Transporting Toy Friends during Tinkering Promotes Storytelling and Testing Talk in Family Reflections

Lauren C. Pagano, Riley E. George, Catherine A. Haden, & David H. Uttal

Northwestern University & Loyola University Chicago

INTRODUCTION

- The tinkering process of making, testing, and iteratively redesigning projects can teach children about engineering concepts (Marcus et al., 2021; NGSS, 2013), but there is variability in how tinkering programs are designed.
- Storytelling may make children's learning experiences personally meaningful and narratively organized, thereby supporting memory (Bruner, 1996).
- We designed multiple story-based tinkering programs and examined how the types of story characters and goals introduced in the tinkering programs would relate to the content of families' talk in post-tinkering reflections.

PARTICIPANTS

- 75 families visited Tinkering Lab and recorded a reflection in Story Hub.
  - Children were estimated to be between 4-11 years old.
  - 25% included only boys, 54% included only girls, 21% included boys and girls.

METHODS

- Families visited Tinkering Lab and participated in a story-based program.
- After tinkering, families recorded a video reflection in the museum's Story Hub exhibit.
- After they finished recording their video, families touched the screen to give consent for their video to be used for research.
- Participants never directly interacted with the researchers, so their Story Hub videos provide a naturalistic view of families' reflections about learning activities.
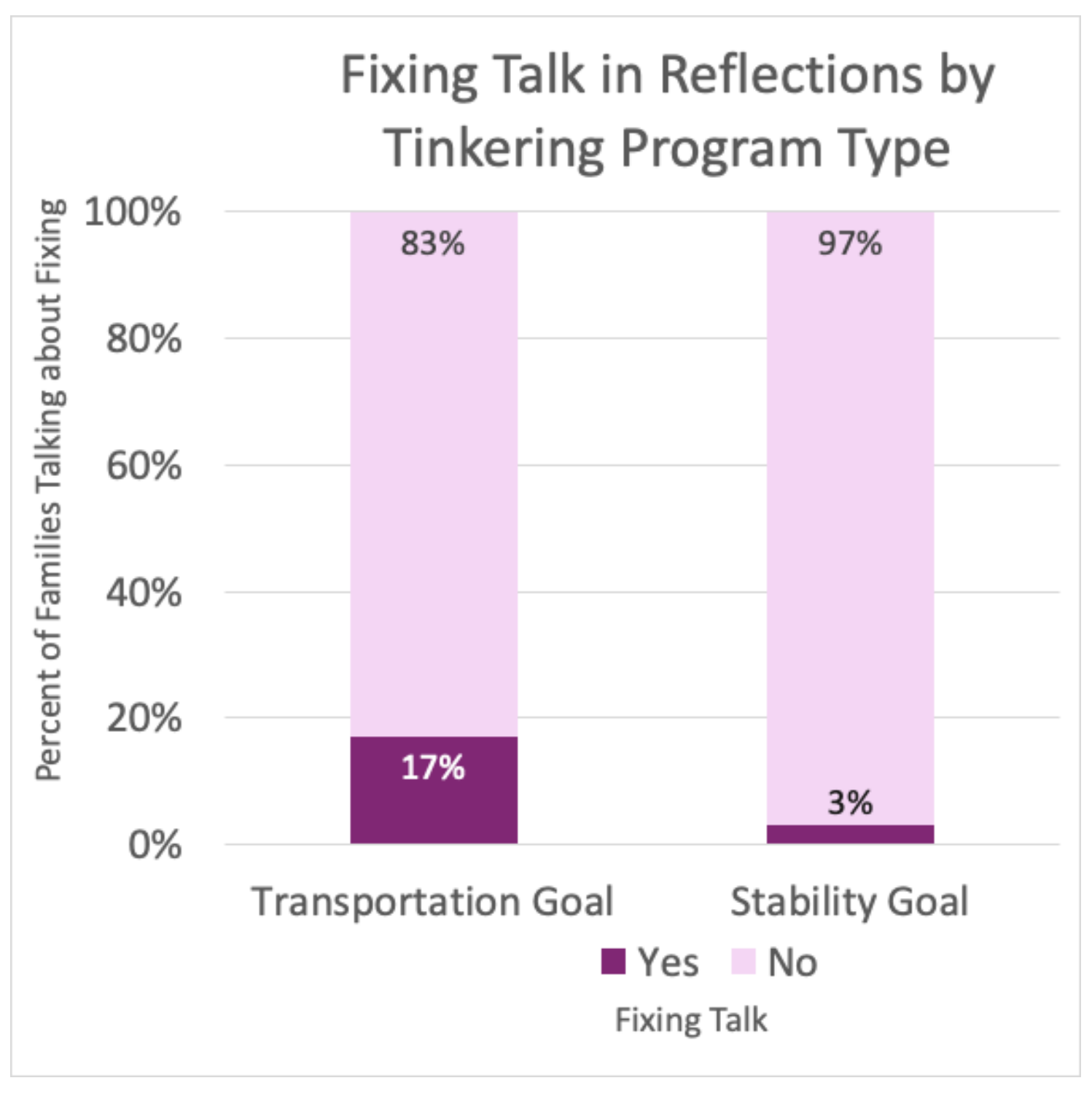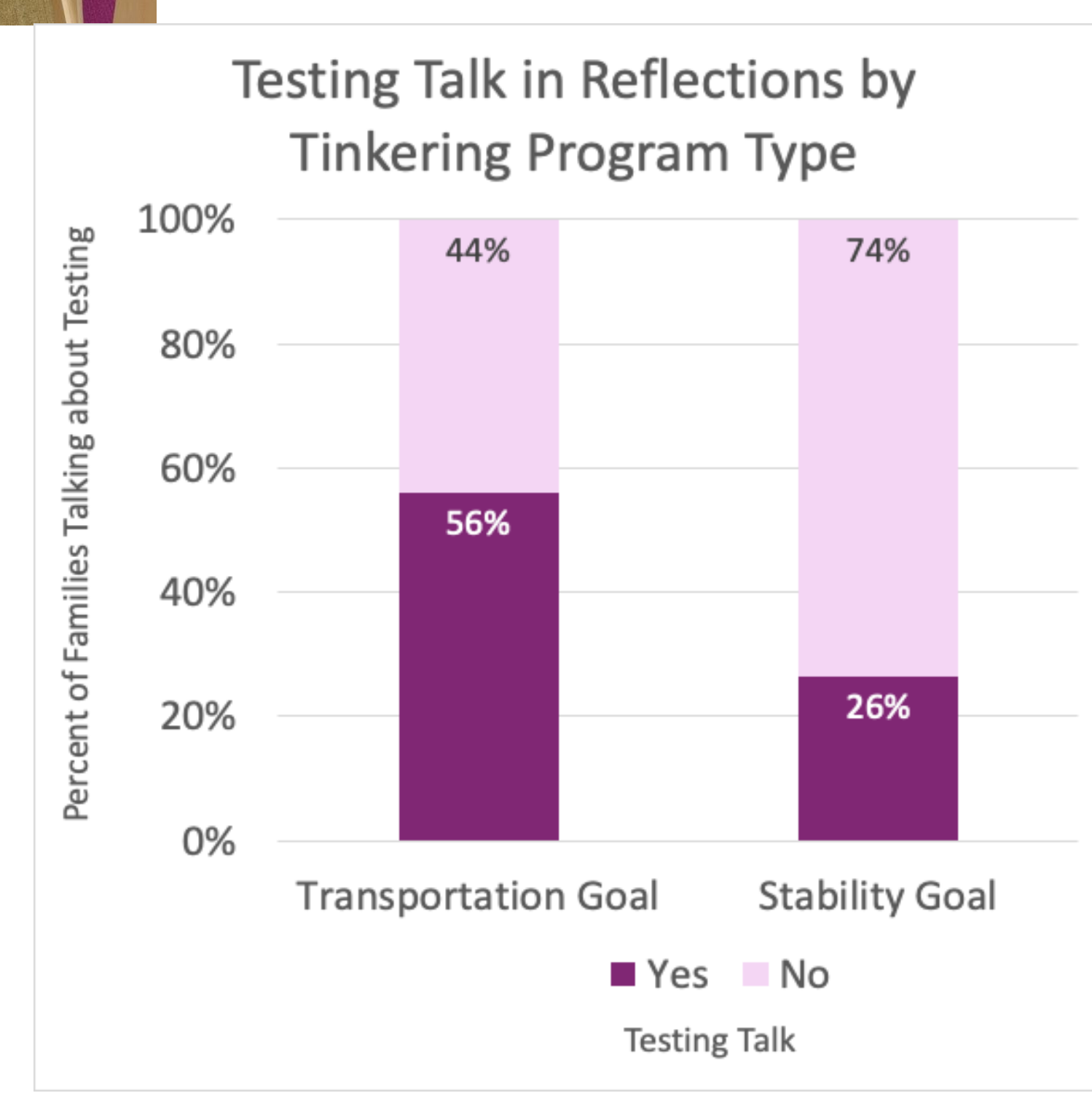
Program	Character	Goal	Description	Photos
Cardboard Costume	Child	Stability/Fit of Project	Children designed a costume that would help them on an adventure of their choosing. Children could test whether their costume would stay on their body on the exhibit's obstacle course.	
Party/ Birthday Hat Challenge			Children created a hat for the museum's party and could test whether their hat would stay on their head at different party games (e.g., dancing, limbo).	
Toy Playground	Toys	Transportation of Object/ Character	Families made safe, stable playground equipment (swings, slides, ziplines) for small toy characters.	
Here to There			Families moved a character (balls, toy cars, toy mice) from their table to the floor (e.g., by making a ramp).	
Safe Travels			Families transported a glow-in-the-dark toy monster across a table without exposing them to light (e.g., by making a tunnel).	

