

Formative Evaluation: Chemistry Lab, Prototyping

Evaluation Goals

Primary:

- Find out what concepts visitors are taking away from the activities,
- See the extent to which children in the target age range are making **conceptual connections** between the activities and the big idea (below)

Secondary:

- Are participants engaged by activities
- Do they make connections to the “Search for Life” exhibition
- Do they see connections between the different activities in the room

Tertiary:

- Can participants conduct the experiments on their own without facilitation
- Any areas of difficulty or confusion in the instructions

Big Idea: The chemical ingredients needed for life on Earth are also found in other places in the universe. This means that the conditions for life might be right for life in those places too.

Each of the 6 lab activities illustrates how scientists search for life in outer space and is built around one of the following ideas:

- **Life in Water (2 experiments):** Water is essential to life on Earth. If we find water somewhere in the universe, conditions there might support life. Scientists believe that water’s special properties support the existence of life on Earth. Special properties include solubility, polarity (which helps water to dissolve things and capillary action).
- **Mars Dirt (3 experiments):** Scientists look for life on other planets by testing dirt from the planet for a reaction. Biological reactions show the presence of life but chemical reactions do not.
- **Spectroscope (1 experiment):** When scientists see evidence of elements that are present in all life on Earth in other stars/suns, they believe conditions might be right for life in possible solar systems there too. Scientists use a spectroscope to look for the unique patterns of light that are associated with elements that are essential to life on Earth.

Protocol/Instructions for Interviewers:

At the door:

- A “family group” must have at least one child in the 8-14 age range and 1 adult.
- The groups must be willing to be observed and be interviewed after each activity they do.
- If all activities are occupied, ask an entering group to wait or come back.
- Groups may participate only once: they may not leave and come back.

Interviewers:

- When a group arrives at your table, get demographic information first.
- Do NOT instruct: tell them that the activities were designed for family groups to do on their own: we are trying them out today to see how that works. If they absolutely can't figure out what to do, you may help them. Note on the form if they needed help.
- For each group, use 1 double-sided form. Side 1 is for your observations. Check ✓ the name of the activity. Record relevant conversation. When the group is finished doing the activity, ask the questions on side 2.
- Before allowing a new group to start, make sure all the forms are complete for the previous group; **make sure your handwriting is legible.**
- Observe the group as a whole but interview only children in target age range (8-14). If interviewing more than one child in a group, try to set it up so that children answer in order from youngest to oldest. Record adults' comments if they are relevant.
- When you write about or quote a specific person, please indicate which one by writing B9, M40, F60, G6, next to that comment.
- Do not mention title of “Search for Life” in Q 5. Do not tell “common theme” in Q 7 because visitors will be asked the same question in their next interview.
- If visitor does not understand the question, do not rephrase unless absolutely necessary, just repeat the question.
- If an answer is unclear, not understandable to you, or could be interpreted various ways, ask, “Can you tell me what you mean by that?” or “I don't understand, could you explain?”
- Always ask the questions in the same order, and ask the prompts each time unless they have already been answered.
- When the interview for your activity is finished, ask if the group would like to try another activity. They can try as many as they like, depending on availability.

Protocol Tip:

If adults attempt to answer for kids or to correct what they see as children's mistakes in answering, please state something like:

- *We need to hear from children directly to get information to make these activities work better.*

After all children in a group respond, adults' relevant comments should be noted

Interview technique:

- Maintain neutrality. In this case you do not teach, you listen and record, even if answer is incorrect. Do not volunteer or discuss your own opinions. Smile. Nod to indicate you are listening. Try not to say uh-huh too much.
- Never rush or interrupt. Allow time for visitor to think about a response.
- If the group seems to want to move on try to complete interview quickly. Stop if necessary