

# How Museum Facilitation and Program Design Support Children's STEM Engagement

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## Introduction

- STEM talk during problem solving activities links to better memory and transfer of learning from these experiences (Haden et al., 2016; Marcus et al., 2018).
- Support from museum facilitators can promote conversations about STEM concepts (Kupiec et al., 2023).
- We examined how facilitation by museum staff and specific aspects of exhibit design can support children's engagement in STEM talk during a hands-on tinkering activity.

## Methods & Participants

- 31 parent-child pairs participated in a hands-on problem-solving challenge that invited them to make a rolling creation.
  - Children were 4-10 years old ( $M = 6.97$ , 23 girls and 8 boys)
  - 51% White, 23% Mixed, 17% Latine, 5.7% Black, and 2.9% Asian

## STEM Coding

Code	Example
Planning	"How can we attach this?" "What should we do with this?"
Predictions	"If the body is heavier, it will go faster."
Functions of Tools	"You can use the drill to make holes."
Testing	"Do you want to try it on the ramp?"
Mathematics	"Let's go get a longer dowel." "Are those the same size?"
Redesigning	"We have to make the hole bigger, right?"
Reflection	"What do you think stopped it from rolling?"

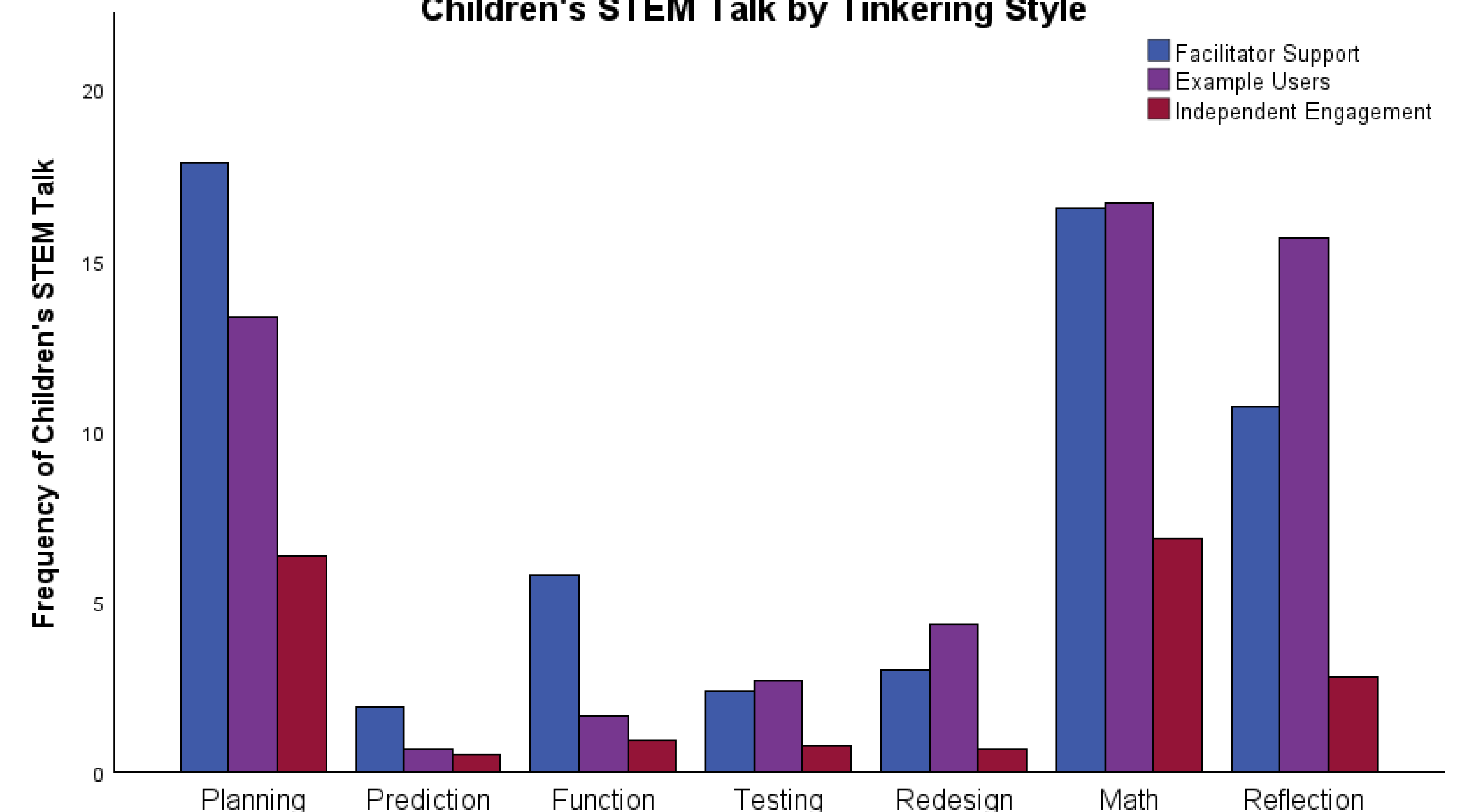
## Facilitation Coding

Code	Description
Using Examples	Dyad uses examples or other's creations to develop an idea.
Facilitator Intervention	Dyad receives help from the facilitator, either prompted or unprompted.

