



**2009-10 Inquiry Based Science
with HaMorah Brooke Einstein Science Lab Teacher**

What is Inquiry Based Science?

Research has shown that the best way for children to learn important science concepts is to actively construct ideas through their own investigations. In the science lab, this means making observations, asking questions, testing ideas, recording results, comparing data, building concepts and explanations.

Core Inquiry Based Science Concepts for All Students

Students explore core scientific concepts in the science lab. All students work on being keen observers. This means that they use their senses to observe what they are learning. They look – noticing changes, colors, shapes, and behaviors. They touch – observing the temperature and feeling for texture and consistency. They smell – noticing differences between the materials and noting if there is an odor. They listen – noting how the sound relates to the materials. Then, they use their words to describe what they are observing by writing in their science journals and having discussions with other scientists. Students have been learning how important it is for scientists to record data and their observations in organized ways, using tables, anecdotes and illustrations. They make predictions based on prior knowledge and then compare the results to their predictions. Students learn that scientists use models in order to observe something that cannot be easily seen. In the lab lessons, they learn how to conduct fair tests. This means knowing which variables remain the same (controlled) and which variables are changed (manipulated).

Grade Level Science Lab Units for Fall 2009-10

Students will have a range of exposure to different scientific areas throughout our five-year program, and specific units of study may vary each year.

1st Grade: Soils

In the 1st Grade Soils unit, students learn about the three basic components of soil: sand, clay and humus. Students learn to identify the component's unique properties through simple tests. They also study how water affects different kinds of soil. They compare each component's properties for suitability for growing and sustaining plants. As this is the first semester the first grade students have been in the lab, we are focusing on their lab skills and procedures. This is the foundation for future years in the science lab.

2nd Grade: Soils

In the 2nd Grade Soils unit, students deepen their awareness about soils. Using simple tests, students learn to identify sand, clay, and humus in soil. They study how water affects different kinds of soil. Through long-term experiments, they explore how roots and plants grow in various soils and how, with the help of worms, old plants decompose and become part of the soil. Applying what they have learned, they investigate their own local soil.

3rd and 4th Grade: Food Chemistry

In the 3rd/4th Grade Food Chemistry unit, students investigate basic nutrients found in the food we eat. Through a series of physical and chemical tests, students discover which nutrients (starches, glucose, fats, and proteins) are found in common foods. Through reading selections they learn more about the role these nutrients play in human health and how these nutrients are related to the growth and development of their bodies. The students practice lab techniques that help avoid contamination during testing. The testing cycle begins with testing five known liquids to observe positive and negative test results; then testing foods to identify the presence or absence of a specific nutrient; and finally, pooling class results and reading about that nutrient and its role in our health. Students repeat this cycle for all four nutrients. Students are introduced to the concept that chemical tests are not always clearly positive or negative. They learn to interpret results that indicate varying amounts of a nutrient. Students examine food labels and discover that labels provide useful information about the nutrients in foods.

5th Grade: Circuits and Pathways

In the 5th Grade Circuits and Pathways unit, students investigate the electric devices that play important roles in their daily lives at home, school, and in their neighborhoods. Most children know electricity makes things work; however, they have little and varied understanding of what electricity is and how *it* works. In this module, students develop a basis for understanding electricity by exploring its properties in simple circuits.

Students are given the opportunity to explore some phenomena of electricity using batteries, wire, bulbs, and motors. The students are encouraged to think of observable phenomena, such as the glow of a light filament, as evidence of something occurring within circuit systems. Students learn about the essential elements of a circuit including critical contact points of each part of a circuit, conductors and nonconductors, energy receivers, and energy source.

Students learn about what is in a battery and how it works, by reading about the Volta battery and making one themselves. Through this investigation the students are given a concrete experience with chemical energy and how it is transformed into electrical energy. Students observe that there are other forms of energy present in a closed circuit system: electrical, light, and heat energy. Depending on what is in these circuit systems, they discover there can be a variety of outputs: sound energy, heat energy, and energy of motion.

As the students investigate further with circuits they learn about series and parallel circuits and how to identify them based on their properties. Students learn about switches and fuses and how, as components of circuits, each has a specific function. The concept of electrical resistance is introduced and students learn about its effect on the brightness of bulbs and heat of wires. Through several investigations, students learn about the effect that gauge, material, and length have on resistance in a circuit.

In addition to learning about electrical circuits, students learn about the behavior of light. They investigate how light travels and how it is reflected off some surfaces and bounces off others.