



“The Way They Teach Math Nowadays!” Parents’ Mental Math Strategies, Attitudes, and Engagement with Educators Predicting Children’s Math Achievement

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INTRODUCTION

- Children’s early math achievement serves as a foundation for their long-term academic success and career trajectories (Shapka et al. 2006).
- Researchers have explored components of the home mathematics environment (HME) – such as home numeracy practices and engagement in educational activities – as they relate to children’s early math achievement (Hart et al. 2016). However, limited research has focused on the way in which parents support their children’s math learning when completing homework.
- Following the widespread adoption of Common Core State Standards – a set of research-based educational standards adopted by most U.S. states in 2010 (Lavenia et al., 2015) – the way in which elementary-school-aged children are taught foundational math has changed from the way in which many of their parents were taught math. Accordingly, when children ask for help on their math homework, some parents may be more aligned in their approaches to solving math problems than others (i.e., alignment with current approaches or with the traditional approaches).
- Therefore, it is necessary to understand linkages between parents’ homework-help approaches and children’s math achievement. In doing so, school administrators can identify families who may benefit from additional support in this area.

AIMS OF THE STUDY

- Explore parent-level factors thought to relate to children’s math achievement, such as parents’ approaches to math problem-solving, attitudes towards their child’s math homework, and parent-educator communication.
- Examine associations between these variables and children’s math achievement.
- Predict children’s end-of-the year math achievement from these home-level predictors.

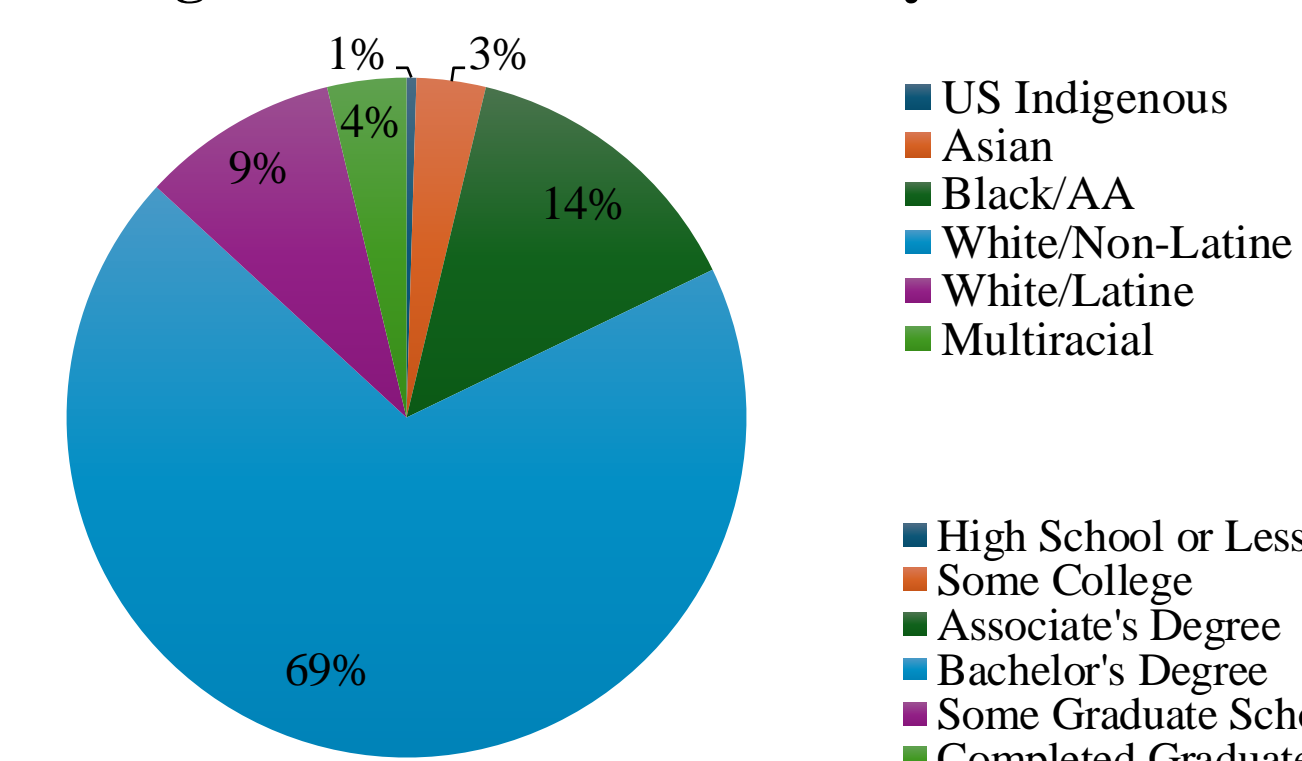
METHODS

- Data originate from the Research on Experiences, Attitudes, and Learning in Math (REALM) Study: a longitudinal study consisting of 2750 students, their caregivers, and their math teachers. The current study focuses on a subsample of 213 children and their caregivers.
- Child-, parent- and teacher-level measures were collected in the fall (Time 1) and spring (Time 2) of the 2018-2019 academic year, and once again in the fall (Time 3) of the 2019-2020 academic year, totaling three timepoints.

