Practicing Science Process Skills at Home

A Handbook for Parents By
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Handbook Objectives

After reading this handbook, you will be able to:
1. Name the major science process skills
2. Understand how we use science process skills not only in the "lab" but in everyday life
3. Better understand how to practice science process skills with your children
4. List activities you can use to teach the science process skills

SCIENCE PROCESS SKILLS

Science process occurs naturally, spontaneously in our minds. By logically breaking down the steps in our thinking, we can use *science process* to find out how to answer our questions about how the world works. *Science process* is not just useful in science, but in any situation that requires critical thinking. Science process skills include observing qualities, measuring quantities, sorting/classifying, inferring, predicting, experimenting, and communicating.

Take a few moments to check off the strongest and weakest science process skills you feel you and your child possess on the table on the following pages.

Science Process Skill	Description	Me		My child	
		Strong	Weak	Strong	Weak
Observing qualities	Using the five senses. Using words to describe what is seen, felt, heard, smelled, and (if appropriate) tasted. Notice details. Break things into parts. Name and describe the parts. Draw what you see and label parts of the drawing.				
Measuring quantities	Using numbers to describe an object, for example by counting parts, measuring different parts with a ruler, weighing with a scale or balance, and comparing objects using quantities (Eg. 2 apples weigh the same as 1 mango).				
Sorting and classifying	Make up categories and group things by breaking them down. (Eg. These are all buttons. Now I will put in a group buttons that are red. Now in that group I will separate buttons that are red with 2 holes and buttons that are red with 3 holes, etc.)				
Inference	What are your assumptions? I assume this is an insect because it has six legs, and when I've seen insects before they have six legs. What have you seen before that reminds you of this? Why do you think that's going to happen?				

Predicting	What's going to happen? If I do this, this will happen… How will we find out what will happen? What are we going to do to find out what happens?				
Experimenting	I wonder what will happen if we do this? I predict that this will happen. What do I have to do to find out if I'm right or wrong? What materials will I need? What steps will I take (procedure)? What needs to happen for my prediction to be right? How will I know if I'm wrong? How will I measure it? Was my prediction right? If so, why? If not, why not?				
Communicating	Sharing ideas through talking and listening, drawing and labeling pictures, drawing and labeling graphs and acting things out.				

We will often have questions after observing something. ***Observing qualities*** is the first step in science process. What details do I see? Can I smell it, touch it, hear it, or taste it? Can I break it into parts? What is happening? "I noticed Ms. Vitti has a large, rough object in her hand. It looks like it has sharp edges and I believe it's a rock. I wonder, what will happen if she throws it?"

Math is another way to communicate in science. By ***measuring quantities***, when I say it rained 2 inches last night, we get the same picture in our minds. "The object in Ms.Vitti's hand probably weighs more than an apple, but weighs less than a bowling ball" (How much do you estimate it weighs in pounds?)

Finding patterns is one way we organize our thinking. When we ***sort and classify***, we separate and put things together to understand how they relate to each other. "That looks like a rock. I know that shape and size are hard and have sharp edges. I could classify it with other rocks, other heavy objects, sharp objects…" (Knowing that it is a fake sponge-rock, would you re-classify it?)

When we are surprised, it is because we had an idea that things were going to happen differently. This is called ***inference***. You may have been surprised to

find out the object in Ms.Vitti's hand was actually a sponge that looked like a rock. Why were you surprised? Would you be surprised if we did it again? The way we think in science is shaped by our everyday experiences.

What do we think is going to happen? ***Predicting*** or hypothesizing is a way of testing how well we understand something. Before doing something, we can say or write a prediction to see if we're right. Before Ms. Vitti threw her object, what did you think was going to happen? Why?

How can we know if our prediction is right? ***Experimenting*** is how we find out. What do we need to do to find out the answer to our question? How will we know if we were right? How do we know if we were wrong? Can you explain things in a different way? Make a plan and do it! Did the object in Ms.Vitti's hand behave like a rock when she threw it? Was your prediction right?

When we are ***communicating***, we find ways to share the steps we took in our process. We learn from listening and answering questions. We find creative ways to explain our thinking. At this science fair, you will have a chance to look at drawings, read writing,

and communicate to learn more about science process skills.

EXAMPLES OF HOW TO PRACTICE SCIENCE PROCESS SKILLS

<u>Observing qualities:</u>
- During cooking, use senses to observe changes. Smell and taste ingredients.
- Watch birds, squirrels, and pillbugs. Notice what things are the same, what things are different.
- Start collections of flowers, leaves, and seashells. Make drawings. Label parts.
- "Do all leaves have veins?" "Do all leaves change color?"
- "What happens to the paint when you add more water?"
- "Does the toy boat float better when we add more bubble bath to the water?"

