Playful STEM Exhibits

InterPLAY: Early Learners Developing STEM Skills through Play and Design

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ASSOCIATION OF CHILDREN'S MUSEUMS

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Agenda

- Housekeeping & Introductions
- Overview of the project
- Playful activity
- Knowledge café
  - STEM
- Closing/Q&A/Reflection
  - What comes next

A little about me…

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How long have you been in the Children's Museum field?

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What is your current position/role?

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interPLAY

Focus…

…broadening participation by supporting playful engagement with STEM exhibits for children three to eight.

What:

- Development of framework/strategy
  - Context and exhibit design principles
  - Spectrum of play and the development of early STEM

How:

- Refinement of framework & tools
  - Observation’s
  - Practitioner focus groups
  - Practitioner survey

Three key areas to reflect on when designing for Playful STEM Exhibit engagement:

- What is Playful STEM Exhibit Engagement?
- What facilitates it?
- How do we design for it?

What is a playful STEM exhibit?

- Play spectrum
- STEM phenomena
- STEM practices

What facilitates playful STEM exhibit engagement?

- Social influences
- Exhibit & materials
- Child's own curiosity, playfulness, and agency

What design elements support playful STEM exhibit engagement?

- Social
- Child-centered
- Materials

What does it look like?

What do we mean by play?

What do we mean by STEM?

What is a playful STEM exhibit?

- Play spectrum
- STEM phenomena
- STEM practices

What does play look like at your site?

- Think about a STEM exhibit at your site and then
- Talk with folks around you focusing on…
  - …how kids engage with the exhibit
  - …how peers or adults support the play and/or the intended learning
  - …the importance of the materials/loose parts
- Then in slido a take-away or an aha or two that emerged for you from this quick conversation

slido

take-away or an aha or two that emerged for you from this quick conversation

ⓘ Start presenting to display the poll results on this slide.

Spectrum of Playful Learning

Intended Exhibit Structure & Caregiver Interactions

More structure

-Replicability, iterative design may be bounded

-Exhibit engagement is goal oriented

-Materials are not varied, but are limited & designed for particular outcomes

-Adult provides guidance in the playful learning while child still maintains agency

-Not replicable, focus on process

-Intended exhibit goal may be process or very broad

-Materials are varied, themed, flexible in use

-Adult in and out of play while child still maintains agency

Less structure

(Pyle et al., 2016; Zosh et al.,2018)

Motivation of child

(3-5 years)

- Motivation to play in response to environment

(5-8 years)

- Motivation to play may involve strategy or risk, identity development (what am I good at?), or exploring interests

(Erikson, 1963; 1968; Roman-Oyola, 2018)

Skill development

21st Century Skills **(values, cognitive, and social)**
Creativity & Innovation
Critical thinking & problem solving
Communication & collaboration
Flexibility & adaptability
Initiative & Self-direction
Social & cross cultural skills
Productivity & accountability
Leadership & responsibility
Information & media literacy

STEM

- STEM Phenomena

  an object or event that can be experienced, observed and/or measured

Examples: Electric current flowing through a circuit, density of materials in water, visual illusions, sunflowers following the sun

- STEM practices

1. Asking questions and defining problems
2. Analyzing and interpreting data
3. Carrying out investigations
4. Obtaining, evaluating, and communicating information
5. Engaging in arguments from evidence
6. Developing and using models
7. Constructing explanations and designing solutions
8. Using math & computational thinking

