

About this Issue

“[Animal math](#)” introduces students to studies exploring whether any animals other than humans have a number sense. Certain other animals seem to be able to distinguish a difference in quantity, but are these animals recognizing discrete quantities or determining, for example, the greatest overall treat volume? Scientists are still debating many such questions. Designing nonverbal experiments that minimize confounding variables is part of the challenge. Scientists would also like to know how animals’ quantitative abilities evolved. Like the scientists, students can focus on distinguishing between discrete quantities and continuous qualities or examine the cross-curricular intersections that bring neuroscience, animal behavior and experimental design together. This guide invites students to plan their own experiment to judge the strength of their peers’ number sense, regardless of their comfort with high-level calculations.

Connections to Curricula

Sense of quantities
Discrete vs. continuous qualities
Animal behavior
Common ancestry
Inheritable traits
Isolating variables
Nerve function

What’s in this Guide?

- [Article-Based Observation](#): These questions focus on reading and content comprehension by drawing on information found in the article “[Animal math](#).” Questions focus on the quantitative concepts covered in the article and the challenges of experimental design.
- [Quest Through the Archives](#): With Internet access and your school’s digital access to *Science News*, your students can use this short section to explore human evolution and how people in different professions and different parts of the world use and manipulate numbers, as reported by *Science News*.
- [Cross-Curricular Discussion](#): These questions and extension prompts encourage students to think about the complexity of experimental design. Students can explore confounding variables and how these variables may hinder scientists’ ability to understand how animals sense numbers. The section highlights decisions scientists make when designing an experiment, such as the necessary sample size, and includes a graphical analysis about neuron activity. The section is subdivided for educators who would like to focus on one particular topic area. The extension prompts are either more topic-specific or more conceptually advanced.
- [Activity](#): The activity “How good is your number sense?” guides students through the process of designing their own experiment to study their peers’ sense of discrete quantities. After an initial experimental idea demonstrated by the teacher, students are led through the design process, which focuses on minimizing confounding variables and selecting a sample size. Statistical analyses may be explored.

Standards Alignment

Next Generation Science	Common Core
From Molecules to Organisms: Structures and Processes: HS-LS1-2	ELA Standards: Reading Informational Text (RI): 1, 2, 4, 6,
Ecosystems: Interactions, Energy, and Dynamics: HS-LS2-8	ELA Standards: Writing (W): 2
Biological Evolution: Unity and Diversity: HS-LS4-4	ELA Standards: Speaking and Listening (SL): 1, 2, 4, 6
	ELA Standards: Reading for Literacy in Science and Technical Subjects (RST): 1, 2, 3, 4, 5, 6, 8, 9
	ELA Standards: Writing Literacy in History/Social Studies and Science and Technical Subjects (WHST): 2, 4, 7, 9