Parent-Child Reflections about Multiple Visits to a Museum Tinkering Exhibit

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INTRODUCTION

- Tinkering experiences in informal learning spaces can engage families in engineering practices and support learning (Pagano et al., 2020).
- Reflections after informal learning experiences can reveal and extend children's memory and learning (Pagano et al., 2019), but reflections vary by age, culture, setting, program, and other factors (Fivush et al., 2006).
- We examined how the conversational structure and engineering content of families' reflections vary across multiple museum visits and across different types of tinkering programs (e.g., open-ended vs. function-focused).
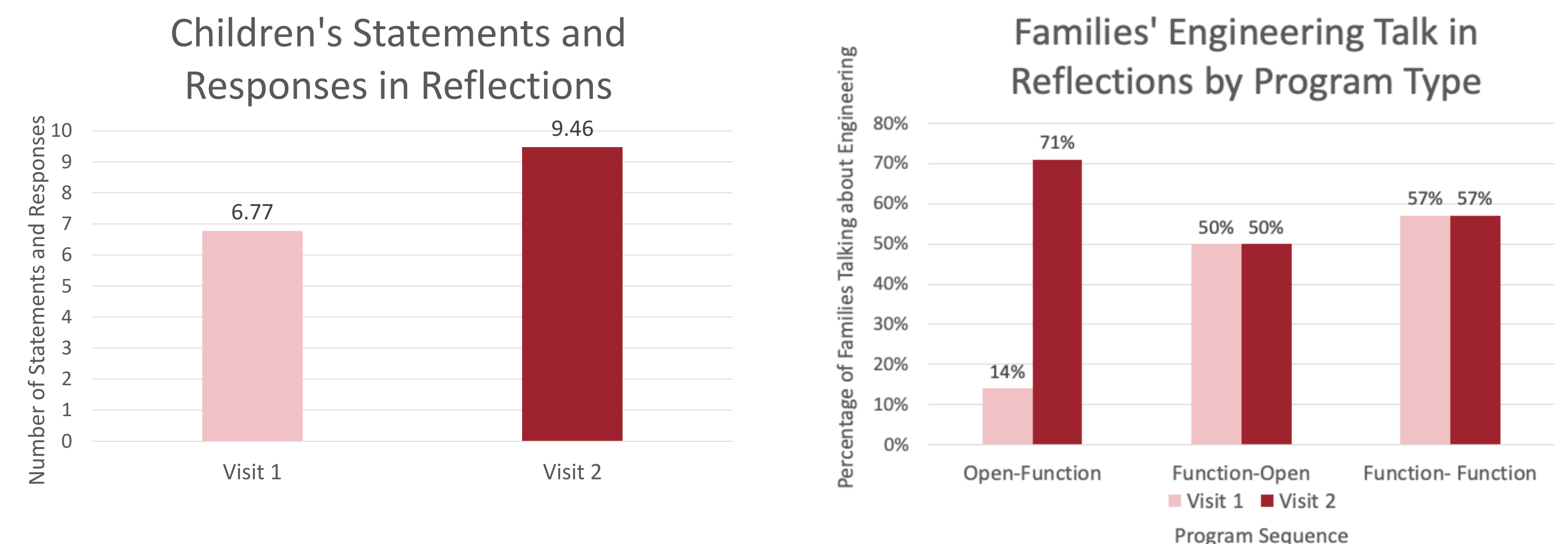
METHODS & PARTICIPANTS

- 22 families with children estimated to be ages 4-11-years-old visited the Tinkering Lab and participated in either an open-ended program or a function-focused program (e.g., make something that flies, rolls).
- Families visited between 2-6 times, spanning from 12-1251 days ($M = 394$ days) between each visit.
- Afterwards, families visited the Story Hub exhibit and recorded a reflection on their experience together.

PARENT-CHILD REFLECTION CODING

Engineering Talk		Any talk about goal setting, brainstorming, planning, testing, and redesigning.
Conversation Structure	**Open-Ended Questions**	Asking or responding to who, what, where, when, why, and how questions.
	Yes-No Questions	Asking or responding to forced-choice or yes-no questions.
	Statements	Providing unique information in the form of a declarative statement.

