Purdue Agriculture PK-12 Workshop
"Youth Assessment Strategies"

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Sample of Evaluation Tools

Method	Evaluation Tool	Source	Website
Observation	ResearchLink Visitor Engagement Framework	Oregon Museum of Science and Industry (OMSI)	http://informalscience.org/evaluation/ic-000-000-010-295/ResearchLink_Summative
Interview	ResearchLink Visitor Interview		
Survey	OMSI Visitor Survey		
Observation	Microrobotics Visitor Tracking and Timing	Museum of Science, Boston	http://informalscience.org/evaluation/ic-000-000-010-318/RoboBees_Summative
Interview	Microrobotics Visitor Interview		
Survey	Microrobotics Visitor Survey		
Observation	PCOP Observation	CaSTL Boys and Girls Club Afterschool Program	http://informalscience.org/evaluation/ic-000-000-009-608/Chemistry_at_the_Space-Time_Limit
Observation & Interview	Science Teaching and Environment Rating Scale		
Survey	Adult Survey	Eight-Legged Encounters	http://informalscience.org/evaluation/ic-000-000-010-252/Arachnids_Final_Evaluation
Interview	Student Focus Group Interview		

APPENDIX A. Visitor Engagement Framework

Behavior types and descriptions are adapted from Barriault's Visitor Engagement Framework. Her framework consists of seven discrete learning behaviors that occur as part of a visitor's interaction with an exhibit. The learning behaviors can be grouped into three categories (initiation, transition, and breakthrough) that reflect increasing levels of engagement and depth of the learning experience. These behaviors and levels were then adapted for this project to suit the nature of hands-on facilitated learning experiences, rather than exhibit interactions. For this study, we also separated and added some additional behaviors in the breakthrough category.

Engagement and Learning Behavior	Description
Initiation Behaviors	
When visitors demonstrate these learning behaviors, they are taking the first steps towards a meaningful learning experience. ***Even though they are not yet completely involved in the experience, they are gaining some level of information through the interaction which, in turn, could lead to more learning****. Above all else, visitors need to feel comfortable about committing themselves to engagement. Initiation behaviors enable them to test the waters with minimum personal risk and provide an entry point into further learning opportunities offered by the activity.*	
1. Observes	Watches the demonstration and/or others participating with expressed interest
2. Physically participates	Physically participates in activity, but at a minimum level or simply follows directions
3. Answers simple question	Answers simple "engagement" question (e.g. yes or no?) from staff or group member
Transition Behaviors	
Smiles and outbursts of enjoyment along with repetition ***indicate that a level of comfort has been achieved and that visitors are willing, and even eager, to engage more thoroughly****. Regardless of whether the activity is repeated in order to better understand it, to master the functions, or to observe different outcomes, the net outcome is a more committed and motivated learning behavior.*	
4. Positive emotional response	Signs of enjoyment: smiling, laughter, verbal references (e.g. "this is fun/interesting"). Signs of eagerness to participate; excited disposition; invites someone else over to "try it"
5. More engaged in activity	Becomes more involved/engaged in activity (e.g. doing it more than once to achieve desired outcome, changes variables to look for a different outcome)

Engagement and Learning Behavior	Description
Breakthrough Behaviors	
Each of these behaviors acknowledges the relevance of the activity, and the learning gained from the activity, to the individual's everyday life. The learning behaviors in this category ***reflect a commitment on the part of the visitor to gaining information and knowledge and to further exploring the ideas being presented****. Their interaction becomes a meaningful learning experience that takes full advantage of the activity's learning opportunities. It becomes evident that the visitor is making meaning, building their own understanding of the concepts through prior knowledge, experience, and further inquiry.*	
6. Refers to past experiences	Makes connections with past experiences (e.g. "I saw that in a book and learned…", "This is like the exhibit over there on renewable energy…,")
7. Verbalizes connections	Makes connections with what they are observing (e.g. "Oh I see, this one is bigger so it gathers more energy...")
8. Seeks information	Asks questions to staff or visiting group about the topic/activity Reads signage
9. Shares information	Shares information (prompted or not) with staff or group members about topic or activity (e.g. explaining a theory, what they learned or observed, how to do an activity)
10. Deeply engaged and involved	Concentration and motivation are obvious; length of interaction significant; outcome or result of activity important, exploratory actions such as repeating the activity several times or significant discussion

APPENDIX B. *ResearchLink* Observation Sheet

Activity:	

Observer:	
Date:	

