Advancing Early STEM Learning Opportunities Through Tinkering and Reflection

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Goals and Audience

The project will provide much needed empirical results on how to promote children's STEM engagement and learning in informal science education settings. The project will yield useful information and resources for informal science learning practitioners, parents, and other educators who look to advance STEM learning opportunities for children.

Questions

When and how do museum-based practices support STEM learning opportunities for children and their families during tinkering, and how can we assess this? How can opportunities for reflection increase the potential for STEM learning made possible through tinkering?

Approach. This Research-in-Service to Practice project is taking place at the *Tinkering Lab* exhibit at Chicago Children's Museum. It will involve at least 350 children ages 6 to 8 years old and their families. Using a design-based research approach, researchers and museum facilitators will prompt children and families to reflect on shared tinkering experiences in ways that can enhance STEM engagement and learning.

Potential Challenges. Recording conversations in a noisy exhibit; live "Blitz" coding of interactions.

Tinkering is an important target for research and educational practice because

1. Tinkering may engender both rich hands-on engagement with materials and conversations with others.
2. Tinkering can be more open-ended than many other kinds of building experiences (e.g., puzzles, making a model airplane), and therefore may foster participants' own unique questions and goals that guide the activity.

Tinkering may provide a highly accessible point of entry into early STEM learning for children and families from a variety of backgrounds, interests and levels of expertise.

Reflection involves stepping back to think, ponder, remember, and make personal meaning of experience. We are examining several forms of reflection that may increase the potential for STEM learning.

1. *Procedural reflection* during tinkering may help children observe data, make comparisons, reassess problems and failures, etc.
2. *Summative reflection* immediately after an activity may showcase what has been learned and include talk about elements not discussed during the hands-on activity.
3. *Post-event reflection* that occurs beyond the museum walls may extend the learning process and support long-term retention of experiences.

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