Cardboard Costume

Party Hat Challenge

Toy Playground

Here to There

Safe Travels

CODING

Code	Example
Character Talk	"Our monster was a vampire..[who] had to stay in the shadow..[we built a] bridge that he went under." "The mouse [needed] to get from the table to the floor...because the air conditioning was clogged up and they had to get him to the pool."
Testing Talk	"[We built] a ramp...to the floor...[but] when we were putting the car in...the car crashed." "We made a robot head...[and] put it on and we had to go through a obstacle course."
Fixing Talk	"She made it too big, so she had to make an adjustment right here." "First our parachute did not work because we did not have string...and then we put string and it worked out better."

RESULTS

Character Talk in Reflections by Tinkering Program Type
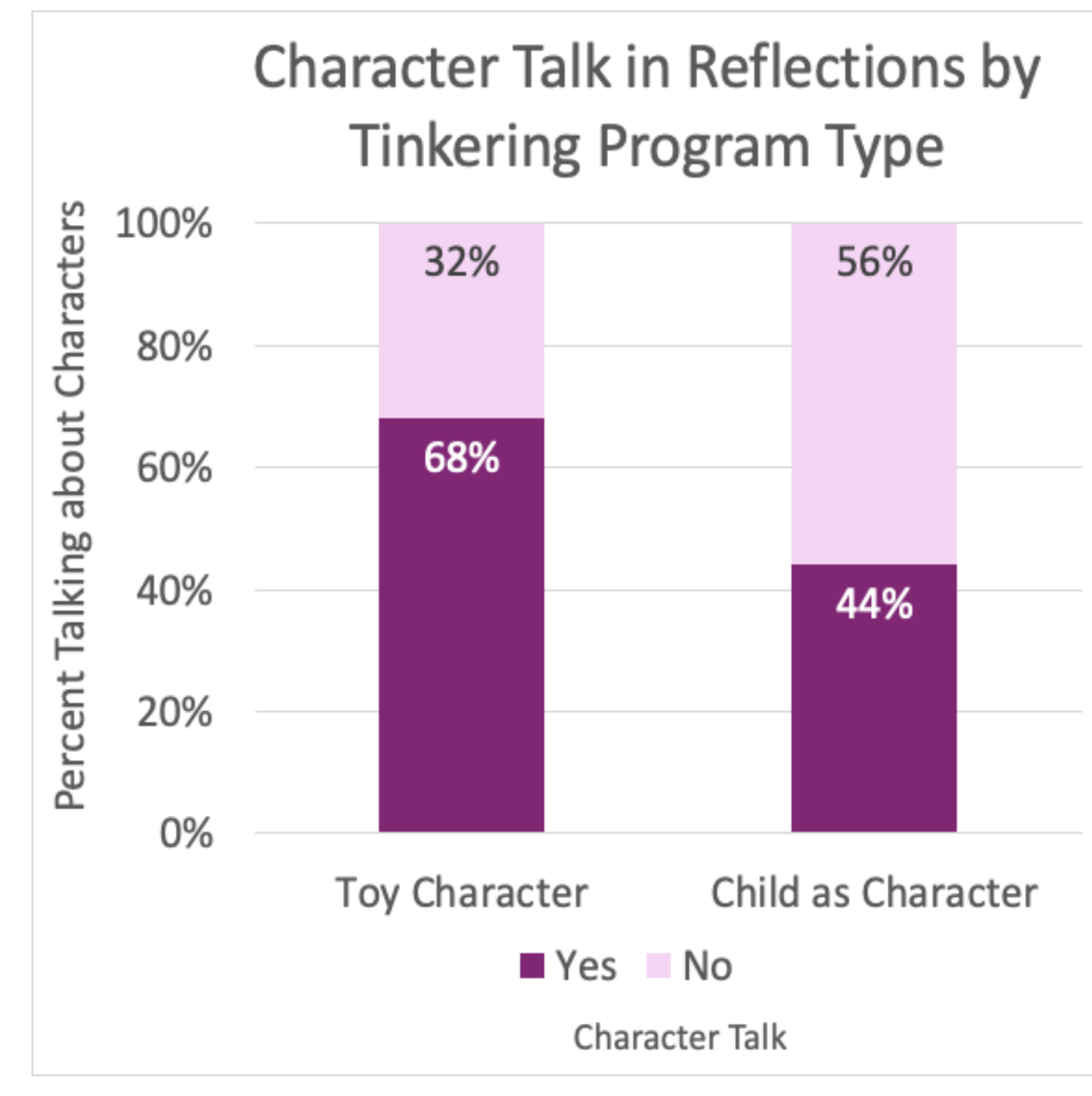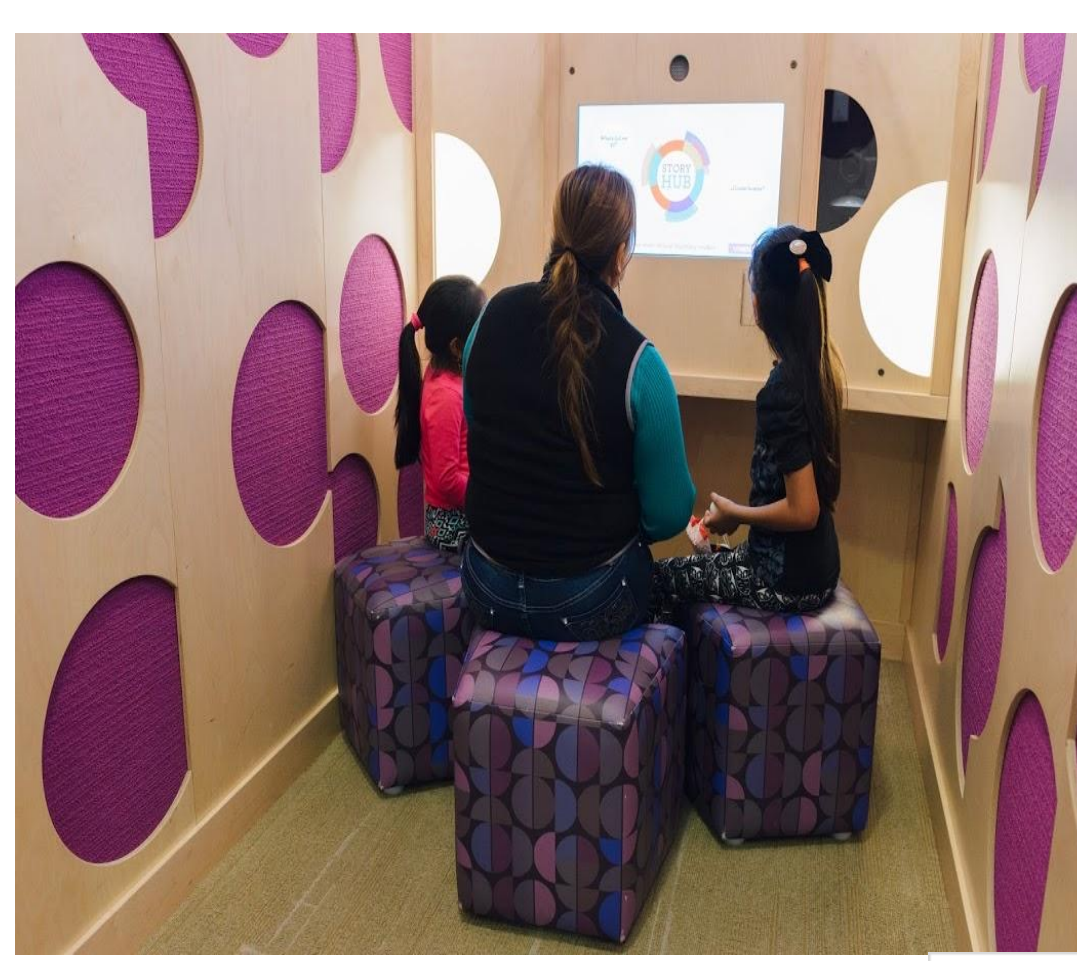
- Families in programs that involved designing for toy characters were significantly more likely to talk about characters in their reflections than families in programs that involved designing for the child, $X^2 = 4.00$, $p < .05$.

Testing Talk in Reflections by Tinkering Program Type

Fixing Talk in Reflections by Tinkering Program Type

- Families in programs with transportation-focused goals were significantly more likely to talk about testing ($X^2 = 6.67$, $p < .01$) and fixing ($X^2 = 3.90$, $p < .05$) than families in programs with stability-focused goals.

DISCUSSION

- Toy characters may facilitate storytelling.
- Compared to stability goals, transportation goals with clear markers of success may foster more talk about engineering practices.
- However, ongoing work from our team suggests that programs with stability and fit goals may promote more spatial language use (*see Polinsky et al., 2023 at Poster 9 on Sat. 3/25 from 10:30-11:15 AM*).

ACKNOWLEDGMENTS