibility of the sources used? (Hint: This is not always in the text proper. Consider all of the material on the page.)	
Pathos: Emotional appeals draw on the readers' emotional response to the subject and on shared beliefs and values. This doesn't always mean *creating* feeling – it can be an absence of feeling, as well. Where does the author use language and/or create images that are emotionally charged? (Hint: Look for descriptive terms and words that have positive or negative associations.)	
Logos: Logical appeals use reasoning and evidence in support of an argument. Logical appeals draw on facts, statistics, research, financial costs, observations, and experiments to reach conclusions using logical schema. Where and how does the author use evidence? What kinds of evidence are used? What logical schema does the author draw on to interpret the evidence?	

Targeted NGSS, Cross-Cutting Concepts, and Science and Engineering Practices

The activities in this guide can be used to address the following standards, concepts, and practices.

Next Generation Science Standards	
LS1.A: Structure and Function	• Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3)
LS2.D: Social Interactions and Group Behaviors	• Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HSLS2-8)
LS4.C: Adaptation	• Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4)
Science and Engineering Practices	
Developing and Using Models	• Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. • Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.
Obtaining, Evaluating, and Communicating Information	• Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. • Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.
Analyzing and Interpreting Data	• Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. • Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations.
Cross-Cutting Concepts	
Cause and Effect: Mechanism and Prediction: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.	• Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. • Changes in systems may have various causes that may not have equal effects.
Patterns: Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them	• Empirical evidence is needed to identify patterns. • Graphs, charts, and images can be used to identify patterns in data. (6-8) • Patterns can be used to identify cause and effect relationships. (6-8)