Supporting Scientific Discovery at Home:

A Caregiver's Guide

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How To Use this Document

These pages are here as a tool to support a conversation between you and the child/children you care for as you help them explore the world around them (near and far). They will support you in engaging children in conversations about a topic that they show interest in or are asking questions about already.

Specifically we provide sentence starters or things you can 1) say to children or 2) encourage them to say to engage in robust science conversations. This will allow you to become a facilitator of learning and outdoor exploration, rather than just answering a child's questions.

Each page will take one of the science practices from the Next Generation Science Standards (NGSS) children have been (or will be) learning in school and give tips for how to engage children in this practice at home.

Learning is not a passive event. The Inquiry Learning Cycle (Karplus & Thier (1967) reflects the active nature of inquiry. Driven by a child's natural curiosity, parents can support the movement through each step by encouraging their child to think deeply about what they are observing.
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Kids are curious by nature. They have lots of questions about the world they encounter, like the names of birds or insects the find. Often, as a caregiver, there is a tension between answering questions and missing an opportunity for children to explore, discover and make sense of the world on their own.

The role of caregivers is to facilitate kids' engagement by encouraging them to ask questions and observe the world around them. It is important to remember that **it is not your job to tell children what is known about a topic, but to allow them to think deeply** about a phenomenon (an observable natural event), ask questions and work towards answering those questions, often in a variety of ways. These frames will support you as you encourage children to explore their world.

Asking Questions

Sentence Frames to Use With Children

“What are you noticing?”
“What does that make you wonder?”

“What questions does that bring up?”

“Why do you think _____ is here?”

“_____ is happening?”

“Tell me more about what you see.”

Science begins with a question. Scientists make observations of a phenomenon, then ask questions about what they are seeing, hearing, feeling before developing/designing ways to answer the questions. **Encourage children to ask questions about what they are observing (what do they hear or see).** You can use these frames to encourage children to ask deeper and more complex questions about the phenomena they are observing.

Develop a Model

Sentence Frames to Use With Children

"What makes this a good habitat for __ ?"

"What patterns do you notice?"

"How does _____ connect to/effect ____?"

"Do you notice any differences between _____ and _____?"

"What new information are you adding to what you already know about _?"

"How does this new piece of information help you understand _____?"

Scientists make observations of a phenomenon, then ask questions about what they are seeing, hearing, feeling before developing/designing ways to answer those questions. As children make observations, they are building their internal model (set of ideas) about how the world works. **Ask children to explain what they are observing (what do they hear or see).** You can use these frames to encourage children to think about the system they are observing.

Plan to Investigate

Sentence Frames to Use With Children

“How might you test your theory [or hypothesis]?”

“What evidence would you expect to see?

“What data would you need to collect?”

“Why do you think _____ is an important part of the protocol?”

By becoming a researcher, children not only see themselves as scientists, but experts in their field (their own backyard). This shift in identity can be very powerful and should be highlighted. Have children look at their set of questions and think, “How might I answer this question?” Some questions might lend themselves to planning and conducting their own investigation to answer their questions. **Others can be answered by engaging in a citizen science project where researchers “engage members of the public to collaborate with professional scientists to collect data and produce new knowledge used for natural resource management or basic research.”** It is important for students to understand the protocols for the chosen project- what steps will help them answer their questions, what method will they collect data.

Analyze Data

Sentence Frames to Use With Children

“How did you decide what to record?”

“How did the protocol allow _____ ”

“How is this data being used?”

“How might you use this data?”

“Does the data you have recorded bring up any other questions?”

Children will be looking deeply at what information they collected, as well as the data collected by others. They are developing their expertise and identifying as scientists, becoming the experts of their own backyard. How to analyze that information to help them better answer their questions and what actions are taken because of that data becomes the next question. Making sure they reflect on their question, and how their data supports them in answering that question is important. Also, taking time to ponder the data to see if it brings up more questions as they collect.

Explanations

Sentence Frames to Use With Children

“Why do you think that might be occurring?”

“What evidence do you have for that claim?”

“Do you think there might be an alternative explanation?”

“Do other sets of data backup your conclusion?”

The goal of any inquiry focused project, such as a youth focused citizen science project, is to have ***students*** make sense of the world around them by posing thoughtful questions and making careful observations. As they are making observations and collecting data, they are able to begin to understand the system that is contained within their backyard. Having students explain their thinking, back up claims, draw conclusions from evidence can be a powerful tool in their sense-making as they construct their internal model of how the system functions. Caregivers can support this step by challenging students to back up their explanations and assumptions with evidence.

Argumentation

Sentence Frames to Use With Children

“What evidence do you have for that?”

“Does _____ support your claim?”

“Has that been observed by other citizen scientists?”

“What does the data show?”

It is important that, in taking on the role of researcher, children make note of evidence they find that both supports their claims as well as evidence that may run counter to their claim. As they take notes and analyze their data, encourage them to write down the evidence that they find to support their explanation, as well as keep track of data that may dispute their claim. Here is where looking at data collected by other fellow citizen scientists or professional researchers can support or contradict their claims.

Communicating

Sentence Frames to Use With Children

"Do you need to note _____?"

"How will you remind yourself about _____?

"Who else might benefit from or want to learn about your findings?"

"What evidence do you have for that decision?"

After becoming experts in their own backyard, children will be well positioned to begin advocating for change. While they are recording their data and taking notes, be sure to encourage your children to ponder how they will be evaluating their notes later, as well as communicating their information to others. Thinking about how to share their data and how that data will be used is an important practice in positioning children to view themselves as having the ability to make change within their community and beyond.