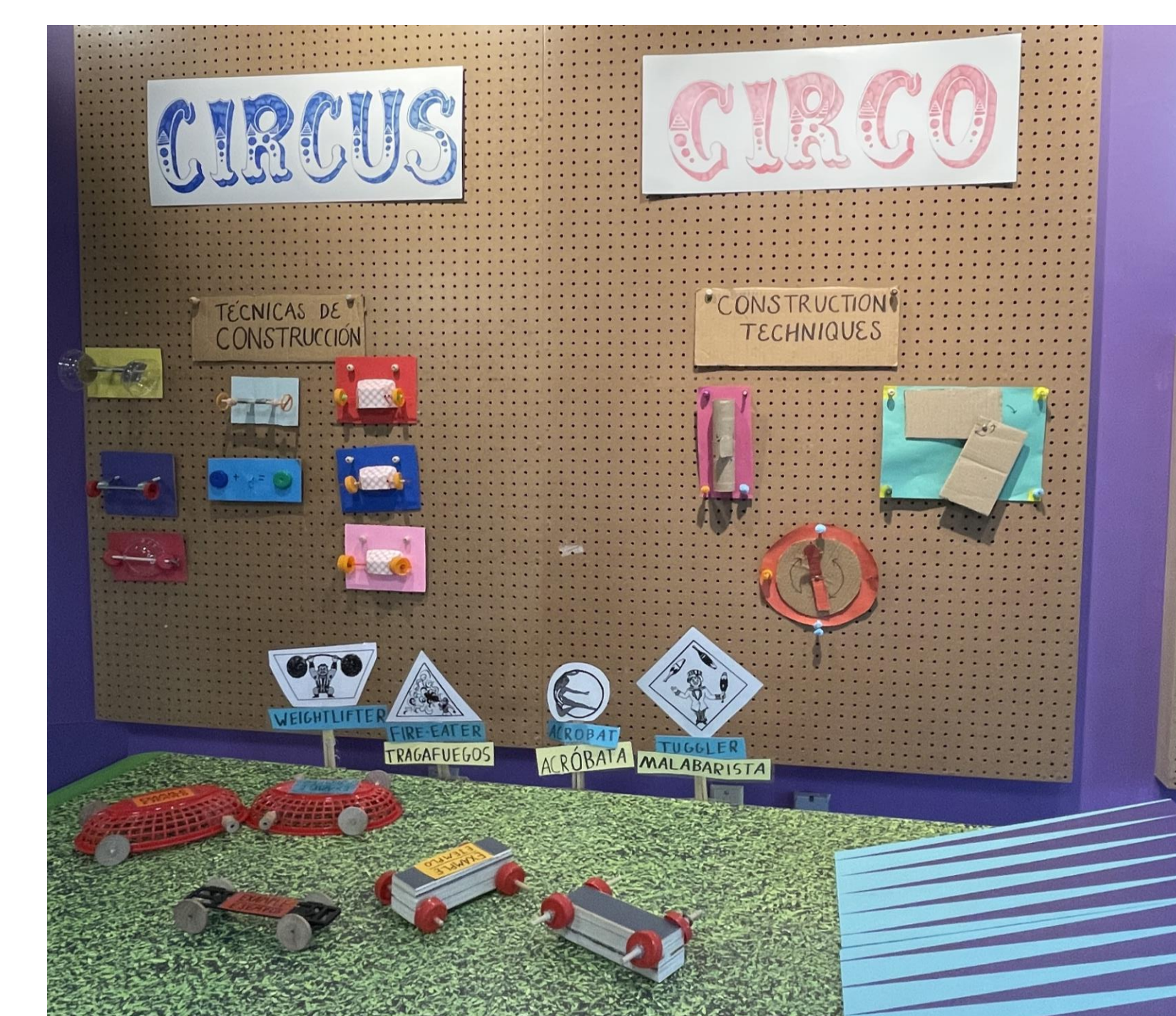
## Results

- Analysis identified three groups with distinct patterns of engagement: *facilitator support* ( $N = 13$ ), *example users* ( $N = 3$ ), and *independent engagement* ( $N = 15$ ).
- *Facilitator support* received the most help from facilitators, and their STEM talk involved the most talk about planning, predictions, and functions of tools.
- *Example users* talked most about examples/models, and their STEM talk was most about redesigning and reflection.
- *Independent engagement* engaged in less STEM talk overall ( $M = 18.27$  total STEM codes while tinkering) while building a rolling creation.

Children's STEM Talk by Tinkering Style



## Discussion



- Families engage in a variety of ways despite all participating in nominally the same program at a children's museum.
- Help from facilitators and talk about examples and models supported children's overall STEM engagement.
- The study highlights the value of providing a variety of resources and interactive opportunities in a tinkering exhibit to advance STEM learning.