INTRODUCTION:

THE PROCESS APPROACH

Science can be viewed as a body of information to be attained or as a process to solve science problems. It is unlikely that we, as teachers, possess every tidbit of scientific knowledge that currently exists. Yet, we must still be reliable resources for the children. So, let's begin at the beginning with an exploration of both of these aspects of science.

THE BODY OF INFORMATION

Children are new learners, eager to find out about the world around them; they want to know everything. They continually try to make sense of everything they encounter. It is up to us, as teachers, to provide children opportunities for acquiring new information. This may include facts that you, the teacher, share with the child as he/she interacts with materials. It may be a film, a video, a DVD, some new website, a guest, a parent, a tape, a book, a field trip, a new creature or a magazine. Your role is to provide an environment that is safe and invites exploration, allowing for the child's natural curiosity to flow. This is where the process comes in. How do we provide a format for children to explore the world and all of it's secrets?

THE PROCESS APPROACH

Children are great explores and want to know every thing. It is fair to assume however, that our young learners have acquired little in terms of the vast amounts of information available in the sciences, *Discovering Science/Explorando* will approach science from a process standpoint and provide children with tools to seek and investigate new information. Teachers and children should become aware of science as a process of investigation. The end goal being that children will begin to experiment with the role of the scientist, discovering facts, gathering information and speculating or predicting outcome and recording results (data collection).

The process approach is a method by which scientists, in this case the children, can proceed when exposed to new material or situations. Emphasis is placed on the sequencing of the children's behavior. The process, itself, provides a framework, as well as consistent opportunities for the children to explore, investigate and learn new information through "hands on" experimentation.

When science is coupled with a consistent process approach children flourish. For example, Iatridis (1981) found that children exposed to specific science experiences, using carefully selected materials, "increased their self-directed discovery." This, in turn, afforded the children a better chance of developing higher orders thinking skills. When a framework is provided within which children can explore and draw their own conclusion, they are able to direct their thinking process and expand on their knowledge through discovery. McMillan, Piaget and Montessori tell us that children need to construct physical knowledge by acting on objects. Children are natural explorers and scientists. They want to find out everything they can and naturally engage in behavior that helps them on their journey of discovery. This means that they must experience, manipulate--taste, touch, hear and feel--the world around them. As children acquire physical knowledge of the world, they are better able to establish relationships between objects. This physical knowledge is essential for children to later develop logical, flexible thought processes. Children are capable of understanding increasingly sophisticated topics, as long as the presentation of the materials is developmentally appropriate. This is where the process approach comes into play and is in deed "child's play".

As *Discovering Science/Explorando* was created a review of the literature and field test guided the construction of the elements included in this program. The element of the science process, as it applies to early learning, are constructed bases on sound early childhood practices, theories of cognitive development, language development, problem solving skills and widely held elements in the scientific process.(Piaget, Vogotskey) The elements of scientific behavior were isolated to allow teacher and children to label behavior as they explore. This also allowed for the introduction of pictographs, which are designed to guide children through new and old materials towards open-ended exploration. After careful thought, the following three behaviors were identified as basic to all experiments and then incorporated into the *Discovering Science/Explorando* program:

Observation: First, all experiments start with observation, whether the scientist happens to be an eighteen month old or a nuclear engineer. In all the research and field testing, the good scientists saw, heard, smelled, touch or tasted something that caused them to question, think, wonder and become curious.

Comparison: The next step in this science problem solving approach is

comparison. This is what we as humans do when we try to solve a problem. We look at our prior experiences (knowledge), and we compare it to our new situation. This stage of comparing means that there will be some manipulation of materials. As adults this might be mathematical, something in writing, for children it is ALL HANDS ON!

Recording: To bring closure to this thinking pattern, the last step in the process is recording, data collection or documentation. This is a very important element in every experiment. It provides an opportunity for children to demonstrate their ability, to reflect their thinking, to work out solutions and make commitments to what they think happened in each experiment. It does not require skill in writing children can record with a paint brush, a few lines, a computer a recording, or a dictation.

These three steps (observation, comparison and recording) are the basic problem solving steps that *Discovering Science/Explorando* has identified as most appropriate with all children particularly with younger children (toddlers to two-year-olds). The older pre-schoolers and elementary age children are capable and interested in more elements of the science process, therefore we can identify more specific elements in the process to guide children behavior.

Each of the above mentioned elements can additionally be defined. When we compare we: **measure, question, predict** (perditions can lead to new experiments and explorations.)

Recording can be further defined in to **describe and discover. Discover** is an essential element of science with out it the natural curiosity is not satisfied and new experiment do not happen. Experiments planned for more sophisticated thinkers include elements that require; **measuring, predicting, questioning, describing and discovery**. The record phase will evolve naturally as children grow and develop in skills, knowledge and understanding of their world. Some children are physically, intellectually and emotionally more able than others to draw, dictate, write or record their thoughts and feelings about a given experience. So, experiments for pre-schoolers group reflect a wider range of abilities.