RESULTS

Children's Statements and Responses in Reflections

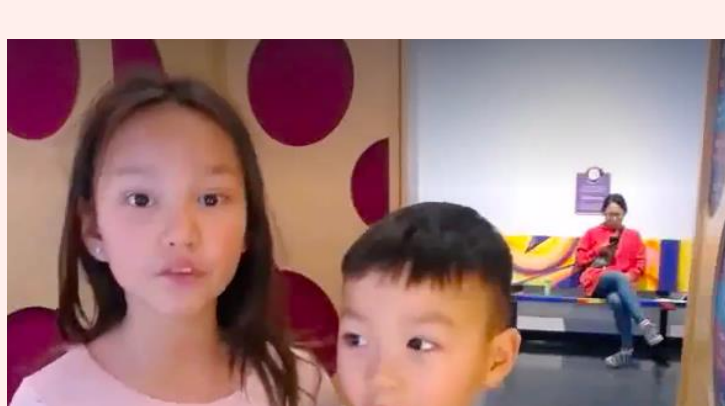Families' Engineering Talk in Reflections by Program Type

- Parents' use of questions and statements in their reflections were not significantly different across visits.
- As shown in Figure 1, children provided significantly more details (i.e., statements and responses to open-ended questions) in their reflections about their second visits than in their reflections about their first visits, $t(21) = 2.79$, $p = .011$.
- As shown in Figure 2, families were more likely to talk about engineering when reflecting about programs with function-focused goals, compared to open-ended programs, Visit 1: $X^2 = 6.14$, $p = .013$, Visit 2: $X^2 = 5.51$, $p = .019$.
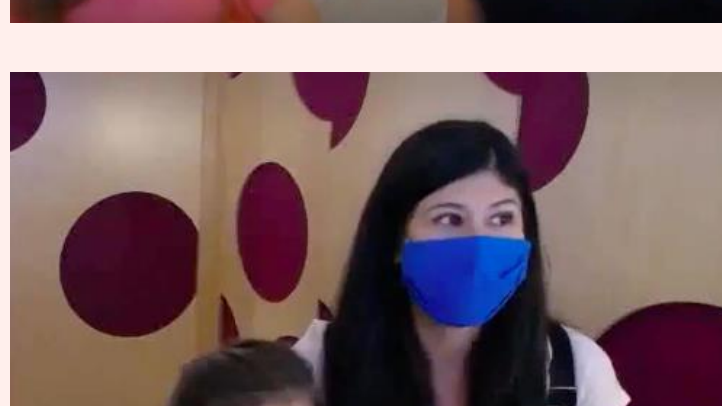
DISCUSSION

- Children's reflections about tinkering became more detailed over time, possibly due to aging or increased experience with tinkering and reflection.
- The design of tinkering programs relates to families' talk about engineering when reflecting on an informal learning experience.
- These findings can be incorporated into the design principles of museum practices to support children's engineering learning in the future.

PARENT-CHILD REFLECTIONS

Family 1: 311 Days/336 Days

	Visit 1: Open-Ended	Visit 2: Open-Ended	Visit 3: Open-Ended
	*Child 1: I made a tent in the tinkering lab and a person to go in it.	*Child 1: So we both made a sailboat. And we first started with a long piece of wood and then a short piece of wood and then we drilled a little hole. Put a straw and then we took fabric and put holes through the fabric then put it on and then we made a sail. Then we made two people and then we were decorating on the boat. And then I finished.	*Child 1: So we went in and I made a car um that had real wheels...well no, it didn't have real wheels it had uh wood wheels and it could turn because I used a saw. I mean uh... *Child 2: The wheel. *Child 1: And I used a drill to drill holes through so you can put a straw in there and I did that for all four. And then now my brother here will tell you what he made. *Child 2: You know what I made. I made a +... *Child 1: Water. *Child 2: Water gun! And I had to drink it. Super fun. I needed a straw and did it and then I took a piece of wood, made it go down and then I cut a hole into um this part um... *Child 1: Your hand? *Child 2: [Laughing] No um I drilled a hole in the part where the straw was gonna go and I sticked the straw in there then I glued it and then I made a hole in the top and then I put water in the top. And then I would take that piece and put it in there.

Family 2: 704 Days

	Visit 1: Function-Focused (Make It Roll)	Visit 2: Function-Focused (Here to There Ramps)
	*Mother: What did we do at the tinkering lab today? What did we build? You wanna show them? This is what we built today. What exactly is it? *Child: A stage! *Mother: A stage for people to go off and dance on huh? *Child: Yeah. *Mother: What else can they do on the stage? *Child: Sit down. *Mother: Then they climb up to the top huh? It was super fun. And did we make anything else while we were there? Did you by any chance make a car too? *Child: Mhm. *Mother: We left the car there, the car that we were testing out.	*Child: We did that [points to the screen]. *Mother: What is that? *Child: The tinkering lab. *Mother: Okay but what did we do at the tinkering lab? *Child: We builded a ramp. *Mother: Alright and what was our ramp doing? *Child: Trying to get to a nest. *Mother: Mhm cause we had to bring it from the table to the ground right? *Child: Yeah. *Mother: And you had to make a story too so what was our story? *Child: Cause the ball needs to get to the mommy. *Mother: Yeah cause we were pretending that the ball was a little egg that got lost and we had to get the egg back to the nest right? *Child: Yeah. When we were doing all that stuff, we actually had so much fun.