Age: Youth: 8–11 12–14 15–17 Adult: 18–29 30–50 51–65 65+	**Gender:** M F Unsure	**Time Spent:** min: sec

learning behavior	✓	notes
Observes		
Physically participates		
Answers simple question		
Positive emotional response		
More engaged in activity		
Refers to past experiences		
Verbalizes connections		
Seeks information		
Shares information		
Deeply engaged and involved		

Other notes:

Sheet #	
Entered:	
Checked:	

APPENDIX C. *ResearchLink* Visitor Interview/Survey Instrument

To be filled out by the data collector

Survey#_____ Date _____ Gender Respondent: M F **Approx. Age Respondent:** 18–29 30–50 51–65 65+

Group Composition: Alone Group

Number in group: ____ Adults ___ Middle/High School __ Elementary School ___ Pre-school __ Infants

Hi, my name is _____ , and I work for OMSI. We are currently trying to improve the demonstrations you just saw. We would very much appreciate you taking the time to talk with us about you and your group's experience with it. Nobody will see your responses. It's anonymous. Your participation in this survey is totally up to you and you can stop answer questions at any time or decide not to answer any questions you don't feel like answering. Would you like to participate in the survey today? Yes____ No____ (Data Collector: Thank and move on.)

Great! Then just to let you know this should take no more than 5 minutes. I will first ask you a couple of questions about your experience and then I will give you a ratings sheet to complete by yourself. We do it in two parts because we find it is the quickest and easiest way for our visitors to participate.

While you do this, we can stay and talk here or I can walk with you as you explore other parts of the museum. Sound good? Any questions for me?

Interview Questions

1. What was the most interesting or exciting thing you did or discovered during the demonstrations? [If they answer for their child, probe for them as an adult as well.]

2. How would you describe this demonstration(s) to a friend or relative? What would you say it was about? [Answer should be from the adult]

3. Was there anything new you learned that you didn't know before? [If they answer for their child, probe for them as an adult as well.]

4. [If educators] How, if at all, has this experience been valuable for you? /[If scientists] How, if at all, has it been valuable having a SCIENTISTS or EXPERT here to interact with you (and your family)?

Thank you! Here is the rating form for you to complete. It should take 1–2 minutes. If you have any questions, I am right here.

Everyday Encounters with Science

How can we improve?

Please circle what best describes your experiences at this OMSI activity. Please be candid and honest. We are trying to get an accurate idea of what our visitors enjoy seeing and learning about.

	Great	Good	OK	Fair	Poor
	5	4	3	2	1
1. Activity was					
Fun	5	4	3	2	1
Clear	5	4	3	2	1
Good topic	5	4	3	2	1
2. My (my group's) interest in this research area					
Before	5	4	3	2	1
After	5	4	3	2	1
3. My (my group's) understanding of this research area					
Before	5	4	3	2	1
After	5	4	3	2	1

4. Were you aware the research you heard about is local? ☐ Yes ☐ No ☐ Not Sure

5A. This experience <u>added value</u> to my visit today? ☐ Yes ☐ No ☐ Not Sure

5B. This experience made me want <u>visit OMSI again</u>? ☐ Yes ☐ No ☐ Not Sure

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
	5	4	3	2	1
6. Because of this activity					
I (my group) want(s) to know more about **this research area**	5	4	3	2	1
I (my group) want(s) to know more about local or personal **applications of this research**	5	4	3	2	1
I (my group) want(s) to know more about the **local scientists** working in this research area	5	4	3	2	1

About you (optional)

7. How often do you come to OMSI?

- ☐ First time visitor
- ☐ Rarely (every few years)
- ☐ Occasionally (1–3 times per year)
- ☐ Regularly (4 or more times a year)

8. Are you an OMSI member?

- ☐ Yes
- ☐ No
- ☐ Not sure

9. How interested are you <u>personally</u> in science?

- ☐ Not interested
- ☐ Somewhat interested
- ☐ Neutral
- ☐ Interested
- ☐ Very interested

10. Have you ever worked in a science, engineering, or technology related field?

- ☐ Yes
- ☐ No
- ☐ Not sure

Anything else?

11. Any additional thoughts or comments you would like to share about this program?

THANK YOU FOR YOUR TIME. HAVE A GREAT DAY!

