resources for early childhood

An Online Resource for Ohio Educators

Early Childhood Building Blocks

Introducing Science to Young Children

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Introduction

As adults, we often think of science as a subject that children don't encounter (or need to) until later in elementary school. We see it as being too formal and too abstract for young children. We also think of science as being teacher directed—the opposite of what we often feel is appropriate for young children. But science is a way of looking at the world rather than a collection of abstract facts or a static body of knowledge (Gallenstein, 1999). True science is at the heart of what young children do naturally every day.

What's Inside

What Is Early Childhood Science?

Many think of science as a collection of abstract facts to be memorized, and early childhood teachers often do not feel comfortable with science content, thinking that they don't really know or understand the "facts" of science. Early childhood teachers must let go of the image of themselves as the suppliers of the answers and begin to see themselves as co-explorers in the search for understanding. The teacher in the early childhood setting should be offering children opportunities to think critically, solve problems, make good decisions, be curious and open-minded, and develop a positive approach to failure. Especially during the early childhood years, science is much more about these skills (known as process skills) than it is the facts, and teachers don't always need to know the "answers" to be good science teachers. Instead they need to know how to ask the right questions and how to explore alongside their children. In early childhood classrooms, extending the possibilities for exploration of ideas, and thus the amount of physical knowledge a child has, should be the main focus of the teacher (Ansbacher, 1987). Skill and concept development begin to come into play more during the early elementary years.

So teachers who are worried about their lack of knowledge about science content can relax, knowing that giving children the opportunity to use and practice process skills is the most important science education they can provide. By using process skills, young children are also developing inquiry skills that are so vital to truly successful science learning. The sections below introduce each process skill briefly, followed by an example of how it might look in an early childhood setting taken from a long-term project in a preschool classroom.

Observing

Describing the world around you.

Using the senses and other "tools" to gather information about an object or event.

Identifying similarities, differences, and details.

Observing may include the process skills of:

- *Measuring.*
- *Comparing — Finding similarities and differences.*
- *Categorizing/classifying — Grouping things according to certain characteristics.*
- *Counting.*

The children observe that the snow on the playground from the last big snowfall has begun to melt, and they begin to ask questions about what is making it melt. Children use yardsticks to measure the snow every day and generate questions about what is making it melt.

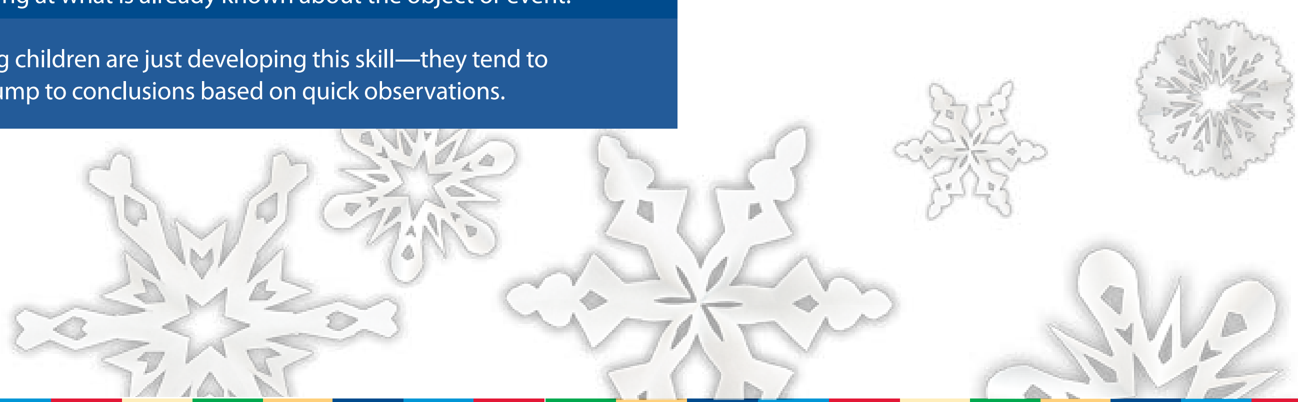
Inferring

Reading between the lines, making assumptions. In early childhood these assumptions are often false, but it is important to let the children continue in their thinking rather than to correct them.

Making preliminary conclusions that have not been actually observed, by looking at what is already known about the object or event.

