Tips for leading hands-on activities

Encourage exploration
Provide positive feedback and assistance when people need it, but let them experiment and learn for themselves. Don't insist people do things the "right" way—sometimes learning how something doesn't work is just as valuable as learning how it does work.

Ask open-ended questions
Help people observe and think about the activity. Try to use questions that have more than one answer, such as: "What do you see happening?", "Why do you think that happened?", "What surprised you about what you saw?", and "Does this remind you of anything you've seen before?"

Be a good listener
Be interested in what your learners tell you, and let their curiosity and responses drive your conversation forward.

Share what you know
Use clear, simple language. Focus on one main idea—you don't need to explain everything at once! Start with very basic information, and then share more with interested learners.

Use examples from everyday life
Familiar examples can help explain abstract concepts. Be aware of different abilities, keeping in mind that children do not have the same skills or vocabulary as adults.

Offer positive responses
If people haven't quite grasped a concept, you might say, "That's a good guess!" or, "Very close, any other ideas?" Don't say, "No" or "Wrong." You can offer hints or suggestions for things to think about or watch carefully. (See the other side of this sheet for positive ways to deal with difficult concepts.)

Share accurate information
If you aren't sure about something, it's ok to say, "I don't know. That's a great question!" Suggest ways that learners can find out more, either by trying another activity or looking up information at the library or online.

Remain positive
Maintain an inviting facial expression, positive tone, and open body language throughout the interaction.

Have fun!
A positive experience will encourage learning.

Using positive responses with difficult concepts

What are misconceptions?

Throughout life we make observations and form patterns to try to understand the world around us. People often use mental shortcuts grounded in previous experiences to make sense of difficult scientific concepts. But sometimes these mental models are incomplete or are too simple. Our intuitive reasoning can lead to incorrect beliefs that are hard to change, even in the face of new information. These types of strongly held beliefs are called *misconceptions*.

For example, one observation we make at a young age is that the closer you are to a hot stove, the hotter you get. This observation can lead to the common misconception that warmer temperatures in the summer happen because Earth is closer to the Sun. The scientific explanation for seasons on Earth is a more difficult concept to understand—involving the angle of Earth and the amount of light reaching the planet. It's important to be aware of the misconceptions we may all have about Earth and space science as we explore these activities.

Building scientific thinking

Overcoming and avoiding misconceptions requires more than just providing the correct scientific explanation. Hands-on activities are a good way to help learners think more scientifically about the world around them. When a difficult concept comes up, try to build on previous knowledge and experience in a positive way.

- Help learners express their thinking by asking open-ended questions.
- Suggest the learner consider new information. Use the activity or model to demonstrate evidence and support a new way of thinking.
- Listen to the learner and respond to what they are saying. Try the "Yes, and…" approach, borrowed from improvisational theater. YES, I acknowledge something you said that is helpful to understanding this concept, AND I would like you to consider some new evidence that will help deepen your understanding.

You might hear…	And respond with….
"The Earth is flat."	YES, Earth does look flat to us, AND that's because it's so big that we can't tell that it's actually shaped like a ball. Let's examine this scale model Earth experiment.
"Earth is hotter in the summer when our planet is closer to the Sun."	YES, it is usually true that when you get closer to something hot you get warmer, AND let's try to figure out how it can be summer in the northern hemisphere, when it's winter in the southern hemisphere. Let's use this scale model of the Earth to chart changes in the amount of daylight during the year.
"An eclipse happens when Earth is between the Sun and the Moon."	YES, this is one type of eclipse, AND another type actually blocks our view of the Sun. A *solar eclipse* happens when the Moon is between the Sun and Earth. This model allows us to demonstrate how the Moon casts a shadow onto Earth.

Note: For specific misconceptions and difficult concepts related to each activity, refer to the activity's facilitator guide.

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