APPENDIX E. Frequency and Examples of Observed Behaviors

ENGAGEMENT AND LEARNING BEHAVIORS	# of visitors	% of visitors	OBSERVED EXAMPLE OF BEHAVIOR*
INITIATION BEHAVIORS			
Observes: Watches the demonstration and/or others participating with expressed interest	75	91%	*Observes the facilitator and computer screen during the demonstration.*
Physically Participates: Physically participates in activity, but at a minimum level or simply follows directions	66	80%	*Covers solar panels with hands, using hairdryer and air can as instructed*
Answers simple question: Answers simple "engagement" questions from staff or group member	56	68%	*Answers a couple simple questions the facilitator asked such as which panel to cover or heat*
Total demonstrating at least one initiation behavior	**81**	**99%**	
TRANSITION BEHAVIORS			
Positive emotional response: Signs of enjoyment: smiling, laughter, verbal references	50	61%	*Smiles, says "Wow!" and after spraying panel with air can she raises hands in excitement*
More engaged in activity: Becomes more involved such as doing it more than once or changing variables	34	41%	*Tries a second activity, places ice on top of solar panel*
Total demonstrating at least one transition behavior	**59**	**72%**	
BREAKTHROUGH BEHAVIORS			
Seeks information: Asks questions to staff or visiting group about the topic/activity or reads signage	24	29%	*Asks question to facilitator "I don't understand how the load increases"*
Verbalizes connections within the activity: Makes connections about the concepts they are observing	21	26%	*When asked why panel output dropped she says "It doesn't get sunlight"*
Shares information: shares with staff or group members about topic or activity	15	18%	*Explains to companion and assists her as she operates tablet computer*
Refers to past experiences: Makes connections with past personal experiences	8	10%	*Says "we did something similar in Chemistry class"*
Deeply engaged and involved: Concentration and motivation are obvious; length of interaction significant; outcome or result of activity important, exploratory actions such as repeating the activity several times or significant discussion	18	22%	*Extended discussion with facilitator, "how well do these roofs work in Portland? It seems Portland would be the perfect place…"*
Total demonstrating at least one breakthrough behavior	**17**	**57%**	

*These examples are drawn from actual observations collected during the study

APPENDIX A: TRACKING AND TIMING

***Microrobotics Takes Flight* Summative Evaluation**
Visitor Tracking and Timing

Visitor Information

Adult F ___ # Adult M ___ # >8 Child F ___ # >8 Child M ___

Group type:
☐ Adults only ☐ Adults and kids ☐ Other: _____

Did the group visit:

☐ Intro Section
- ☐ Used hearphone
- ☐ Discussed with group members
- ☐ Watched intro video (right side)
- ☐ Watched spin browser video (left side)
- ☐ Turned spin browser wheel (left side)

☐ Body Lab
- ☐ Used hearphone
- ☐ Discussed with group members
- ☐ Watched video
- ☐ Lifted simple pop-up
- ☐ Lifted complex pop-up (with lever)

☐ Colony Lab
- ☐ Discussed with group members
- ☐ Completed activity
- ☐ Retries activity after completing

Number of times group completes activity: _____

☐ Brain Lab
- ☐ Successful combo present at start
- ☐ Used hearphone
- ☐ Used audio screen readout (large square button)
- ☐ Discussed with group members
- ☐ Tested any sensors or batteries
- ☐ Found one successful combination
- ☐ Found two successful combinations

☐ Focus visitor (if applicable): _____

Other Notes (who used the different components, conversations between visitors, questions about vocabulary/instructions, misuse of exhibits):

APPENDIX B: VISITOR INTERVIEWS

***Microrobotics Takes Flight* Summative Evaluation**
Visitor Interview

1. What are the ages and genders of your group members?

Group Member	Age	Gender
1		
2		
3		
4		
5		
6		
Other group members:		

2. What did you find most interesting about the exhibit?

3. What do you think the Museum was trying to have you learn about in this exhibit? [Probe]: Is there anything else you think the Museum was trying to have you learn about here?

3. What, if anything, did you learn that you did not know before? [Probe]: Did you learn anything else that you did not know before?

4. Did you do anything in this exhibit like what an engineer does? If so, what was that?

5. Think about a team of researchers trying to create tiny flying robots. Can you talk in general about the process the researchers might go through to make those robots? [Probe: Who might work on this project? What challenges might they face? How might they go about solving those challenges?] **[Note: Please write down or circle any probes you use.]**

6. What are two things you think the RoboBee could be used for?

7. Would you characterize your background in engineering OR science as low, medium, or high?

☐ Low ☐ Medium ☐ High (Visitor: _____)

Other visitors:
☐ Low ☐ Medium ☐ High (Visitor: _____)
☐ Low ☐ Medium ☐ High (Visitor: _____)
☐ Low ☐ Medium ☐ High (Visitor: _____)

7a. If Medium or High, please describe:

[Hand them the survey, let them fill it out, then take it back and look at Q1]

8. I see you marked [number] for question 1. Can you tell me why you chose that rating?

9. Is there anything else you'd like to add?

***Microrobotics Takes Flight* Summative Evaluation**
Non-Visitor Interview

1. Have you and group members looked at this exhibition about RoboBees before?
___YES ___ NO → [If yes:] "Thanks, have a great day!"

