

# Teaching Together: Engaging Parents and Preschoolers in STEM Activities & Academic Conversations

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## Informal Learning Context

- Use a series of 6 museum-facilitated family workshops at pre-kindergarten (pre-k) centers to promote informal STEM learning.
- Examine 3 conditions in which families and their children most benefit from "doing science and math" together.
- Focus on populations that are typically underrepresented in STEM fields – families experiencing poverty and families who speak English and/or Spanish at home.

## Challenge Questions

This project draws on expectancy-value-cost theory (e.g., Eccles & Rosner, 2009; Wigfield & Eccles, 2000) by addressing potential barriers families face in supporting STEM learning. See barriers to motivation in Figure 1.

- How can **workshops** encourage exciting, rich conversations that inspire inquiry learning ( $\uparrow$  value) and provide information and resources to increase diverse parents' knowledge of how to "do science and math" with their child ( $\uparrow$  expectancy)?
- How can additional **materials** for STEM be useful and feasible to integrate into family's schedules ( $\downarrow$  time costs/task effort)?
- How can academic **terminology** and STEM processes be accurate, yet not intimidating ( $\downarrow$  emotional costs/anxiety)?
- How to best **measure**: (a) parent motivation, (b) STEM conversation quality, and (c) quantity of informal STEM activities?

## Approach

### Setting

- Occurring afterschool in pre-k centers in Houston, TX.
- Programs serve families who speak English or Spanish.
- Programs serve >50% economically-disadvantaged students.

### Participants

- Development Phase 1: 250+ families and their 4-year-old children.
- Experimental Phase 2: 360 family caregivers and their 4-year-old children.