Young children are just developing this skill—they tend to jump to conclusions based on quick observations.

The children infer that it is the light from the sun that is making the snow melt. They come to this conclusion based on their observations while being on the playground.



Questioning

Raising questions about objects, events, or phenomena.

Good questions often begin with "What causes...?" "How does…?" "What makes…?" "What if…?" "Why…?"

The teacher in the classroom records their questions. "Why does the snow melt?" "How could we find out if it is the light that makes it melt?" "Does the snow still melt at night?"

Hypothesizing

Giving possible explanations.

Forming a preliminary explanation or testable statement, based on experience.

Encourage explanations with "I think…" "What do you think…?" "Why do you think…?"

Based on their observations and questions, the children form a hypothesis that it is the light from the sun that makes the snow melt.

Planning

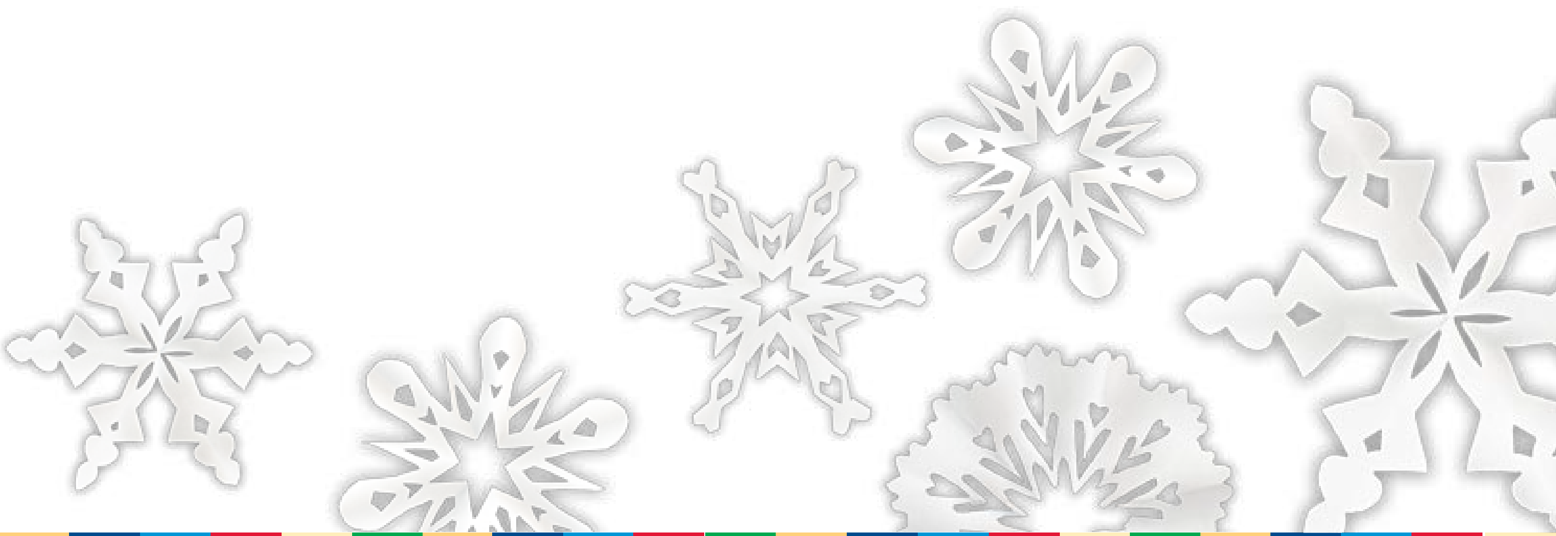
Devising investigations to test a hypothesis.

Designing one's own investigation using procedures to collect information.

Planning is not always formal.

"How can we find out?"

Together the teacher and the children plan some experiments to see if their hypothesis is correct. They make various plans for how they will bring snow inside and place it under lights to see what happens.



Predicting

Using ideas or evidence to predict an outcome.

- Stating the outcome of a specific future event based on a pattern of evidence or an explanation.
- Often involves an action and a reaction or an if-then statement.
- A prediction is not a wild guess.
- You may have several predictions.
- "What do you think will happen when…?" "If we do…, then what will happen?"

