The Health Adventure® It's A Celebration Of You!

Welcomes you to

The Super Sensory Science Show . . .

A science stage show designed and presented by The Health Adventure staff.

Program Objectives: With our teaching staff, students will:

1) Experience science first-hand through a variety of demonstrations and activities.

2) Develop process skills listed in Section 2 of the North Carolina Science Curriculum, such as observation, prediction, and data interpretation.

3) Use systematic problem-solving techniques.

4) Develop a more thorough understanding of the nature of science, (Section 1 – North Carolina Science Curriculum), especially as it applies to the real world and to them personally.

5) Wonder, observe, experiment, think, compare and have fun!

Suggested Classroom Activities:

I. What is matter? (anything that has space and mass) What are the three states of matter? (gas, liquid, solid) A good way to help students visualize states of matter is to let them become molecules. They will stand close together – be bound together, in fact, as a solid. To represent the loosely bound molecules of a liquid, have them stand near each other with their arms loosely draped over each other. They can sway slightly from side to side. As gas molecules, they do not touch at all, and they may run around the room! Then have some fun with matter by making **Magic Mud Slime**!

   Try the following recipe to learn about a colloidal suspension – a substance which acts like both a solid and a liquid. Place 5 tablespoons of cornstarch into a small bowl and add 3 tablespoons water. (It should be difficult to stir even when the water and the cornstarch are fully mixed.)
   Play with the stuff. Is it a liquid or a solid? What happens if you hit it with a spoon? Will it splatter? Actually, it is both a solid and a liquid. When you press it, it feels solid because the molecules bind tightly together. When you stop squeezing, the molecules relax and it becomes runny again.

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II. Chemists study matter and how it changes. One type of change is a physical change, which changes a substance's form but not its properties, such as changing water to steam or ice and back again. Chemical changes, on the other hand, produce totally new substances.

Divide your class into pairs. Give each pair a zip lock bag with a spoonful of baking soda in each bag. They should add about 1 oz. Of vinegar to their bag and record the results. Is this a chemical or a physical change? Can you get the vinegar and baking soda back again or have you produced a totally new substance? The chemical equation for this reaction is: weak acid + weak base = salt + water + (in this case) carbon dioxide gas

Acetic acid sodium bicarbonate sodium acetate water carbon dioxide
$CH_3COOH + NaHCO_3 = CH_3COONa + HOH + CO_2$

This reaction is endothermic (absorbs heat) so the baggie should feel cool to the touch. The release of the carbon dioxide gas causes the bubbles and fizz. Since CO_2 gas is not in the baggie, what do your students think will happen if you hold a lighted match or burning splint in the bag? Try it. Would this make a good fire extinguisher?

III. Backyard Luminescence

Why do fireflies have lights in their tails? Fireflies use their tails to talk to each other. At night males try to find mates by flashing a signal. The females know the signal and when they see it, they send back a reply. When males and females find each other, they will mate. For example: a male firefly makes two flashes two seconds apart. If a female sees the flashes, she will reply with single flashes on second apart.

Different types of fireflies talk to each other with different patterns of flashes. The flashes are created when two chemicals in the fireflies' abdomen mix together to form a completely new chemical and light as a byproduct. This type of reaction is call chemiluminescence.

Try this activity at home. Catch several fireflies and put them in separate jars with air holes in the lids. Watch the fireflies flash their tails. Can you recognize any patterns? Are all patterns the same?

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IV. Evaluating Experiments

Just because an experiment or research study is reported on TV or in the newspaper does not mean its conclusions are scientific fact. We must always be skeptical and ask questions about what we read. More importantly, if we are truly interested in the subject being investigated we should go to the original research document for our information rather than just readying or hearing an account of it in the media. This doesn't mean that no study is ever clear or that all scientific work should be regarded with distrust. It simply underlines the fact that it's usually unwise to generalize from a single experiment or study, and that scientific progress is usually slow and steady rather than a matter of dramatic "breakthroughs."

Here are some things to look for:

1) Know all the facts. Are there hidden factors (like the hole in the bottle in the Science Show experiment) that might mislead you? What is the history of the subject of experimentation? Do your results change according to weather, time of day, temperature? Try to isolate all the factors that might affect your experiment.

2) Sample size – remember that you can't draw conclusions or make predictions unless you can repeat your experiment and get the same result over and over again. Beware of medical studies of a small group of people, (less than 100) or environmental surveys of a small parcel of land, because there will be too much variation in results to draw valid conclusions.

3) Who sponsors they study? Science must be conducted with an unbiased mind. It is easy to ignore or downplay certain facts that don't fit into the desired results. Would you believe a study by a tobacco company that found all kinds of health benefits from smoking? Or a study that found no problems with clear cutting that was paid for by a company with heavy interest in the paper making business? Learn to be skeptical.

V. Ask your students to use what they have learned about the scientific process to evaluate experiments. Choose two actual research studies, one flawed and one that uses "good science" or use the two fictional reports below. What are the key points that make you trust or distrust these reports.

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Megadoses of Q Vitamins Cure Athletes Foot

In a pilot study of 25 co-eds at ABCD University, it was found that 65% of women taking 500% of the RDA of Vitamin Q showed no symptoms of Athletes Foot. The remainder, while continuing to have some symptoms, reported a significant improvement in both smell and itchiness.

Curlycue Bacteria Linked to Gorblatt's Disease

Scientists at Lazer Laboratories have isolated the curlycue bacteria in the saliva of 97% of patients treated for Gorblatts at N. Y. Medical Center in the past year. This supports the findings of researchers at General Hospital in a case study of over 1,000 Gorblatts patients. How the bacteria is transmitted has yet to be determined, as research continues into this puzzling disease. Medical science is confident, however, that the curlycue may be a causative factor in Gorblatts.