<u>Measuring quantities:</u>
- Measure during cooking.
- Follow recipes.
- When driving places, estimate distances and check with the odometer.
- Count at the grocery store. "We need 3 apricots, help me count, 1, 2, 3…".
- "How many chips are in your bag of potato chips?" Measure how long it takes to do things.

- "How long does it take you to get ready for school in the morning?"
- "How long did it take us to drive to school? How far was it?"
- Weigh things. "How much do you weigh with your backpack on? With your backpack off? How much do you think your backpack weighs?"
- Practice fractions. "We have one pie. How many people want to eat pie? How many pieces do we need? Help me cut and count".
- "How many pizzas do we need for this many people? How many slices in each pizza?"
- Use money. "This costs $1.00. How many quarters is that?" "I gave the cashier $1.00. How much should I get back?"

Sorting/Classifying:
- Play "what doesn't belong here" and take turns. Explain what qualities you look for in classifying. Use quantities too. "Each of these leaves has 3 lines".
- Sort laundry together.
- Sort silverware together.
- Organize and put away groceries.

- Dump out a junk drawer and organize it. Organize toys and label containers.
- When grocery shopping ask what aisle would you find eggs in? Apples? Cheese? Etc.

Predicting:
- "What will happen when I put this in the microwave?"
- "What will happen when we add salt to boiling water? What will happen when we add salt to ice?" Find ways to use measurement to make predictions. "How many seeds will be in this watermelon?"
- "How big do you think our avocado seed will be?" "How many miles to grandmother's house? How long will it take? Which one is farther, your friend's house, or grandma's house? How can we find out?" "How many robins will we see on our walk?"
- "How many of the seeds that we plant in our garden will sprout? How many days until they sprout? Which will grow faster?"
- "How many rungs on the monkey bar can you do without needing help or falling?" "Did you make it half-way?"
- "Before I turn the page of this book, what do you think is going to happen? Why do you think that?" (and then, "What happened? Was your prediction right? Why or why not?")
- Before the commercial is over, "What do you think is going to happen next in the TV show? Why do you think that?"

Inference:
- "Who do you think is the tallest person in our family? Why do you think that? How can we find out?"
- "What do you think is going to happen? *Why* do you think that? How can we find out?"
- "What things remind you of this object? *Why*?"
- "How much time is left until we get there? *Why* do you think that?"
- "Have you seen this before? Have you seen something like it before?"
- "Where did this come from?"

Experimenting:

- I wonder what will happen if we plant this bulb upside down in our garden. Will it still grow? I predict that _____. Make a plan to find out and track results. Discuss the results.
- I wonder what birdseed the birds like best. I predict they will like the sunflower seeds more than the mixed seed. Make a plan to find out and track results. Discuss the results.
- I wonder if I can ride my bike faster if I crouch down on my bike. I predict I'll ride faster crouched down than riding with my back straight and head up. Make a plan to find out and track results. Discuss the results.
- I wonder if the water balloon will break easier if it has more water in it. I predict that it will. Make a plan to find out and track results. Discuss the results.
- I wonder if I can make a taller sandcastle if the sand is wet. I predict that _____. Make a plan to find out and track results. Discuss the results.

Communicating:
- If your child is trying to explain something to you, but you don't understand, you can ask them to show you what they mean.
- Model communication by writing, speaking, and demonstrating yourself
- Help your child communicate to resolve a conflict with a peer or sibling.
- Write a letter to share information to a family member.
- Make a graph of candy collected from holiday celebrations
- Make maps
- Play 20 questions
- Draw or paint pictures of things observed (ie. painting the rainbow after the sunshower)
- Talk through the steps of a process such as dribbling the soccer ball or tying shoes
- Keep a vacation journal or scrapbook
- Think-Aloud...this models your thought process

OTHER ACTIVITIES THAT ENGAGE KIDS IN SCIENCE

Miss Torres and Ms.Vitti remember some of the experiences when they were little that really opened their eyes up to science. The two most important elements: ('unstructured') time to play and explore, and sharing the activity with someone we loved and looked up to (parent, sibling, cousin, teacher, etc.).

- Trips to museums
- Trips to the beach and other places in nature
- Cooking activities
- Gardening
- Making messes (With glue, with mud, with yarn, with paint, with clay, with sand, with water… summer is the perfect time to lay some plastic bags outside, dress kids in old clothes and let them explore and investigate the properties of things with their five senses…)
- Take apart an old clock or telephone together
- Build something together, a piece of furniture, a birdhouse…
- Take walks in all kinds of different weather
- Have conversations about everything