	Encountering STEM Phenomena	Engaging with STEM Practices	Skill Development
Free Play (the context matters)	Building materials provided & children play w/out adults, using the materials flexibly & w/out any guidance. Exhibit goals are open and flexible. Science concepts: gravity; balance	Children are curious & ask questions (unprompted) while using the building materials such as how high can the materials be stacked while exploring different ways to stack the materials (e.g., building a wide base). Practice: Asking questions	Children engaging w/building materials on their own decide to try to & build something as tall as possible. Different designs, testing each time to see if they can come up with a taller structure. Skill: Problem solving
Inquiry Play	Open-ended prompts at marble run exhibit encourage children to use materials (e.g., tubing/pipes, ramps, and marble/ball) to build a run, testing materials to make the marble drop faster or to increase the incline enough for the marble to have enough momentum to go up a ramp. Exhibit also encourages caregivers to suggest different sized marbles for children to test. Science concepts: energy, momentum	Children experiment with different sizes and weights of marbles as well as various surfaces & heights to experiment and test how they effect the speed of the marbles. Children use the materials how they want to explore what variables influence the speed of the marbles. An Adult introduces tools to measure the varied heights, speed, and weight of objects. Practice: Investigation	Children work with an adult to conduct investigations with marble run and communicate with adult what they observe. Adult follows the child's lead, but may prompt a question that the child verbally responds to. Skill: Communication & collaboration

	Encountering STEM Phenomena	Engaging with STEM Practices	Skill Development
Collaborative Play	Child is playing at farm to table exhibit & wonders how the bee gets the pollen from the flower. Adult then brings over a flower model & they talk about pollen and parts of the flower. Science concepts: pollination, plant structures	Child is playing at farm to table exhibit & wonders how the bee gets the pollen from the flower. Adult then brings over a flower model & they talk about pollen and parts of the flower. Child then chooses to build a puzzle/model that represents flower structures. Practice: Developing and using models	Child is playing at farm to table exhibit & wonders how the bee gets the pollen from the flower. Adult then brings over a flower model & they talk about pollen and parts of the flower. Afterwards, the child brainstorms other animals that might help pollination while playing with other puppets (butterfly, fly, ladybug). Skill: Creativity
Guided Play	Digital game at Mars Rover exhibit where children are prompted to code the rover using provided code blocks to follow a designated path for collecting rock samples. Math concept: computational thinking	Children visiting a Mars Rover exhibit collect rock samples and then through a series of prompts they "test" spectrum data to arrive at final conclusion regarding the rock samples. Math Practice: Reason quantitatively	Children visiting a Mars Rover exhibit are able to interact with a video representing scientists involved with the International Space Station and role play what it would be like to colonize on Mars. Video role play will encourage children to think about what do they need to know and how will they work together and make decisions? Skill: Cross cultural skills

