Engineering an Engineering Experience: A Museum-University Partnership
7 Design Strategies to Increase STEM Learning
Questions for Fine Tuning a Tinkering Experience

1. Challenge Specificity
   - How open-ended or specific is the hands-on experience for visitors?
   - Is there a goal that leaves room for creativity?
   - Can visitors make a unique project that does something?

2. Deliberately-Chosen Materials
   - Do the materials allow visitors to make something that works?
   - Do the materials leave room for both failure and success?
   - Are problems solved in multiple ways?
   - Do projects end up looking different?

3. Opportunities for Testing
   - Are there legible and fun ways to see how projects are working?
   - Is there a way to measure incremental success or small changes?
   - Does testing motivate visitors to improve what they made and retest it?
   - Do visitors use testing during their making process—to see what’s working or to check on a strategy?

4. Challenge Difficulty
   - Is the challenge too easy or too hard to engage a wide range of visitors in tinkering?
   - How long does it take to make something that can be tested or modified?

5. Activate Knowledge
   - What prior knowledge or experiences do visitors have that might be useful?
   - What information would help visitors be successful?
   - What vocabulary will help them make connections later?
   - What are strategies for sharing information in an engaging, hands-on way?

6. On-going Staff Training
   - What are ways to support collaborative learning by scaffolding for caregivers and interacting with families?
   - How can you integrate a layered approach to training that clarifies staff’s critical role while building on their experiences?
   - How can reflection enable staff to fine tune the tinkering experience including their own facilitation role?

7. Opportunities for Reflection
   - Are there times during the experience to chat about what visitors have tried so far?
   - Can visitors make things that they can take home to show others?
   - Do staff ask visitors to share what they made and explain their process?
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Role of Staff

- **Introduce the challenge:** *We’re making things that roll.*

- **Be a guide to the space:** Point out tools, materials, and testing stations.

- **Activate (background) information:** Offer an orientation with an advanced organizer. Call out prior knowledge: *What do you know about swing sets?*

- **Be an active and appreciative presence:** Circulate and check in often. *Show me what you’re up to. Wow. Look what you did!*

- **Offer support and expertise:** *How can I help? Would you like to try a different tool?*

- **Promote observation:** Focus attention on what’s happening with the object. *What are the wheels doing?*

- **Boost the engineering process:** *Did you try it yet? What happened? Let’s watch it together.*

- **Model a way of interacting:** Do with--not for. *Let’s try this together. What do you want to try next?*

- **Support reflection:** *Wow! How’d you do this? What did you learn?*

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