2. [If no, continue with the interview]: What are the ages and genders of your group members?

Group Member	Age	Gender
1		
2		
3		
4		
5		
6		
Other group members:		

3. Think about a team of researchers trying to create tiny flying robots. Can you talk in general about the process the researchers might go through to make those robots? [Probe: Who might work on this project? What challenges might they face? How might they go about solving those challenges?] **[Note: Please write or circle any probes you use.]**

4. Would you characterize your background in engineering OR science as low, medium, or high?
☐ Low ☐ Medium ☐ High (Visitor: _____)

Other visitors:
☐ Low ☐ Medium ☐ High (Visitor: _____)
☐ Low ☐ Medium ☐ High (Visitor: _____)
☐ Low ☐ Medium ☐ High (Visitor: _____)

4a. If Medium or High, please describe:

APPENDIX C: VISITOR SURVEYS

***Microrobotics Takes Flight* Summative Evaluation**
Visitor Survey

1. Please rate your agreement with the following statement:

	Strongly disagree				Strongly agree
The RoboBees project is finished.	1	2	3	4	5

2. Had you heard of the RoboBees project at Harvard University before today? ☐ Yes ☐ No

3. Please rate your level of agreement with the following statements before and after using the RoboBees exhibit today.

   When answering the questions, please answer them about researchers and engineers in general, not just the ones working on the RoboBees project.

	BEFORE using the RoboBees exhibit					**AFTER using the RoboBees exhibit**				
	Strongly disagree				Strongly agree	Strongly disagree				Strongly agree
I know what engineers do.	1	2	3	4	5	1	2	3	4	5
I know how engineering can be used to help society.	1	2	3	4	5	1	2	3	4	5
I know how engineering is different from science.	1	2	3	4	5	1	2	3	4	5
I am interested in engineering.	1	2	3	4	5	1	2	3	4	5
I know about some of the challenges researchers face when building tiny flying robots.	1	2	3	4	5	1	2	3	4	5
I know about some of the strategies researchers use to overcome these challenges.	1	2	3	4	5	1	2	3	4	5
Research teams may need to develop innovative methods to solve new research challenges.	1	2	3	4	5	1	2	3	4	5
Researchers may need to break into specialized teams to solve large research problems.	1	2	3	4	5	1	2	3	4	5
Research projects involve diverse groups of people encompassing a range of specialties and expertise.	1	2	3	4	5	1	2	3	4	5

***Microrobotics Takes Flight* Summative Evaluation**
Non-Visitor Survey

1. Had you heard of the RoboBees project at Harvard University before today? ☐ Yes ☐ No

2. Please rate your level of agreement with the following statements.

	Strongly disagree				Strongly agree
I know what engineers do.	1	2	3	4	5
I know how engineering can be used to help society.	1	2	3	4	5
I know how engineering is different from science.	1	2	3	4	5
I am interested in engineering.	1	2	3	4	5
I know about some of the challenges researchers face when building tiny flying robots.	1	2	3	4	5
I know about some of the strategies researchers use to overcome these challenges.	1	2	3	4	5
Research teams may need to develop innovative methods to solve new research challenges.	1	2	3	4	5
Researchers may need to break into specialized teams to solve large research problems.	1	2	3	4	5
Research projects involve diverse groups of people encompassing a range of specialties and expertise.	1	2	3	4	5

APPENDIX D: SUPPLEMENTARY DATA

TABLE 8. Post Group Responses to Question 1, "What was most interesting to you about the exhibit?" (N=41).

