



## PLAY-BASED STEM EXHIBIT ENGAGEMENT OBSERVATION TOOL

### CHEAT SHEET AND EXAMPLE

Date:	Exhibit title:	Start time:	# of children at exhibit / in social group:
1/1/2024	Rocket Launcher	10:03 AM	3 / 2
Observer:	End time:	# of adults in social group:	
Pat O.	10:17 AM	2	

### CHILDS ACTIONS

Child is observing or experiencing STEM phenomena. Name or describe the phenomenon:  
Child observes the paper rocket flying through the air.

*Making an observation or experiencing a STEM phenomenon can be observed by the child exploring systematically, beginning a line of inquiry, or collecting and sorting/categorizing where children are making intentional decisions based on observation. For example, a child who is sorting through plastic fruits and choosing only carrots to be "planted" is making an observation of vegetables that grow underground.*

*The STEM phenomenon provides the context for the play-based STEM experience. The context can be a real-world STEM object such as a tree, robot, or rainbow, or a STEM concept like heat, cold, ecosystem, etc. STEM phenomena events can be observed or experienced directly or in mediated ways. This designed experience or observation of a STEM phenomenon provides the foundation for inquiry that can then be further explored and explained through guided play based STEM engagement.*

Child is playing with a game or is playing a game

*Games are high structure play, defined by rules, boundaries, and objectives. Children make choices, strategize, and are motivated to solve a challenge or master something. Examples include mazes, logic-puzzles, target games, board games and digital games.*

Child is playing with objects that can be picked up and moved

*Object-based play is low structure play, free of external or exhibit guided rules, boundaries, or objectives. Children may create more structure, but there is freedom to change the structure, including objectives. Examples include playing with blocks, tools, toy vehicles, and figurines. Excludes items that children cannot hold, and the manipulation does not serve curiosity, for example manipulating a lever or pushing a button.*

Play where the child is exploring and processing information through kinesthetic activities.

*Kinesthetic play involves children moving and engaging their body to process information. Includes pumping water at a water pump, running, and jumping. Excludes play where children pick up and manipulate an object (see object play above).*

Play where the child is experiencing and processing information through their senses.

*Sensory play provides a first-hand experience (which may exclude evidence for the observing practitioner of observing or experiencing a STEM phenomenon). Sensory play is designed to engage a particular sense and provides the opportunity to directly engage through that sense. Includes visual illusions, experiences reliant on touch for exploration, sound, and temperature. This excludes picking up an item to process information (see object play).*

Play where the child engages in pretend, imaginative, fantasy, or play that involves alternate realities.

*Imaginative play involves children engaging in sociodramatic, dress-up, or role-playing. Children may or may not be imitating real-life behaviors. Includes pretending to be engage with an abstract phenomenon.*

## SOCIAL CONTEXT OR ACTIONS

- Play is with someone else; interactive or jointly experienced.

Examples include two children playing together at a water table, they are communicating (can be different modalities) and motivated by shared or coordinated goals. Excludes play where individuals play near or even with the same materials but are not interacting and coordinating (see parallel play).

- Play is not with someone else. The child watches others play as an onlooker or is playing independently alongside or parallel to an adult or peer.

Examples include onlooker and parallel play. In onlooker play a child watches a peer or adult play. This includes a child who becomes interested in another child's play or observes workable solutions to a problem. In parallel play a child is playing independently alongside or parallel to an adult or peer. This includes an adult and child using building blocks next to each other, but independently and not coordinating a build.

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## ROLE OF ADULTS

- Adult is supporting the child's interaction with the exhibit, acting as an audience.

Support is the least involved guided interaction by an adult. This includes verbally acknowledging what the child is doing or assisting by holding or pressing something so the child can continue. Includes exclamations, comments, or limited actions done in response to child's exhibit engagement. Excludes telling a child what to do (see directing) or showing a child what to do (see modeling).

