Teaching Science Skills

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There are three key components of teaching kids about science:

1. Content – "what" we teach. Follow your child's lead – answer their questions, help them pursue learning more about their favorite topics. Look for teachable moments when they notice something to talk about the science behind it. Don't feel you have to be an expert who knows all the answers – you can learn alongside them – reading books, watching videos, and looking up answers to their questions to model how learning happens.
2. Attitudes – "why" it's important (and fun!!!) to learn science. As teachers or parents, when we show enthusiasm about science, when we demonstrate being curious and imaginative, and we get really excited about finding an answer to a question or solving a problem, our kids begin to view science as a powerful and rewarding subject. If we try something and it fails, then adjust our plan and try again, we model persistence and a growth based mindset.
3. Skills – "how" we teach. As your children explore new things, we can guide their learning using six *science process skills*. Let's look at those skills, from simplest to most complex:

Observation

Observation is the fundamental skill of science. We observe with all our senses. One of the best ways to support science learning is to help them *observe more closely* – look for more details.

We do this by asking questions: When a child is looking at something new, ask what they notice about it. They begin with a simple observation. "It's a leaf." If we ask them to describe it, they choose one way to describe it: "it's green." Encourage them to think in more depth by asking what they observe with each of their senses: what does it look like? smell like? taste like? sound like? feel like? Show them more ways to explore it… pick it up, turn it over to look at it from all sides, see how it interacts with other things (can you cut it with scissors?), shake it to see if it makes noise. Introduce tools which enhance their observation, such as a magnifying glass.

Communication

Observing and communicating those observations go hand-in-hand. To communicate new learning, children need to learn lots of new words – adjectives to describe what they observe. While your child is observing the different between different plants on the hiking trail, to describe different leaves, you might teach the words serrated, or glossy, or brittle, or even variegated all depending on what kind of leaf they're observing. If they were describing music, we might talk about tempo, mood, etc.

As they're observing, encourage them to draw a picture or write a description. This will bring up questions for the child which motivate them to look more closely to figure out how to get their description right. As they write or draw, ask more questions to help them notice finer details.

One key point of communication is knowing your audience and explaining it in a way they can understand – for example, if your child is telling grandma all about a video game grandma has never seen, you can encourage your child to give more details or find a different way to explain.

Measuring

Measuring is a special case of observing and communicating. Observing how big something is by measuring it against something else, and then communicating that information to someone else using commonly agreed upon units. Counting and weighing are part of measurement. Saying a tree was "ten feet tall" makes it clear to everyone exactly how big it was.

It is easy to incorporate measurement into play. Just ask: how tall is your tower, how far can you jump, how many seconds does it take you to run to there? Teach your child how to use measuring tools with standard units, but also show that it's fun (and sometimes useful) to use non-standard measurements. Maybe the snake puppet is 10 dominoes long. If I'm wondering if something will fit somewhere, I can take a piece of string or of paper to measure the space.

Classifying Into Groups / Sorting

Sorting is a way of creating order, or making sense out of a large collection of objects by using observation skills to notice what things have in common with each other and how they are different. One method of classifying is putting things in serial order: lining up from smallest to biggest, or arranging them by color in the order of the rainbow, or smoothest to roughest.

Objects can be sorted into binary categories: magnetic or not magnetic; plastic or wood, vertebrate or non-vertebrate. These sort by a single criteria – you could also have more than two categories, such as sorting into: reptile, mammal, bird, fish, insect. You can also do a multi-stage classification. First, sort out the plastic toys from the wood, then sort the plastic ones by color, then sort the red plastic ones by size. We use this skill a lot when sorting laundry or when putting toys and art supplies away in the right bins.

Inference

An inference is an explanation or interpretation that follows an observation. We observe data with all five senses, but we infer meaning based on all our prior experience and knowledge.

Your child might observe that there's a mixing bowl, measuring cups, and baking ingredients on the counter. You might ask them what they think this means. If they say "we're making pancakes", you can ask how they know. They say "it's Saturday morning and sometimes we make pancakes in Saturdays… so if all those things are out, I bet we're making pancakes."

Ask your child about their assumptions: *why do they think that*? Ask: what does this remind you of? Help them sort out the difference between facts – anyone looking at this object would see the same thing – and inferences – different people could interpret this data in different ways, based on their experiences. Or we might interpret it differently if it weren't Saturday morning.

Prediction

A prediction is an educated guess, based on our observations and inferences, about future events. It is always based on data. We identify trends in the data which let us predict what will happen. Predictions can be tested: if I do X, does Y happen? "If I put this in water, do you think it will sink or float? Why do you think that? Will the same thing happen every time we try it?"

How children benefit from learning science process skills

The better they get at using all these skills, the better they will learn science. But these skills go beyond just science! Measurement teaches math skills. Communication builds language skills. Sorting, inference and prediction teach critical thinking skills. And all these skills can be used in everyday life tasks, and in helping kids make sense of their world.

Resources for learning more:

- My blog InventorsOfTomorrow.com contains more details on these skills and LOTS of hands-on science activities, based on 40+ themes, from dinosaurs to space travel.
- Practicing Science Process Skills at Home: https://static.nsta.org/connections/elementaryschool/200712TorresHandoutParentNSTAConn.pdf
- Teaching Science Process Skills: www.longwood.edu/cleanva/images/sec6.processskills.pdf