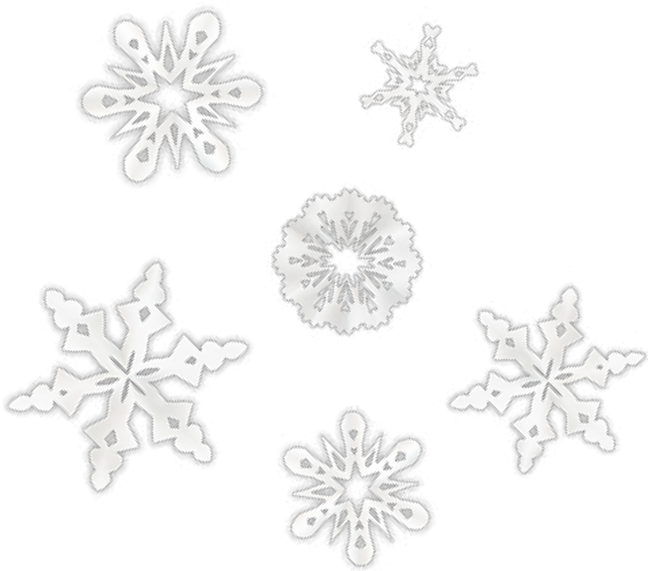
Before each of their experiments, the teacher asks the students to predict what they think will happen. These predictions and the results of the experiments are put on a chart for the children to use to make new predictions.

Investigating

Conducting an "experiment," testing your ideas.

- Carrying out a planned experiment based upon your hypothesis. In early childhood, experiments may be spontaneous, but as children get older (three years and up), we can help them be more thoughtful about planning their investigations.
- Investigations use most of the previous process skills.

The students bring snow in from the playground in a bucket, place it under a light in the classroom, and carefully observe what happens. When the snow melts, they insist that their hypothesis was right. The teacher pushes them to investigate and be sure that it was really the light that caused the snow to melt by asking them how they can be really sure that it was the light and not something else. The children then decide to put the snow in the closet where there is no light and see what happens. When the snow again melts, they decide that some light must have slipped in and place another bucket of snow in the closet, this time taping all the possible space where light could slip in. At the end of each experiment, the teacher takes them back to their predictions, and they compare the results with the predictions and ask a new set of questions.



Interpreting

Considering evidence, evaluating, and drawing a conclusion.

Drawing conclusions by looking at the "data" or what happened.

Finding a pattern or other meaning in what you saw.

Allows you to answer the questions "What did you find out?" and "What did you see/hear/etc.?"

The teacher asks the children at the end of every experiment what they found out. In the first two experiments, the children believed that they found out that light was indeed what made snow melt. But the last experiment called those ideas into question, and the teacher helped the children brainstorm about what other factors might have caused the melting. When the children determined that the heat from the room, the light, or the sun could have been what caused the melting, they decide to try to melt snow on the stove. When they see it very quickly melt, they decide that they have reached a conclusion.

Communicating

Presenting reports, using secondary sources.

Representing observations, ideas, conclusions, or models by talking, writing, drawing, etc.

"Can you tell me what happened?" "Can you draw a picture of what you saw?"

Throughout the project the teacher is helping children to record their ideas and observations in journals, on charts, and with drawings. As well, children are encouraged to talk about their ideas in a large group after each experiment.

Relating and Applying

Connecting knowledge to other situations.

Relating makes parallels to similar concepts.

Applying uses the knowledge gained to help solve a challenge.

"Where else do you see…?" "What if we did this with…?"

The teacher extends the learning by helping the children think through various ways these same ideas apply to other situations. For example, they investigate what else melts with heat and how the heat from the sun contributes to other factors such as the growth of the grass or the dryness of the dirt.

Conclusion

Children are naturally curious, and curiosity is at the root of all science exploration. This curiosity reveals itself as a passion for learning. It is our job in early childhood settings to ignite and fuel this passion. If this passion turns into drudgery, one out of four children will leave school before they graduate (Johnson, 1998). Some of the most important theories of appropriate early childhood education (Reggio Emilia, Montessori, High Scope) say that the role of the teacher is to be the facilitator of learning—to encourage children to ask questions and find ways to answer these questions by doing. This approach is especially suited for early childhood science—as children participate in this kind of learning environment, they develop the vital process skills needed for science learning.