- Adult is modeling how to engage with the STEM phenomenon through STEM practices.

Modeling is next on a spectrum of guided interaction by an adult. Includes demonstrating how to engage with a STEM phenomenon and this is distinct from demonstrating how to physically use/manipulate exhibit or tool.

- Adult is providing inquiry prompts to guide engagement. These are questions, not statements.

Inquiry is an interactive and guiding role and includes an open-ended and intentional prompt introduced through materials or line of questioning. This changes how the child uses, engages, or interacts with the exhibit and materials. The prompt structures an opportunity for meaning-making with STEM phenomena and STEM practices. Excludes adults prompting a non-engaged child. The child is connecting observed phenomena with the inquiry prompt provided by the adult.

- Adult is directing interactions with the exhibit or engagement with practices, showing the child how and what to do.

Directing is an interaction where the adult instructs how to manipulate or interact with an exhibit or part of an exhibit. Adult is telling a child what to do either verbally or gesturing such as pointing in the direction of an object or part of an exhibit. This is for instances where the adult is encouraging engagement with the phenomena. Excludes instances where the adult is directing the child away from the exhibit.

- Adult is explaining what is happening at the exhibit or what is happening because of engagement.

Explaining is the most involved guided interaction by an adult. This includes adults communicating causal or personal connections, sharing science terminology, principles, or describing an aspect or mechanism of the engagement. Includes an adult communicating a connection in response to nonverbal cues of curiosity such as a child turning an object over and exploring the object.

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## STEM PRACTICES AT PLAY

### THE CHILD ALONE OR WITH OTHERS IS:

- Using observations or experience with phenomena and systematically applying observations, experiences, or evidence of phenomena.

This includes intentionally trying something new or engaging with an exhibit based on something observed about the phenomena. Must have direct, explicit evidence. Evidence that they have connected what is happening based on prior results or observation of phenomena must be observed directly.

- Systematically testing variables based on observations or experience with the phenomena

Excludes the colloquial use of "testing". Includes testing different variables to see how it influences the experience with the phenomena.



**Designing solutions by generating ways to solve a problem.**

Includes trying to optimize towards a particular outcome. This may or may not include systematic testing. Progression or attempts towards a solution must be observed or expressed verbally. Designing solutions is not interchangeable with the word designing, which refers to building or creating but not necessarily towards a solution. For example, building a house with LEGOs is not designing solutions; however, a child observed trying to build a bridge that can hold a particular capacity is designing solutions.



**Revising or making a change to design, implementation, rebuilding in a different form, or repeating to test.**

Includes intentional decisions to revise. Is often co-coded with testing.



**Using evidence or making arguments to make a claim or suggesting a solution supported by evidence (e.g., from their observations) and describing how the evidence supports the claim.**



**Communicating STEM information to others around them (can be multiple modalities)**

Includes statements and connections made to the phenomena. It is important to acknowledge that development and meaning making are situational and often specific to child's experiences when considering the level of meaning making and if the child is communicating STEM. Excludes a child expressing how they feel because of interacting with an exhibit but can include a child expressing how they feel engaging with a phenomenon.



**Asking questions about a STEM phenomenon.**

Includes inquiry about scientific tools or techniques. This does not include general questions unrelated to science phenomena.



**Making predictions or a guess about what will happen based on observations or prior experience/knowledge. This should be explicit with direct evidence.**

This may be designed into the exhibit, for example pressing a particular button based on a prediction made.

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## **OBSERVATION DETAILS**

**USE THIS SPACE TO NOTE WHAT YOU OBSERVE AND OTHER RELEVANT INFORMATION.**

This space can be used to make more detailed notes about the observation such as behaviors not captured within the checklist or how social interactions were observed. It may also be useful to write down initial thoughts or reflections following an observation. These memos to yourself can provide information about the exhibit or exhibit environment, the child observed, or about the social interactions that may have been influential to the observed play-based STEM exhibit engagement.