Code	Number of Groups	Example
The RoboBee's small size was interesting	13	[M1, 56]: Amazing how they can make something that small…
The general features of the exhibit were interesting	10	[M2, 10]: The game and the popups and video. [M1, 13]: The game. Liked how it has a model of one [RoboBee model].
I didn't know the RoboBees project existed	9	[M2, 81]: What I found interesting was I had no idea such a project was underway.
What the RoboBee will do (fly, be independent, etc.) was interesting	8	[F1, 52]: Little RoboBee is incredible…the fact that it can fly.
The RoboBees team is developing innovative methods to solve research challenges	6	[F1, 32]: The fine tuning. Which sensors to put on.
RoboBee technology could be used for many different applications in the future…	6	[M1, 12]: The purposes--military stuff. [F1, 65]: Why we're doing it.
General thoughts about RoboBees, e.g. "How it works"	4	M1, 63]: Demonstrate how research is done.
I'm an engineer or technical person	4	[M1, 24]: …I was a math kid, so having it explained this way made things easier for me.
Asks questions about purpose or effects	3	[F1, 47]: …But to be honest I would like to see the purpose or use of the technology. Maybe I didn't see it. It's hard to build, but what's its purpose?
I don't know/I'm not sure/I didn't read much	3	[M1, 24]: As I said, didn't look much.
The technological advances of the project were interesting	2	[M1, 64]: The innovation.
Watching a group member use the exhibit was interesting	2	[F1, 67]: Watching him do it.
Bees, colony collapse, or pollination was interesting	1	[M1, 10]: …Bees are dying because of… I forget
There are women working on the RoboBees project	1	[F1, 62]: …Females involved in it, not male dominated.
...but the project is not yet finished	1	[F1, 62]: The fact that I never knew RoboBees existed. Not here yet, but coming.

Write Actual Time Here→												
Observation Category	**5 min.**	**10 min.**	**15 min.**	**20 min.**	**25 min.**	**30 min.**	**35 min.**	**40 min.**	**45 min.**	**50 min.**	**55 min.**	**60 min.**
Type of Classroom Involvement by Students												
Class Listening to Teacher												
Group Listening to Teacher												
Individual Listening to Teacher												
Student(s) Presenting to Class												
Student(s) Asking Questions												
Student(s) Answering Questions												
Student(s) Using Kinesthetic Movement												
Class Discussion w/ Teacher												
Group Discussion w/ Teacher												
Individual Discussion w/Teacher												
Students Discussion w/ Students												
Students Working Independently												
Students Working In Groups												
Students Reading Aloud												
Students Reading Silently												
Students Writing												
Students Taking an Exam												
Intended Cognitive Level of Task												
Memorization/ Comprehension												
Skills/Procedures												
Concepts												
Relational Knowledge												
Not applicable												
Level of Student Engagement (% of Students Engaged)												
Low (0%-33%)												
Moderate (34%-66%)												
High (67%-100%)												
Tools Used in Classroom												
Audio/visual media												
Manipulatives												
Pictures												
Realia (real objects)												
Textbooks												
Worksheets												
Other: _____												
Not applicable												
Strategies Used by Teachers												
Administrative tasks/prep work												
Classroom management												
Context/orienting students												
Explaining												
Formative assessment												
Graphic organizers/ visuals												

Kinesthetic movement												
Lecture												
Listening/checking work												
Modeling/demonstrating/think aloud												
Positive reinforcement												
Questions: Higher order												
Questions: Lower order												
Random selection												
Reading aloud												
Rephrasing												
Review												
Other: _____												

Table 1
Averages for PCOP Variables: Front-End and Formative Evaluations

Observation Category	Front-End	Formative Evaluations (December-May)				Average (all formative)
		Eval. 1	Eval. 2	Eval. 3	Eval. 4	
Type of Classroom Involvement by Students						
Student(s) Asking Questions	0.00	0.58	0.33	0.00	0.00	0.18
Student(s) Answering Questions	0.00	0.89	0.69	0.86	0.81	0.65
Group Discussion w/ Teacher	0.00	0.32	0.47	0.08	0.33	0.24
Individual Discussion w/Teacher	0.00	0.55	0.65	0.64	0.56	0.48
Students Discussion w/ Students	0.00	0.11	0.06	0.25	0.25	0.13
Students Working Independently	0.85	0.41	0.53	0.33	0.36	0.49
Students Working In Groups	0.00	0.07	0.47	0.25	0.11	0.18
Intended Level of Task						
Concepts	0.00	0.58	0.88	0.81	0.94	0.64
Engagement Level						
High (67%-100%)	0.62	0.93	0.82	1.00	0.94	0.86
Tools Used in Classroom						
Manipulatives	0.00	0.00	0.52	0.00	0.00	0.10
Pictures	0.00	0.45	0.00	0.00	0.06	0.10
Realia (real objects)	0.00	0.15	0.28	0.33	0.69	0.29
Strategies Used by Teachers						
Context/orienting students	0.37	0.64	0.94	0.53	0.61	0.62
Explaining	0.00	0.51	0.65	0.39	0.58	0.43
Listening/checking work	0.07	0.85	0.76	0.75	0.44	0.57
Modeling/demonstrating/think aloud	0.00	0.65	0.76	0.58	0.53	0.51
Rephrasing	0.00	0.51	0.42	0.69	0.78	0.48
Review	0.00	0.11	0.31	0.36	0.67	0.29

Appendix B

Science Teaching and Environment Rating Scale

Chalufour, I. Worth, K. & Clark-Chiarelli, N. (2003). *Science teaching and environment rating scale.* Unpublished manuscript.