An important facet taken into account when developing this

program was the strong link between math and science. Math and science are both problem solving and process oriented--both intimately interrelated Therefore elements for each are present in experiments presented in this program.

The experiments presented in this session are from the Introduction to Science and from Natures Secrets

NATURES SECRETS

When was the last time you went to a magic show? Did you notice how much science was a part of the show? Magicians use physics and chemistry to Dalzell their audiences. The experiments in this Focus are some of those fun, funny things from science that seem like magic. It is an opportunity for children to acquire physical knowledge of some of nature's wonders so that as they mature intellectually they will see the magic as part of science.

This Focus lends itself to creativity. There are many opportunities to add experiments and invite children to make up their own to add to the science center.

The units in this Focus deal with simple physics and chemistry. Simple every day occurrence will be examined and used to provide children with opportunities to explore their world.

SPECIAL NEEDS

HEARING IMPAIRED. The experiments with reactions have some sound attached to them. It would be a good time to encourage a deaf child to feel the reaction, as you sign the *fizz* or another word that might explain the sound.

VISUALY IMPAIRED. Provide opportunities for children to touch and taste (were appropriate) all the ingredients of the experiments. Verbally label the ingredients and materials with the appropriate words. Allow children to touch all parts of the experiment when safe to do so. For example, when blowing bubbles allow children to gently feel the top of the cup or blow a bubble on their hand. With the experiments that have reactions encourage children to feel the top of the cups. Provide as many tactile clues as possible. When setting up the experiments for the children keep materials on a tray, organized in a consistent fashion. This will provide children with clues so that they can achieve their maximum potential.

MOTOR IMPAIRED- If children have limited range of motion a friend can be assigned to be their helper for the day. That child who is the helper can pour, use dropper and other materials that may be two difficult for the child to manipulate. Ask the help to encourage his /her friend to tell them what goes next and help them with what they can do. This works better than you may think, Children can be very compassionate. Adaptive spoons and other eating devises may be helpful when they are available for children with motor problems.

MAGNETS AND MAGNETISM

The Magic Magnet Which One is Magnetic?

Magnet activities have been around for a long time in preschool classroom. In fact in some cases they are the only thing in the science area. Children sometimes look at them and go on because there is no process. Nothing to use the magnet with. The experiments here and the ones we hope you will create should be ones that allow children to fallow a process and invite interaction to facilitate discovery the wonders of magnets.

MAGNETISM

Magnetism occurs naturally in a few minerals. Lodestone, is a natural magnet. A few ores such as manganese, nickel and iron-titanium become magnetic when heated. Other minerals such as crystals have electrical properties and can control radio wave. Some minerals when heated can change there polarity from a positive to a negative charge.

When we talk about magnetic pull we are referring to the positive and negative poles attracting each other. If you put the two positive poles together they repel or push off. The stronger the magnet the stronger the pull together and the harder they push apart. In The Magic Magnet the children will pull item along with an invisible energy. That is the power of magnets. Magnets are used in all kinds of industrial area to pull cars up in junk yards and to keep motors turning. Magnets are a part of radio and T.V. speakers. As a matter of fact that is the least expensive and best place to get magnets. The only problem is that some of them are to heavy or too powerful to use with very young children.

<u>Magnet field</u>. Is that a field were they grow magnets. No! It is the space around the magnet within which it can effect iron or steel objects. Spaces were there is an appreciable magnetic force.

Did you know that a Magnet only works on Iron or Steel. It wouldn't pick up aluminum, gold or silver, try and see. Why does that happen?

Which one is Magnetic allows the Explores to experiment with a magnet and sort items. The items should be changed frequently so that children will not lose interest. You could let them bring items in to add to the tray. The idea here is that children classify. The explores may not understand magnetic field but they will have the opportunity to classify material that were attracted to the magnet and those that were repelled. It is important is that the appropriate vocabulary be used so that children can begin to identify what is happening in the experiment.

ADDTIONAL EXPERIMENTS

With older children you can map the magnetic field.

Placing the magnet in the center of a piece of paper.

Draw a line around the magnet.

Place iron or steel objects close to the magnet.

Make a mark at each point were the magnet pull the object to it. A (+) could be placed were it attracts the an other magnet and a(-) where it repels the other magnet. You could also use different color to indicate whether the item was attracted or not.

PRECATIONS

Magnets are lots of fun but there are some things that are important to remember. Some magnets are very strong and if children finger are between them they can pinch. The ceramic bar type are one of the best specially for the younger group. The magnets form speaker on old cars or stereos are stronger and a lot of fun, one at a time. They can pinch finger and are heavy so explain to the children what is expected of them. Avoid using them with the toddlers.

CAUTION Do you have a computer? If so, keep the magnet far away. Magnets can wipe out your program. Computers, and other electronic do not mix with magnets!