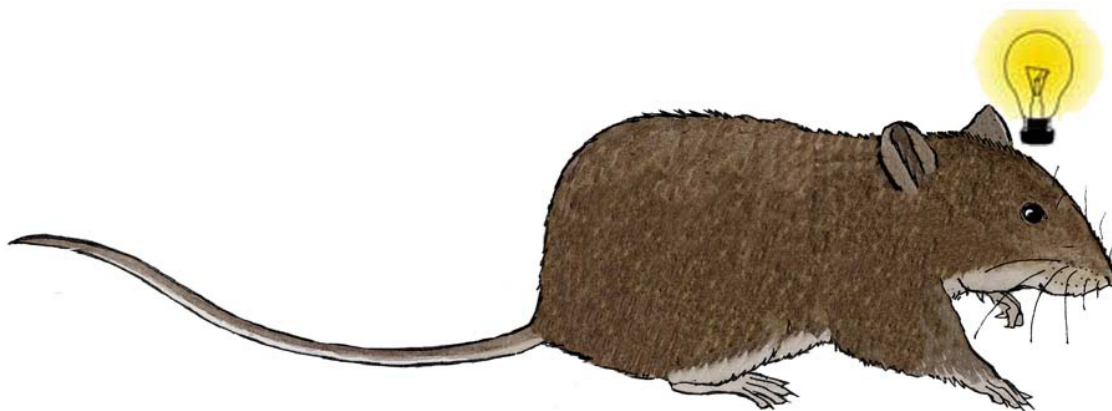


Scientific Phenomena can be used as a tool to anchor a science unit involving a series of lessons to engage in deeper science learning – or what is being called “3 Dimensional Learning”.



Can Taking a Break From Learning Make You Smarter? Scientific Phenomena

Neuroscientists at MIT studying the brains of rats discovered something interesting. After learning a task the rats took a break and their brains played back repeatedly what they had just learned. In addition, they played it back 10 times faster than the actual task took them to learn it. This gives the rest of the brain more of an opportunity to take in all the new information and store it for long term memory.

These results support earlier studies, which showed that people and animals learn best when given breaks between tasks.

(Kleeman, Elise. “Relax and Think Like Rats.” Discover May 2006: P. 20)

Off site resource from Discover: <http://discovermagazine.com/2006/may/rat-think>

Essential Questions

1. Is memory improved by resting the brain between lessons?

Disciplinary Core Ideas

LS1.A: Structure and Function: <http://www.exploringnature.org/db/view/1938>

- Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1-1)
- Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1-2)
- 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)

Can Taking a Break From Learning Make You Smarter?

Scientific Phenomena continued...

Science and Engineering Practices

Developing and Using Models: Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-2)

- Use a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-LS1-4),(HS-LS1-5),(HS-LS1-7)

Planning and Carrying Out Investigations: Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-LS1-3)

Constructing Explanations and Designing Solutions

- Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-1)
- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS1-6)

Crosscutting Concepts

Systems and System Models: Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS1-2),(HS-LS1-4)

Energy and Matter:

- Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. (HS-LS1-5), (HS-LS1-6)
- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS1-7)

Structure and Function: Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-LS1-1)

Stability and Change: Feedback (negative or positive) can stabilize or destabilize a system. (HS-LS1-3)

Connections to Nature of Science

Scientific Investigations Use a Variety of Methods: Science knowledge is based upon logical connections between evidence and explanations. (MS-LS1-6)

Using Discoveries and Inventions as Scientific Phenomena to Integrate with NGSS – A Template –

Scientific Phenomena can be used as a tool to anchor a science unit involving a series of lessons to engage in deeper science learning – or what is being called “Three Dimensional Learning”.

- 1) Describe the **phenomena** in a way that your students can understand and which sparks their imagination.
- 2) Create **Essential Questions** for them to answer to explain the phenomena.
- 3) Identify the NGSS **Disciplinary Core Ideas** that you are targeting.
- 4) Provide clear directions for a process they should use to try to answer the questions using the NGSS **Science and Engineering Practices** to frame as your guideline.
 - Discuss how to **Develop and Use Models**
 - Discuss how to **Plan and Carry Our Investigations**
 - Discuss how to **Construct Explanations and Design Solutions**
 - Provide a few links online to get them started **Obtaining Information**.
 - Once they find some sources, they should *evaluate them* and *communicate their finding* to the rest of the class
 - Practice *analyzing and interpreting the data* they find.
- 5) Discuss the **Crosscutting Concepts** that students should be aware of throughout the lesson.
 - Discuss the development of **Models**.
 - Discuss the flow of **Energy and Matter**.
 - Discuss how **Structure and Function** comes into play in this situation.
 - Discuss how **Stability and Change** might affect this concept.
- 6) Discuss the Connections to Nature of Science
 - Discuss how science knowledge is based upon logical connections between evidence and explanations.
- 7) Make note of other **questions generated** in the process of exploring this Scientific Phenomena. Discuss them as a class.