STERS – Observation and Interview Record

Science Teaching and Environment Rating Scale
Observation and Interview Record

STERS

STERS Toolkit, Research Edition

Teacher and Classroom Profile

Program or district: _____ **Center or school:** _____

Teacher: _____ **Observer:** _____

Date of observation: _____

Time and duration of observation: _____

Duration of entire classroom day: _____

Number of teachers (e.g. teachers, co-teachers, aides): _____

Number of other adults: _____

Number of girls: _____ **Number of boys:** _____

Ages/grade of children: _____

Number of students with identified special needs: _____ **Number of English language learners:** _____

Primary language used by teacher: _____ **Observer:** _____

Primary language spoken in classroom: _____

Languages spoken by other students: _____

General comments:

Observations Completed

- ☐ Pre-Interview
- ☐ Classroom Observation
- ☐ Teacher Interview

Scheduling Phone Call

Content to cover in phone call:	Notes:
1. Introduce yourself and explain: • **The purpose of your visit is** to observe science teaching and/or to observe children and teachers engaging in science experiences in or out of the classroom. • **What you would like to observe is** a sample of science teaching that they consider typical of their approach. • **Why you are observing:** this is one way that we are collecting information for the research project. **2. Tell the teacher that during this phone call you would like to:** • Get some general background information about the children. • Arrange a time for the visit that works for both of you. • Talk about what science experience you will see when you come. • Also arrange a time to talk with the teacher for about one half hour after your visit **3. Ask the teacher: Is science a part of your curriculum right now?** • **If yes, science IS a part of the curriculum:** o Is there a current science topic in process? **If yes, there IS a current science topic:** — What is the topic? — Has the topic just been introduced, is it on-going, or is it coming to an end? — What are the teacher's goals for children's learning on the topic? — What can you expect to see when you observe? **If there is NOT a current science topic:** — What types of science activities are children currently engaged in? — What are the teacher's goals for children's science learning? — What can you expect to see when you observe?	

Summative Evaluation: CaSTL Boys and Girls Club Afterschool Program
CCI-ISE Supplement (NSF 12-056)
CHE-1243593, supplement to CHE-0802913, CaSTL

Content to cover in phone call:	Notes:
○ Do they plan their own science curriculum or do they use a pre-packaged curriculum that includes science activities? **If they do use a pre-packaged curriculum:** — What curriculum is used? — How much flexibility does the teacher have to extend activities, add activities, or change activities in the curriculum? • **If no, science is NOT part of the curriculum:** ○ Will the teacher be willing to present a science activity for the purposes of your visit? **4. Schedule a visit:** Suggest a day and time for the visit: • Is that a good time to observe science teaching (or children's science exploration)? • Is there a time of day that the teacher would especially like you to see? **5. Schedule the post-visit interview:** • Tell the teacher that this will take about one half hour. • It will be a chance to talk about any science happening that you did not have a chance to see, or any other activities she is doing on this topic that she would like to share **6. Ask teacher to bring to this interview:** • Any documentation (drawings, photographs, or notes and teacher observations) that shows children's interests and/or learning in science • Any curriculum on the current topic s/he would like to share. • If s/he uses pre-packaged curriculum, ask her/him to bring a sample of this as well.	

