Explore the fortune telling fish.
Practice Based Facilitation: Advancing Science Centers’ capacity to engage visitors in STEM Practices

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Tara Henderson, Explora
MOXI, The Wolf Museum of Exploration + Innovation
Open ended exhibits
- Multiple entry points
- Multiple ways of interacting
- Multiple outcomes

Diverse visitors
- Age
- Background
- Interest

unobservable
Practice-based Learning

Practice-based Facilitation

Visitor

Facilitation Moves

Goals
● What are the ways you and your tablemates interacted with the fish?

● What other ways might people interact with the fish?
Ways that people might interact with fish.

- Look at the fish.
- Read the instructions on the packaging.
- Read and follow the instructions (e.g., place it on their hand)
- Change temperature of hands (e.g., rubs hands together, puts hands in pockets)
- Use other body parts (e.g. place on knee)
- Use external materials (e.g., wet fish, rub with wool)
- Collaborate with other people by comparing observations.
Engagement levels

- Look at the fish.
- Read the instructions on the packaging.
- Read and follow the instructions (e.g., place it on their hand)
- Change temperature of hands (e.g., rubs hands together, puts hands in pockets)
- Use other body parts (e.g. place on knee)
- Use external materials (e.g., wet fish, rub with wool)
- Collaborate with other people by comparing observations.

- Each level is a brief description of common activities that visitors engage in (ideally 5-7 levels).
- Levels are specific to the particular exhibit/program.
- Levels are easily identifiable through observation.
We use the NGSS Practices of Science and Engineering as a starting place to think about the ways we want visitors to engage with exhibits.

- Asking questions (science) and defining problems (engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (science) and designing solutions (engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Engaging in the practices can lead to productive STEM identities (“identity work”) (Kelly, Cunningham, & Ricketts, 2017)
<table>
<thead>
<tr>
<th>Engagement Level</th>
<th>STEM practices</th>
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<tbody>
<tr>
<td>● Look at the fish.</td>
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<td>● Use other body parts. (e.g., place on knee, arm)</td>
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<td>● Use external materials to test fish (e.g., wetting fish, rubbing it with static)</td>
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<td>● Collaborate with other people by comparing observations.</td>
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<td>Obtaining information</td>
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<td>● Change temperature of hands (breathe on hands, rub hands together)</td>
<td>Testing ideas, collecting &amp; analyzing data</td>
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</table>
We used the NGSS practices as a starting point. We broke some down into smaller pieces and added additional practices we were interested in.

Identified which of these were likely to be found in interactions at each engagement level.

Engagement levels are observed. Practices are inferred.
**Practice-based Learning:** Experiences in which visitors learn through engaging in STEM practices.

**Practice-based Facilitation**
Facilitation which supports visitors’ learning through practice-based learning.
## Facilitation Pathways

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MOXI, The Wolf Museum of Exploration + Innovation
Balls of various diameters, mass, and materials

Wall and flexible tracks

Pegs hold tracks at different distances from wall
Two visitors repeatedly test an existing track. The ball leaves the track at the same point, not completing the loop.

Facilitator observation

The pegs holding the track vary in length causing the track to curve side to side as it makes a loop.
Facilitation pathway 1: Maximize Engagement

<table>
<thead>
<tr>
<th>Engagement level</th>
<th>Observing</th>
<th>Asking Questions</th>
<th>Defining Problem</th>
<th>Planning Invest</th>
<th>Carrying out Inv.</th>
<th>Analyzing and Improve</th>
<th>Designing Solution</th>
<th>Testing Solution</th>
<th>Developing Model</th>
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- □ Inferable by observation and listening
- ○ Likely inferred by observation and listening
Two visitors repeatedly test an existing track. The ball leaves the track at the same point, not completing the loop.

“That’s a wobbly track”
## Facilitation pathway 2: Expand Practices

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Expand Practices

“What seems to be the problem?”
## Facilitation pathway 3: Optimize Practice

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### Table Legend:
- ○: Indicates the presence of a behavior or activity.
- ○: Indicates the absence of a behavior or activity.
Two visitors repeatedly test an existing track. The ball leaves the track at the same point, not completing the loop.

Optimize a Practice

“What do you each notice about the track?”
Challenges with Practiced-based Facilitation

1. Requires skill in observing visitor behavior
2. Requires experience with exhibit – what visitor engagement is possible?
3. Requires practice for spontaneous facilitation
MOXI/UCSB Certificate in Informal STEM Learning

- 12-15 month program
- 1,000 hour paid internship as MOXI floor staff
- 4 quarters of coursework (16 credits)
- Capstone project
Practice-based Facilitation

- Observation
- Reflection
- Shared practice
Playful Exploration

- Discovering possibilities
- Building conceptual understanding
- Modeling behavior
Next steps for advancing science centers’ capacity to engage visitors in STEM practices

1. Study training methods
2. Develop training modules
3. Build a replicable model

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Case Studies

Preeti Gupta
Director of Youth Learning and Research
American Museum of Natural History

Tara Henderson
Director of School & Community Programs
Explora
Case Study 1: AMNH

- What does practice-based facilitation look like at a diorama?
- What is possible at a cart?
Case Study 2: Explora

Internal Professional Development and Training

**Education staff:** full and part time educators whose job is to facilitate programs both at Explora and in the community.
Case Study 2: Explora

ECME 2096-901 - Math and Science in the Early Childhood Classroom
Offered in collaboration between Explora and the Community College of Central New Mexico
How does your institution facilitate visitors’ engagement in STEM practices?

How might you use practice based facilitation in your institution?
For more information on Practice-based Learning