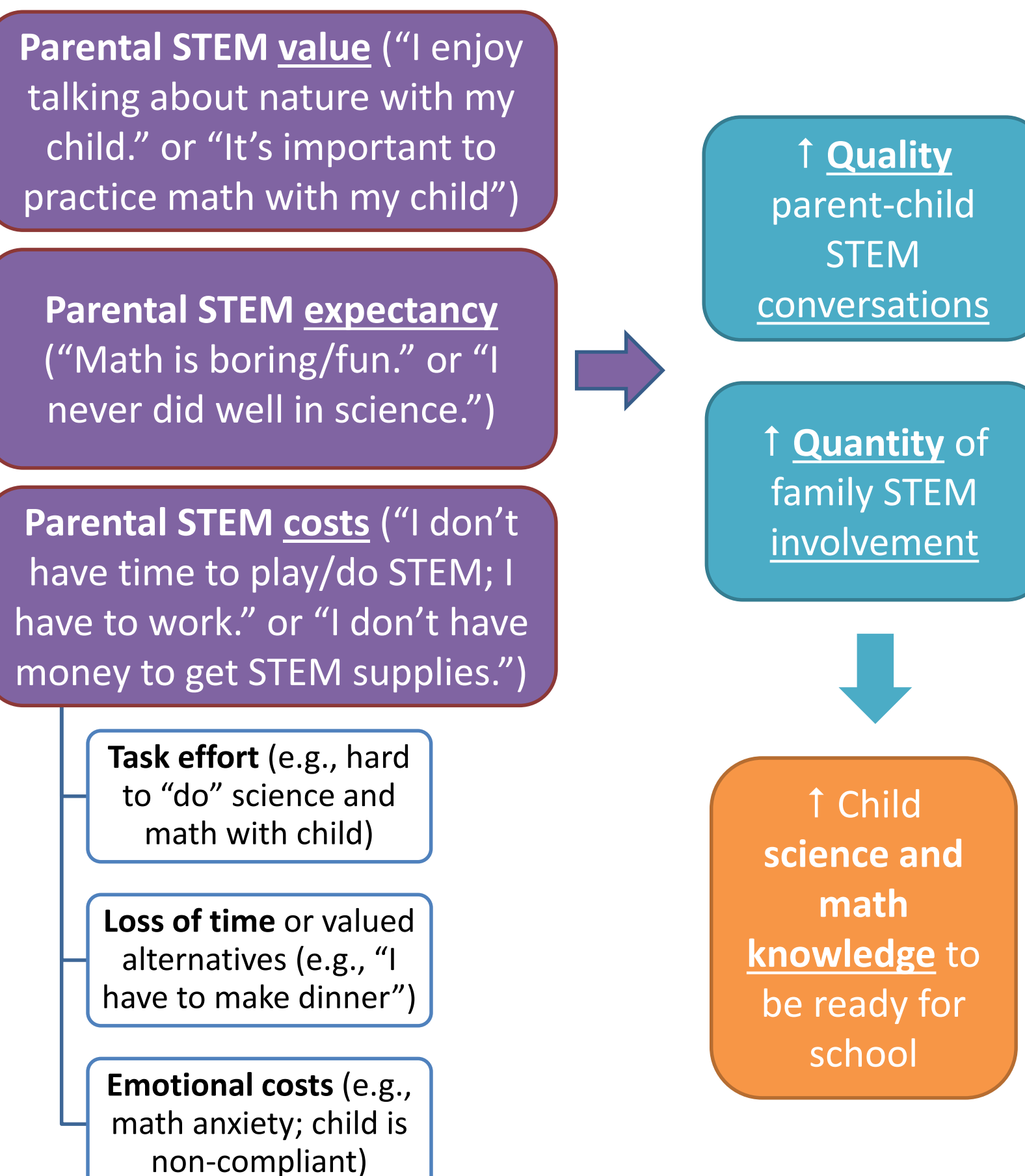
### Procedures

- Family STEM workshops:** Within preschool buildings, we use interactive parent-child workshops led by a museum educator. Parents learn ideas, activities, and strategies to support STEM learning at home. Parents see strategies modeled in videos and by the facilitator. Parents then have opportunities to practice with feedback, praise, and support.
- Addressing Barriers:** We evaluate the added benefit of extra motivational supports designed to reduce barriers:
  - Providing materials to decrease perceive challenges in accessing STEM resources, and
  - Providing incentives to reduce various time or emotional costs associated with informal learning.



## Parent Motivation Theory

Figure 1. Illustrates how the expectancy-value-cost theory guides this study of parental support for informal STEM learning.



## Significance

- Parent involvement** is associated with better academic outcomes in pre-k through high school (ES range .29 to .33; Jeynes, 2012; Wilder, 2014).
- Many **schools** provide **family education opportunities** to increase family engagement in informal learning.
- But a meta-analysis with 46 studies of ECE programs (Grindal et al., 2016) found no benefit of adding parent education programs (average ES = .01) on children's outcomes (e.g., vocabulary, math, literacy) unless it included **opportunities for modeling and parent skill practice** (ES range .08 to .22) or more expensive parent coaching in the home (ES range .30 to .42).
- Thus, it is important to examine a **promising approach** developed by **museum educators** that includes such opportunities for practice and that mirrors commonly used family engagement activities in schools.
- Moreover, the pre-k period may be a key time for engaging families in ways with the potential to build genuine partnerships between families and informal educators around the common goal of increasing children's **school readiness**.

## Results: Iterative Development Phase 1

Note. This study is currently in the first 6 months of a 4-year project.

### Workshop Iterative Testing & Refinements

- Six of 24 planned pilot workshops (25%) have been conducted to date. The purpose is to refine the existing learning model based on parent feedback and observation.
  - A total of 237 adults and 303 children have attended these workshops at three different school sites (2 Head Start, 1 charter school).
- Parent exit survey feedback (n=39): **80-90% of parents give the highest satisfaction rating** for major workshop components (book reading, activity stations, handout).
- Parent exit interview feedback (n=12): Parents report learning new activities and ideas they can do at home. Parents explain their **motivations for attending** the workshop(s) include: (a) spending fun time together, (b) parent learning new activities/approaches, and (c) the excitement their child experiences in doing activities.

### Piloting Parent Survey of Expectancy-Value-Cost for Informal STEM Learning

- A 78-item expectancy-value-cost survey has been developed based on extant literature. We are currently gathering data to evaluate psychometric properties.
  - 250 families with 4-year-olds will complete this initial survey to inform IRT-based item reduction and scaling with the goal of a 5-minute final survey.
  - Feedback** on this initial measure is greatly appreciated – see handout.

Figure 2. Phase 2 – Planned Experimental Conditions: Across 2 cohorts, a total of 360 families will be randomly assigned to one of four conditions.

- STEM Family Nights/Workshops**
  - Facilitated by Children's Museum of Houston
  - 6 STEM themed sessions with hands-on practice
- STEM Workshops + Materials**
  - Set of STEM activity kits that support STEM inquiry
  - Represent typical commercially available resources
- STEM Workshops + Materials + Incentive**
  - \$2.50 per SMS photo evidencing informal STEM
  - Paid monthly via Walmart or Amazon gift card
- Business-As-Usual (BAU) Control**
  - Preschool centers may offer some or no family education opportunities as their BAU

Figure 3. Key Workshop Components: Designed to empower families to see themselves as their pre-k child's first and most important teacher.

- STEM and parenting **experts** from the Children's Museum of Houston facilitate 60-min workshops.
- A short **video** explains two key strategies with several parent-child video segments modeling the behaviors. A **handout** provides more ideas and a link to online activity collection with over 50 STEM activities for the home.
- An interactive **book reading** activity models the strategies.
- Families rotate to four or five hands-on **activity stations** to practice strategies and have fun! The facilitator offers feedback and support.
- Families leave with a **free museum pass** for their entire family.



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