Little Scientists: Supporting STEAM Skills in Infants and Toddlers

June 25, 2019

Presenter:

Marley Jarvis, Ph.D.
National Center on Early Child Development, Teaching and Learning
What is STEAM?

Science  Technology  Engineering

Art  Math
Session Objectives

At the end of this presentation, you should be able to:

- Identify ways young children naturally engage in inquiry, reasoning, and problem-solving
- Understand how STEAM is for everyone and children use it every day
- Connect children’s exploration and inquiry to their culture and to outcomes described in the ELOF
- Use strategies to support children’s inquiry in the classroom and at home
Here’s what we’re doing today:

1. STEAM and the Inquiry Cycle
2. Young Explorers: What the Research Tells Us
3. Connecting Cultural Practices to Early STEAM Skills
4. Strategies for Incorporating Inquiry into Daily Activities
STEAM and the Inquiry Cycle
Understanding Inquiry
You Naturally Use the Scientific Method

Observe  Question  Predict  Explore

Reflect
You Naturally Use the Scientific Method

- Observe
- Question
- Predict
- Reflect
- Explore
The “A” in STEAM

Observe → Question → Predict → Explore → Reflect
Little Scientists Using STEAM Skills
Young Explorers: What the Research Tells Us
What Do Babies Know About Physics?
What Do Babies Know About Physics?

Schulz, 2015 (image); Stahl & Feigenson, 2015
What Do Babies Know About Physics?

Solidity

Knowledge-consistent Knowledge-violation Baby banging the toy

Schulz, 2015 (image); Stahl & Feigenson, 2015
What Do Babies Know About Physics?

Schulz, 2015 (image); Stahl & Feigenson, 2015
What Do Babies Know About Physics?

- Baby dropping the toy
- Observe
- Question
- Reflect
- Predict
- Explore

Schulz, 2015
Theory-Building: Probability

Machine

Marble dispenser

(Waismeyer, Meltzoff, & Gopnik, 2015)
Theory-Building: Probability

(Waismeyer, Meltzoff, & Gopnik, 2015)
Theory-Building: Probability

(Waismeyer, Meltzoff, & Gopnik, 2015)
Theory-Building: Probability

4 of 6 = 67%

(Waismeyer, Meltzoff, & Gopnik, 2015)
Theory-Building: Probability

2 of 6 = 33%

(Waismeyer, Meltzoff, & Gopnik, 2015)
Theory-Building: Probability

(Waismeyer, Meltzoff, & Gopnik, 2015)
Making Sense of a Messy World

(Waismeyer, Meltzoff, & Gopnik, 2015)
Music and Culture

Trainor, Lee, & Bosnyak, 2011
Exploration and Inquiry Activity

Observed ➔ Question ➔ Predict ➔ Explore ➔ Reflect

- Observe
- Question
- Predict
- Explore
- Reflect
How You Explore the World - Not Which Facts You Know
Cultural Skills to Support STEAM Learning

- Teaching children about their culture, language, and traditions helps prepare them for school success.
- Brainstorm with neighbors for ideas that support STEAM learning.
Connecting Cultural Practices to Early STEAM Skills
3 Steps in Making It Work

- Making the Connection
- Making It Happen
- Making It Real
Making the Connection and Developmental Goals

The ELOF describes:

- what young children know and should be able to do.
- the skills, behaviors, and knowledge in different areas of development.
- specific developmental goals and progress.
# The Five Domains of Learning and Development

<table>
<thead>
<tr>
<th>Domain</th>
<th>Approaches to Learning</th>
<th>Social and Emotional Development</th>
<th>Language and Literacy</th>
<th>Cognition</th>
<th>Perceptual, Motor, and Physical Development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INFANT/TODDLER DOMAINS</strong></td>
<td>Approaches to Learning</td>
<td>Social and Emotional Development</td>
<td>Language and Communication</td>
<td>Cognition</td>
<td>Perceptual, Motor, and Physical Development</td>
</tr>
<tr>
<td><strong>PRESCHOOLER DOMAINS</strong></td>
<td>Approaches to Learning</td>
<td>Social and Emotional Development</td>
<td>Language and Communication</td>
<td>Mathematics Development</td>
<td>Scientific Reasoning</td>
</tr>
</tbody>
</table>
STEAM Stretches Across the Domains

Cognition (Infant/Toddler)
- Subdomains
  - Exploration and Discovery
  - Memory
  - Reasoning and Problem-Solving

Cognition/Scientific Reasoning (Preschooler)
- Subdomains
  - Scientific Inquiry
  - Reasoning and Problem-Solving

