A Content Secondary Science Newsletter from the
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Using Demos to Create Student–Centered Science Classrooms

Quality science instruction comes from individuals who have a thorough understanding of their content and effective methods to increase their students' learning. Too often, teachers explain and deliver content to a passive student audience. Although direct instruction is necessary, it should not be the only method of instruction. Students need to be engaged and experience science.

The teacher-centered classroom promotes a superficial understanding of science. The students may be engaged in the lesson by taking notes and listening, but how many students actually construct meaning of the lesson by connecting the information to previously learned material? Teachers that use a "traditional" approach to teaching might reason, "I learned in a teacher-centered classroom and turned out just fine." Although this may be true, the students of today have different lifestyles compared to the student population of past generations. In a typical classroom, a teacher can estimate that approximately 20% of their students are auditory learners. Therefore, a majority of your students are visual or kinesthetic learners. Brain research supports varied instruction and notes the positive effects it has on student achievement. The teacher-centered classroom is an effective way to assess the teacher's content knowledge, but it does not motivate all of the students to learn. In order to promote student achievement and understanding among a diverse classroom audience, varied instructional approaches are necessary.

One way to engage your students is to begin a lesson with a demonstration or student investigation. A discrepant event is especially effective, because it produces the opposite result than what the students expect. Present the problem to the students and have them brainstorm possible solutions or results. Challenge the students to connect with what they already know or believe about the topic. This provides the teacher with the opportunity to increase student motivation and assess for common student misconceptions. During the teacher demonstration or student investigation, have the students make observations and collect data. Then, have the class work in groups to try to attempt to explain the phenomenon or resolve the discrepancy. Use the questions generated during the demonstration to introduce the new topic. As the teacher progresses through the lesson or unit, reflect on the demo or activity and assess what was learned.

Integrating Demonstrations and the 5 E Model

- **Engage**: Challenge students to connect what they already know or believe with the learning experience facing them.
- **Explore**: Students collect data and make observations.
- **Explain**: Students try to explain their data or observations.
- **Elaborate or Extend**: Students can take what they have learned and apply it to other situations.
- **Evaluate**: Students and teachers assess what was learned from the activity.

The effectiveness of demonstrations will be determined by how relevant it is to the students and it also depends upon the teacher's presentation. Creativity and entertainment add to the wow factor.

The demos on the next page are ideas for teachers to consider, not recommended activities.

Written by: Elizabeth Marconi

Characteristics of Life– Are They Alive?

Introduction: Create a "critter" in an instant by adding modeling glue to water. Feed the glue monster, watch it move, and observe its behavior!

Concept: Characteristics of life

Materials: Petri dish (top or bottom), Construction paper, Modeling glue (Duco® cement modeling glue), Overhead projector, Wood pencil, Tap water, Pencil sharpener

Safety Precautions: Vapors from modeling glues are very caustic and breathing the vapors should be avoided. Most modeling glues are extremely flammable; keep away from open flames. Review and follow all laboratory safety rules before beginning the activity.

Procedure:

1. Place one-half of a Petri dish on an overhead projector.

2. Fill the Petri dish about one-half full with tap water.

3. Release a "critter" into the Petri dish by adding one small drop of modeling glue to the surface of the water. (Using a pipet to dispense the glue will hide the source of the "critters" from the students.)

4. Prepare some "critter food" ahead of time so that students will not be aware of the actual source of the food. Make the food by shaving small particles of wood and graphite from the tip of a wood pencil. Sprinkle a small amount near the "critter" during the demonstration.

5. The "critter" should start to move in an amoeboid fashion. It will move toward the wood shavings and "eat" them.

6. Add additional "critters" and watch them interact with each other.

7. When the "critters" stop moving and "die," shut off the projector and discuss what has been observed. Consider all the behaviors that made the glue monsters seem alive.

Discussion: Since biology is literally the study of life, students need to be able to respond correctly to the basic questions: What are the characteristics of life? What does it mean to be alive? How do you know if something is alive? Have the students brainstorm a list of characteristics of life and if they apply to the critter demonstration.

Source: **The demonstrations listed in this newsletter were obtained from Flinn Scientific, Inc's resources. To view these activities in their entirety and many more demos, go to www.flinnsci.com/Sections/MS/ms_Index.asp**

High School Chemistry- Magic Genie

Introduction: When sodium iodide is dropped into a flask containing 30% hydrogen peroxide, a "magical" genie appears in the form of water vapor and oxygen.

Concepts: Exothermic reaction, Catalysts, Decomposition reactions

Materials: Hydrogen peroxide (30%, H_2O_2, 50mL) Volumetric flask (Pyrex®, 1000-mL), Sodium iodide (NaI, 4 g), Filter paper, Graduated cylinder (50-mL or 100-mL)

Safety Precautions: Use extreme caution. Hydrogen peroxide, 30%, will act as an oxidizing agent with practically any substance. It deserves the science teacher's special handling and storage attention. This substance is severely corrosive to the skin, eyes and respiratory tract; a very strong oxidant; and a dangerous fire and explosion risk. Do not heat this substance. Sodium iodide is mildly toxic, LD50: 4340 mg/kg. The reaction flask will get extremely hot; use only a Pyrex flask and hold with a towel around it to prevent burns. Do not point the mouth of the flask towards yourself or anyone else. Never tightly close a vessel containing hydrogen peroxide- it may explode. Wear chemical splash goggles and chemical-resistant gloves and apron. Please review current *MSDS* and your district's science safety manual for additional safety, handling, and disposal information.

Procedure:

1. Wrap 4 g of sodium iodide in a small piece of filter paper. Staple the filter paper so that no sodium iodide leaks out.

2. Add 50 mL of the 30% hydrogen peroxide solution to a 1000-mL Pyrex volumetric flask. ***Caution:*** Wear gloves when handling 30% H_2O_2,. Contact with skin may cause burns.

3. Set the flask on a counter and hold the flask with a thick cloth towel. Drop in one packet of the sodium iodide solid. Point the flask up and in a safe direction away from yourself and your students as the magic genie (water–vapor) emerges from the flask. The flask will get extremely hot. The towel will hide the flask contents as well as protect your hand from the heat produced.

Discussion: The Magic Genie demonstrates the decomposition of hydrogen peroxide into oxygen gas and water vapor. The decomposition is catalyzed by iodide (I–), which is not changed during the reaction. It is an exothermic reaction and will evolve *a lot* of heat.

Note: According to the *CCSD K-12 Science Safety Manual*, Hydrogen peroxide (30%) is a restricted chemical.