2. Facilitate Direct Experiences to Promote Conceptual Learning

Exemplary (4)	Adequate (3)	Inadequate (2)	Deficient (1)
There is **compelling** evidence that teachers facilitate direct experiences with important science phenomena in ways that promote conceptual learning.	There is **sufficient** evidence that teachers facilitate direct experiences with important science phenomena in ways that promote conceptual learning.	There is **limited** evidence that teachers facilitate direct experiences with important science phenomena in ways that promote conceptual learning.	There is **minimal** evidence that teachers facilitate direct experiences with important science phenomena in ways that promote conceptual learning.
▪ Teachers structure science experiences that provide a high level of engagement allowing children to directly experience scientific phenomena.	▪ Teachers structure science experiences that provide children with a high level of engagement, but not directly linked to any specific scientific phenomena.	▪ Teachers structure science experiences for children but limit engagement by completing tasks for children.	▪ Teachers structure science experiences for children that do not provide an opportunity to directly experience scientific phenomena. For example, teachers may conduct a demonstration or read a science book.
▪ Teachers intentionally observe and document children's science exploration.	▪ Teachers intentionally observe, but do not document children's science exploration.	▪ Teachers observe children's science exploration in an unintentional manner.	▪ Teachers do not observe children's science exploration.
▪ Teachers' facilitation promotes development of science concepts and is responsive to children's related behaviors and comments. Including: - Calling attention to children's experiences - Encouraging careful observation - Helping children learn to use materials and tools - Adding or taking away materials - Drawing out and acknowledging children's observations and questions ▪ Teachers help make connections between children's experiences and science concepts by posing questions and problems to solve, or challenging a misconception.	▪ Teachers' facilitation focuses on children's experience of particular science phenomena. Including: - Calling attention to children's experiences - Encouraging observation - Helping children learn to use materials - Adding or taking away materials	▪ While some facilitation may focus on children's science experiences, most focus on dramatic play or concepts such as color, number shape, or social skills.	▪ Facilitation consists of casual chat, intention to manage behavior, or there is no interaction at all.

2. Facilitate Direct Experiences to Promote Conceptual Learning

Sources of Evidence:

- Structure of experiences
- Teacher-child interactions
- On-going adjustment of environment and instruction

EVIDENCE: _____

SCORE:

5. Engage in Extended Conversations

Exemplary (4)	Adequate (3)	Inadequate (2)	Deficient (1)
There is **compelling** evidence that teachers understand the role that extended conversations play in children's science learning.	There is **sufficient** evidence that teachers understand the role that extended conversations play in children's science learning.	There is **limited** evidence that teachers understand the role that extended conversations play in children's science learning.	There is **minimal** evidence that teachers understand the role that extended conversations play in children's science learning.
▪ Teachers select topics and use strategies that engage children in conversations about their ideas, science activities, and questions about the current science study. These support broader intellectual engagement (e.g., connections to past experiences in order to make predictions or see patterns; reflecting on science learning).	▪ Teachers select topics and use strategies that engage children in conversations about science activities. The focus of conversations is typically context specific (e.g., description of what each child might do next to build a tower) and does not require broader intellectual engagement (e.g., discussion of how various blocks might affect the stability of the tower).	▪ Conversations consist of a series of teacher questions and student responses. The subject of teachers' comments is often informational and rarely extends science learning. (e.g., "You did a good job filling that baster!")	▪ The subject of most discussions is procedural, directing children to the next activity or task.
▪ Teachers create varied opportunities for interaction that engage a range of children in a balance of individual, small-group, and large-group conversations. They take advantage of opportunities for informal and formal exchanges.	▪ Teachers make consistent efforts to engage a range of children in conversations, though the balance may favor certain settings (e.g., predominantly large groups) or conversational types (e.g., listing items used). Teachers regularly engage in informal conversations with children.	▪ Teachers' attempts to talk about science with children are generally formulaic and are not conducive to an exchange.	▪ Teachers' efforts to engage children in extended conversations are minimal across formal and/or informal settings in the classroom.
▪ Conversations and exchanges maximize talk that informs science learning. For example, teachers orchestrate a discussion about how the class will build a vivarium for snails, including brainstorming and listing the supplies they will need.	▪ While most conversations lead toward learning, they are not as extended (i.e., they do not contain as many turns or are less complex).	▪ Management talk is commonplace, although teachers may make an occasional attempt to focus discussion on a topic related to the science study, such as a question posed during circle time.	▪ Management talk predominates, with occasional efforts to quiet children and limit children's attempts to engage in productive conversation.

5. Engage in Extended Conversations

Sources of Evidence:

- Selection of topics
- Varied opportunities
- Promotion of science learning

EVIDENCE: _____

SCORE:

Summative Evaluation: CaSTL Boys and Girls Club Afterschool Program
CCI-ISE Supplement (NSF 12-056)
CHE-1243593, supplement to CHE-0802913, CaSTL

Post Observation-Interview Notes

Start the interview by reviewing what the teacher said in the pre-observation interview about the science she would be teaching and the learning she was hoping for. Proceed to the questions asking for specifics when answers are vague. This interview relates to rubrics 7. Plan In-depth Science Investigations and 8. Assess Science Learning. Questions 5 and 6 will also support scoring of rubric 3: Promote Use of Scientific Inquiry, as the teacher may provide context to inquiry you may have observed.