Approaches to Learning

Social and Emotional Development

Language and Communication
Making the Connection Example: Drumming

<table>
<thead>
<tr>
<th>CENTRAL DOMAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPROACHES TO LEARNING</td>
</tr>
<tr>
<td>SOCIAL AND EMOTIONAL DEVELOPMENT</td>
</tr>
<tr>
<td>LANGUAGE AND LITERACY</td>
</tr>
<tr>
<td>COGNITION</td>
</tr>
<tr>
<td>PERCEPTUAL, MOTOR, AND PHYSICAL DEVELOPMENT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFANT/TODDLER DOMAINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approaches to Learning</td>
</tr>
<tr>
<td>Social and Emotional Development</td>
</tr>
<tr>
<td>Language and Communication</td>
</tr>
<tr>
<td>Cognition</td>
</tr>
<tr>
<td>Perceptual, Motor, and Physical Development</td>
</tr>
</tbody>
</table>

Drumming
Domain: Cognition

Sub-domain: Exploration and Discovery
- Goal IT-C 1: Child actively explores people and objects to understand self, others, and objects.

Sub-domain: Memory
- Goal IT-C 3: Child recognizes differences between familiar and unfamiliar people, objects, actions, or events.

Sub-domain: Reasoning and Problem-Solving
- Goal IT-C 6: Child learns to use a variety of strategies in problem-solving.
• Plan activities that teach the cultural skill(s), values, beliefs, or lifeway(s), and goal(s) you selected.
• Choose activities to engage families and community members.
• Choose how to document and assess progress in the selected cultural skills.
Making It Happen: Activities to Promote STEAM Learning

Observe → Question

Reflect → Explore → Predict
Making It Real: Match Children’s Interests & Abilities

- Individualize activities for individual or small groups of children
- Use assessment of child’s skills to identify interests / strengths / needs
- Final step – Teach the activities!
Strategies for Incorporating Inquiry into Daily Activities
Being An Expert vs. Exploring Together

“I am going to teach children lots of information about this topic.”

“As a teacher, I am the expert and I need to have answers to all the questions they ask.”

“I can say: I don’t know. Let’s find out together.”

“I listen to children’s questions and model a questioning mind. We explore together.”
Creating a Culture of Inquiry

- Foster children’s curiosity and questioning.
- Guide children in exploring their questions.
- Be an active observer.
- Talk with children and engage them in conversations.
- Know when to intervene and when to stand back.
- Provide children with time.
Speak the Language of STEAM

- Observe, observation
- Predict, prediction
- Test
- Similar, different
- Compare, contrast
- Count
- Measure
- Investigate
- Explore
- Experiment
- Discover
- Record
- Explain
- Hypothesize, hypothesis
Questions to Encourage Inquiry and Problem Solving

**Observe**
- What do you see / hear?
- How do they sound / smell?
- How are they the same?
- How are they different?
- What happens when you try?
- You seem curious about...

**Question**
- What are you curious about?
- What do you want to know?
- Are you wondering if...?

**Explore**
- Let’s investigate!
- What do you notice?
- What is changing?
- What did you try?
- What do you think will happen next?
- Let’s draw what we see.

**Predict**
- What do you think will happen?
- What are your predictions?
- Why do you think that?
- How could we find out?

**Reflect**
- What were your predictions?
- What happened?
- What did you notice?
- Why do you think that happened?
- What could we investigate next?
How do polar bears stay warm?
Inquiry in Action: Blubber Experiment
Blubber Experiment and the Inquiry Cycle

Observe ➔ Question ➔ Predict ➔ Explore ➔ Reflect

Explore

Predict

Reflect

Question

Observe
Wrap-Up: STEAM is for Everyone
Resources

Early Childhood Learning & Knowledge Center (ECLKC)

• Understanding STEAM and How Children Use It: https://eclkc.ohs.acf.hhs.gov/publication/understanding-steam-how-children-use-it

• Making It Work: https://eclkc.ohs.acf.hhs.gov/culture-language/article/making-it-work-connecting-cultural-learning-experiences-american-indian


• Marvelous Explorations through Science and Stories: https://eclkc.ohs.acf.hhs.gov/school-readiness/article/marvelous-explorations-through-science-stories-mess

• Fostering Children’s Thinking Skills: https://eclkc.ohs.acf.hhs.gov/video/fostering-childrens-thinking-skills

• Incorporating Cultural Themes to Promote Preschoolers’ Critical Thinking in American Indian Head Start Classrooms: https://eclkc.ohs.acf.hhs.gov/culture-language/article/incorporating-cultural-themes-promote-preschoolers-critical-thinking-0
Resources

- Culture and Language: [https://eclkc.ohs.acf.hhs.gov/culture-language](https://eclkc.ohs.acf.hhs.gov/culture-language)
Other Websites

Thank you!

Please fill out a survey: