

Do Materials Get Tired- Do Rubber Bands Get Longer During Use?

Lesson

The lesson “Do Materials Get Tired – Do Rubber Bands Get Longer During Use?” will allow students to determine what happens to materials as they get tired.

Suggested Grade Level

6-8

Approximate Run Time

60 -90 minutes (approximately 2-3 class periods)

PDE Standards

- 3.2.7 A: Explain and apply technological knowledge.
- 3.2.7 B: Apply process knowledge to make and interpret observations.
- 3.2.7 C: Identify and use elements of scientific inquiry to solve problems.
- 3.2.7 D: Know and use technological design process to solve problems.
- 3.4.7 A: Describe concepts about the structure and properties of matter.
- 3.4.7 C: Identify and explain the principles of force and motion.
- 3.6.7 C: Explain physical technologies of structural design, analysis and engineering, financial affairs, structural production, marketing, research and design.
- 3.7.7. A: Describe the safe and appropriate use of tools, materials, and techniques to answer questions and solve problems.
- 3.7.7. B: Use appropriate instruments and apparatus to study materials.
- 3.8.7 A: Explain how sciences and technologies are limited in their effects and influences on society.

National Standards

- NS 5-8.1: Science as inquiry
 - Abilities necessary to do scientific inquiry.
 - Understandings about scientific inquiry.
- NS 5-8.2: Physical science
 - Properties and changes of properties in matter.
 - Motions and forces.
 - Transfer of energy.
- NS 5-8.5: Science and technology.
 - Abilities of technological design.
 - Understandings about science and technology.

Content Objectives

1. Students will predict what happens to materials as they creep.
2. Students will be able to measure, compare and contrast how weight and size of a rubber band will affect how creep changes with time.

3. Students will describe the relationship between creep and time.
4. Students will determine other factors that are involved to produce creep.

Process Objectives

1. Students will be able to determine the creep of rubber bands using quantitative data.
2. Students will be able to determine how the creep of a rubber band changes with time.
3. Students will compare and contrast how different variables affect the creep such as size of the rubber band, weight of the object and time the object is under strain.

Assessment Strategies

1. Students will complete the hypotheses and study the materials before completing the lab.
2. Students will complete the lab and lab questions.
3. Informal evaluation of participation in group discussion.

Materials

- Do Materials Get Tired ? Do Rubber Bands Get Longer During Use ? Lab, questions and data tables.
- Rubber bands: (2 of the same size length/width, 2 of differing sizes and 1 rubber band of any size or shape)
 1. 1 rubber band will be used in the lab for Table A
 2. the other 4 rubber bands will be used in the lab for Table B (2 of same size, 2 of different size)
- Weights: (2 of the same weight, one light weight and 2 differing weights, for example:
 1. one light weight (5 grams or less)
 2. two of the same weights: for example, 15 grams
 3. two weights that are different: for example: 10 grams and 20 grams
- Video clips (online): "Do Materials Get Tired? Creep" 1 minutes 28 seconds

Procedure

Part 1: Creep of Materials

1. Introduce this lesson by asking the students to share their ideas about the creep of materials. Ask them about materials that are new versus materials that are old. What types of materials seem to lose their durability with time?
2. Now, introduce the factors that lead to creep: use of the object, forces on the object, heat, etc. Talk about each of these factors and their importance making a list on the classroom board. Also, ask the students for other ideas.
3. Talk to the students about how useful it is for people to test the creep of a material. Engineers are scientists that construct objects, buildings, airplanes, etc. out of materials that have specific properties. How would it be useful to understand how a material will tire before you build with it?

4. Complete the lab and when the lab is over, use data from the lab to reiterate parts 1-3 above. Draw on real-life experiences and objects used in everyday life.

Part 2: Video

Watch the video of the creep of materials:

<http://win.wpsu.org/Streams/Produc03062008133359.wmv>

Part 3: Other Examples

1. Teacher-led discussion about how an object tires.
2. What are the disadvantages of objects that tire easily?
3. Are there any advantages of a material that would fatigue easily? For example, have you ever heard about the environmental impact of 6-pack rings? 6-pack rings are commonly used to hold together soda cans and if 6-pack rings get into the ocean or other wild areas, animals can get stuck or choke on them. However, scientists have engineered 6-pack rings to break apart when they are exposed to sunlight (UV rays). Now, 6-pack rings are strong when you are carrying your soda home from the store but after being exposed to sunlight, they become brittle.

Extension

1. Try the experiment again and compare the results to the first time. Were they similar or different?
2. Try lengthening the experiment to a couple of weeks. Do you notice any difference in the creep of the rubber bands?
3. Add heat to the rubber bands by using a blow dryer. Compare the effects of the rubber band exposed to hot air from a blow dryer to the rubber bands that are not.