



2010-11 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 2010-11

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 and 2nd Grade: Balls and Ramps

The ball is a universal toy that delights children of all ages. Children come to school having played with balls of many different kinds and in many different ways. This unit builds on that experience by asking children to extend their explorations of balls, how they roll and bounce, and what they do on ramps. Children explore the properties and characteristics of balls by observing, using, and comparing different balls. They make balls and in so doing learn about materials, size, and weight. They use balls as they bounce and roll them and experiment with them on ramps. Students learn about things that affect the way balls behave such as gravity, inertia, momentum, and friction. During this unit they are continuously engaged in exploration, discovery, and problem solving.

3rd Grade: Rocks and Minerals

Most children have picked up a rock or mineral to show their parents or friends. They often collect and sort them. They are fascinated with the colors, sizes and textures of rocks and minerals they find as well as of those they see in museums and rock

shops. This natural interest, coupled with the variety of rocks and minerals, leads many children to wonder what these earth materials are made of and how they are formed.

Rocks and Minerals is a 16-lesson unit in which students investigate rocks and minerals to answer these and other questions. Students explore the similarities and differences among rocks; they also study how rocks and minerals are both similar and different. They conduct several tests on minerals and develop a systematic way to record their observations. Finally, students apply the information they have collected to identify the minerals they have been studying by name. These activities introduce students to the way geologists study rocks and minerals. They also help students develop and apply process skills in observing, describing, and recording.

4th Grade: Rocks and Minerals

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Models and Designs

The four investigations in the *Models and Designs Unit* provide experiences that develop the concept of a scientific model and engage students in design and construction. The students will manipulate objects and materials in order to design and construct conceptual and physical models. They will look for relationships between structure and function of materials and systems. Throughout the unit the students will organize and analyze data from investigations with physical objects and systems. As the lab partners work together, they will gain confidence in their abilities to solve problems and learn that there is often more than one solution to a problem. During class discussions they will communicate their ideas to peers and work in a collaborative scientific manner. Students will use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, organizing, and relating.

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 gauge, material, and length has 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.

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