



Drexel-SDP GK-12 LESSON

- *What is it?*
- *Nanotechnology*
- Subject Area (Unit): *Nanotechnology*
- Concept: Nanotechnology

Objectives In this lesson students will be exposed to how things can look different on the micro-scale. Using a set of micrographs of everyday things, they will get a first hand look of textures and shapes of things on the micro-scale.

Students will be able to....

- gain an understanding of scale using a set of micrographs
 - learn how objects appear at a very small scale
 - gain an introduction to nano and micro scale characterization techniques
- PA Academic Standards: *3.1.7ABC, 3.2.7ABC, 3.4.7ABC, 3.7.7E, 3.8.7ABC*
 - Grade Level: **6**
 - Setting/Group Size: Classroom split into small groups or working as individuals.
 - Duration/Time Required: *1 60 minute session*

Materials List: Set of number micrographs of everyday objects

A Google search for SEM Micrographs provides a large number of useable images at fairly high resolution right from the websites of various laboratories.

Context: Nanotechnology requires a wide array of characterization tools in order to “see” things on the nano-scale. One of the workhorses of research into the nanoworld is the Scanning Electron Microscope (SEM). Light is too “big” to be able to see things smaller than a few microns; therefore an SEM uses electrons at high energies to image objects on this scale. They are able to do this because electrons at high energies are much smaller than optical light.

Imaging at small scales often reveals textures and features that are not apparent to the naked eye. These features are sometimes to be expected and sometimes very surprising.

Methods and Procedure: Begin with a discussion of nanotechnology and the size of light. Why can't we see a nanometer? What techniques are used by scientists to image and explore materials at this scale? The discussion can range in complexity depending on the amount of time allowable and the ability of the class.

After the discussion, pass out sets of the micrographs. It may work to divide them up into sets and then have small groups work with the different sets. Each group can have a set amount of time to make their guesses on each micrograph before they are rotated to other groups.

Ask the students to list numbers up to the number of micrographs in the set. Then ask them to make guesses as to what they think each image is of. Give them enough time to discuss each set and make their guesses and then rotate the sets around so each group sees all the images.

After time is up, go through each image and ask each group what their guess is. The instructor can keep score to see which group gets the most correct and name the “Micro-investigators” of the class.

Finish the lesson with a discussion of the students' impressions. Why was it so hard to figure out some of the images? What clues lead them to their correct guesses? What have they learned about what things look like on the micro-scale?

- Assessment: List of Image Identifications, Science Journal Entry
- Keywords: Wireless Communication
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