Interview Questions for Rubric 7 & 8:	Notes:
1. Was today's science activity typical for your class regarding the: ▪ Amount of time usually spent on science per day? ▪ Kinds of learning experiences children have? ▪ Amount of time children are engaged in direct, hands-on experiences? ▪ Amount of time teachers spend talking with children about science experiences and ideas? If today's science activity was not typical, find out why and what is typical. How much time is typically spent on science per week? 2. Why did you choose this topic? What are your goals for the children's learning? 3. What experiences related to this topic preceded those I observed today? ▪ Draw out descriptions of each (or a good sampling) that include the materials used and what the children actually did.	

Eight-Legged Encounters Year Two

Adult Survey

Eight-Legged Encounters Experience Questionnaire

We would like to learn more about your experiences at this event today. Please take some time to let us know your thoughts.

1. How interesting did you find the following stations/materials?	Very Interesting	Somewhat Interesting	A Little Interesting	Not Interesting	Did Not Visit
1. Create a chelicerate	○	○	○	○	○
2. Build a burrow	○	○	○	○	○
3. Sticky vs. wooly silk	○	○	○	○	○
4. Weave a web	○	○	○	○	○
5. Microscope madness	○	○	○	○	○
6. Path of predators activity booklet	○	○	○	○	○
7. Community Experiment	○	○	○	○	○

2. After participating in this event….	Much less likely	Less Likely	The same	More likely	Much more likely
a. how much more or less likely are you to set up your own experiment at home?	○	○	○	○	○
b. how much more or less likely are you to kill a spider in your house?	○	○	○	○	○
c. how much more or less likely are you to attend another similar event?	○	○	○	○	○
d. how much more of less likely are you to take the time to observe a spider, or other arachnid?	○	○	○	○	○
e. how much more or less likely are you to say that you understand what the scientific process is?	○	○	○	○	○
f. how much more or less likely are you to read about arachnids?	○	○	○	○	○

3. After participating in this event, did this make you more or less likely to consider a future job in science?
   - ○ Much less likely
   - ○ A little less likely
   - ○ The same
   - ○ A little more likely
   - ○ Much more likely
   - ○ Not applicable

4. After participating in this event, how much more or less interested are you in learning about scientific discoveries?
   - ○ Much less interested
   - ○ A little less interested
   - ○ The same
   - ○ A little more interested
   - ○ Much more interested

5. What surprised you about this event?

6. Did you learn anything new?
   - ○ No
   - ○ Yes → 6a. If so, please describe:

7. What was most meaningful to you from today's exhibit?

8. How effective was the artwork in engaging you with the exhibit?
   - ○ Not at all effective
   - ○ A little effective
   - ○ Somewhat effective
   - ○ Very effective

9. How effective were the volunteers in engaging you with the exhibit?
   - ○ Not at all effective
   - ○ A little effective
   - ○ Somewhat effective
   - ○ Very effective

10. How could the volunteers be more effective in engaging you with the exhibit?

11. What did you like best about this event?

12. Do you think it is important for these kids of activities to be available to the public?
    - ○ No
    - ○ Yes → 12a. If so, why?

13. What is your gender?
    - ○ Male
    - ○ Female

14. What is your current age?
    - ○ Less than 25
    - ○ 25-34
    - ○ 35-44
    - ○ 45-54
    - ○ 55-64
    - ○ 65 or older

15. How did you learn about this event?
    - ○ Newspaper
    - ○ Radio
    - ○ School
    - ○ Museum Website
    - ○ Friends of the Museum
    - ○ Facebook
    - ○ UNL email
    - ○ TV
    - ○ Attended other Sunday with a Scientist
    - ○ Other:
    - ○ Did not know it was going on

16. What is the zipcode for where you live?

17. Please list suggestions for additional topics that may be of interest to you:

18. Please use the space below to provide any additional comments or feedback:

Appendix C: Seminar focus group script

Student Focus Group Questions

1. What do you like best about the course?
2. What do you like least and what could be improved?
3. How do you feel this class has increased your knowledge of science communication?
4. Has teaching this after-school clubs affected your understanding of the curriculum material?
    a. If yes, how so?
5. How has this course (and the after-school clubs) influenced your future goals in science?
6. How has this course (and the after-school clubs) influenced your future career goals?
7. From your experience with the after-school clubs, what would say is important for scientists to know about science outreach?
8. Now that you've spent a semester with your after school clubs, what skills do you wish you had before you had started with the clubs?
9. Do you have any ideas of other outlets for science outreach that could be used in the class in the future?
10. After your experience with the after-school clubs, how will you do science differently now?

    Should time allow:

11. What worked well with your after-school clubs this semester?
12. What challenges have you confronted with your after-school clubs?
13. How have you been able to address those challenges?
14. Would you change anything with your after-school clubs this year? If so, what would you change?