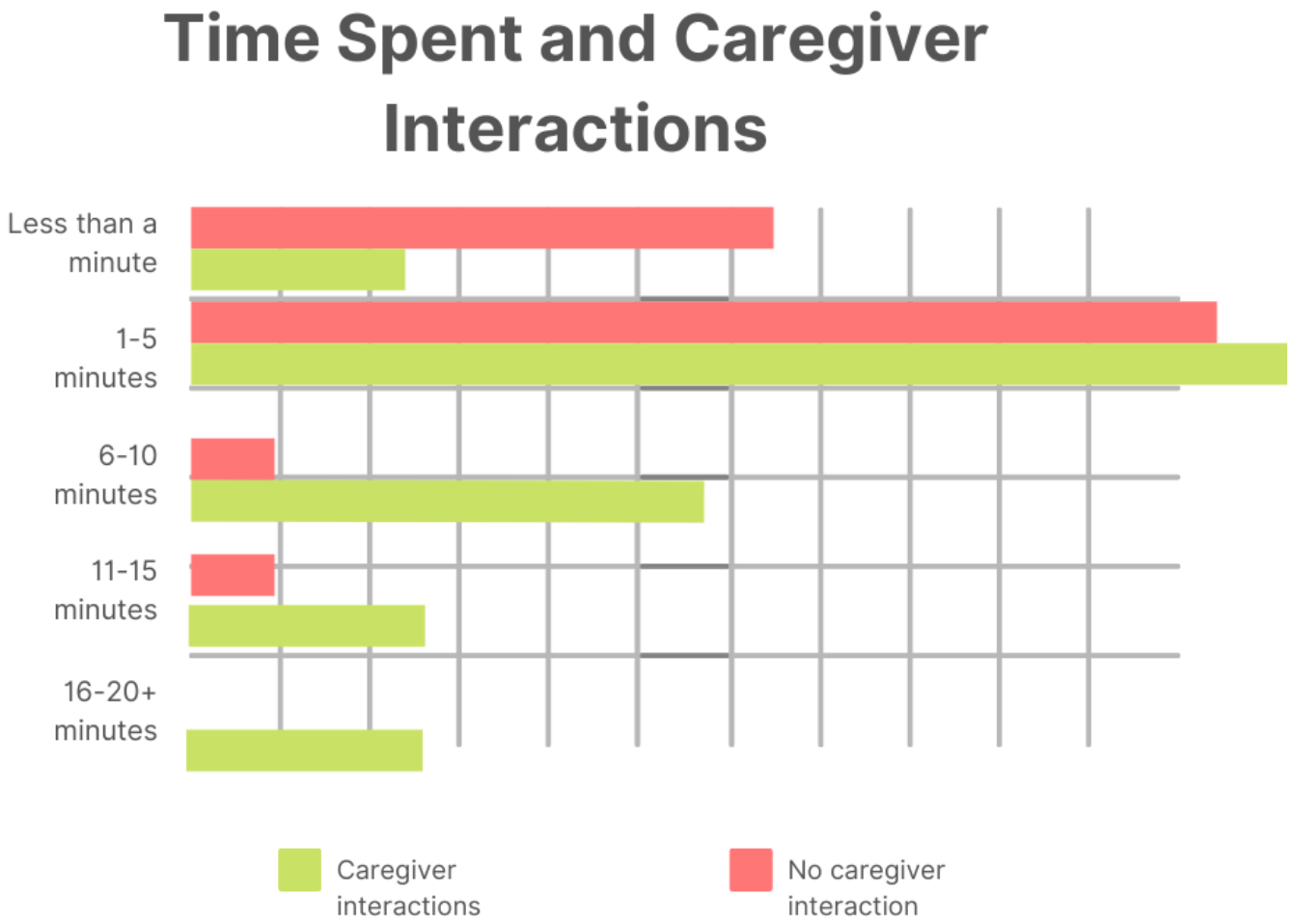
	Encountering STEM Phenomena	Engaging with STEM Practices	Skill Development
Not play	An exhibit where you lift a car using a simple machine (pulley). Invites only one way of engaging and one response. There are no prompts or extensions from adult or exhibit. Science concept: force, simple machines	Children visiting a dinosaur exhibit are encouraged to ask questions then use their observations and reading of the text on the signage to find the answers.	A scaled model of the solar system that children can view to visualize the distances between planets in the solar system, aligned with scale, proportion and quantity concepts.

What facilitates playful STEM exhibit engagement?

- Social influences
- Exhibit & materials
- Child's own curiosity, playfulness, and agency

What facilitates playful STEM engagement?

Social Influences



Facilitators

Exhibits & Materials

Child's own curiosity, playfulness, and agency

Knowledge café

Putting it all together

1. On your own:

At your site…

…think about the same STEM exhibit and then walk through the Matrix,
what STEM is encountered how can you manipulate the playful learning?
How can you support social interactions?
What role do the materials play in the playful STEM learning?

2. In a pair:

Discuss

3. We will do a couple share outs

Next steps…

- Continue observations
  - MN, PA, FL
- Landscape survey
- Practitioner feedback and refinement
- Share it!

Wrap-up

- What format (e.g., reflective guide, framework guide, blog-like posts) would be most useful?
  - Think outside the box. What format would allow for understanding?
- What questions still remain?
- What do I need to know or what do you want me to know?

Resources

- STEM
  - Resources on phenomena
    - https://www.nextgenscience.org/resources/phenomena
    - https://www.ngssphenomena.com/
  - Resources on practices
    - https://ngss.nsta.org/PracticesFull.aspx
    - http://www.corestandards.org/Math/Practice/ - Math standards (practices). They are very similar and map well to the NGSS practices.
  - https://www.nextgenscience.org/ - full website on Next Generation Science Standards (NGSS). This might be overwhelming, but if you want to dive in, it is a great resource.

To get in touch about this or to partner on future projects…

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Send me a message on the event app