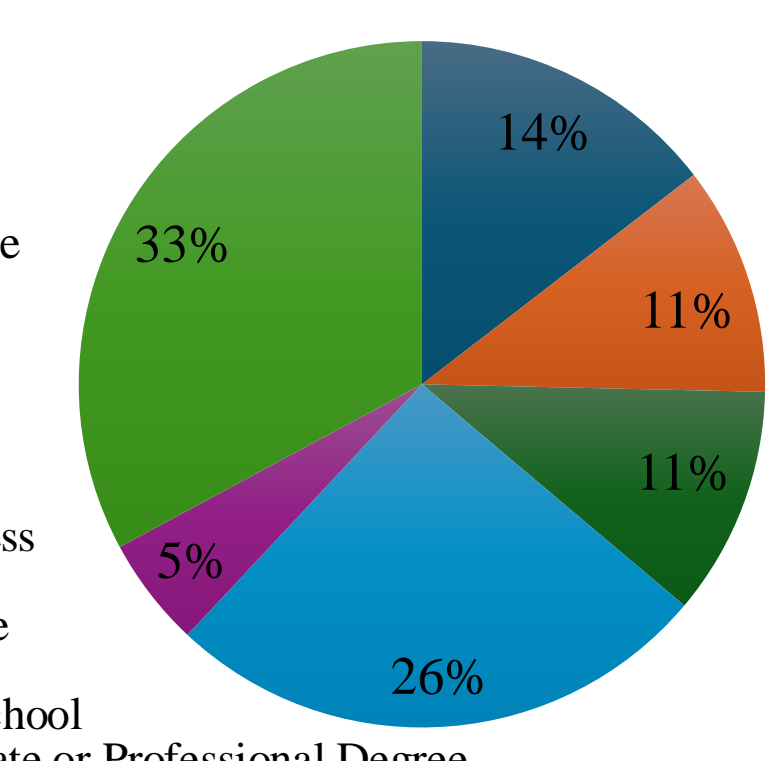
PARTICIPANTS

- Participants were drawn from one county and included 213 children and their caregivers (140 mothers, 56 fathers, 7 step-parents, 6 foster/adoptive parents, 3 grandmothers, and 1 great aunt).
- Children were in K – 3rd Grade, 34% qualified for free or reduced lunch, 51% female.

Caregiver Ethnic-Racial Identity



Caregiver Education Level

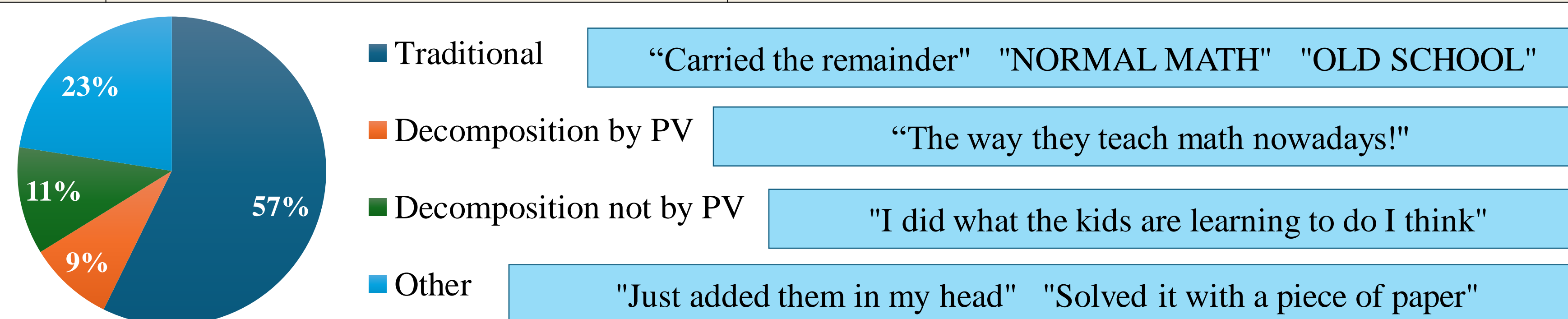


MEASURES & DESCRIPTIVE FINDINGS

Parents’ Mental Math Strategies

- Parents were asked to solve an addition problem using mental math: $125 + 238 = ?$
- Participants reported how they solved the problem responses were double-coded by two researchers using a coding scheme by Ganley et al. (under review).

How did you solve that problem?	Definition
1. Traditional U.S. Algorithm	Add by stacking numbers and solving right to left
2. Decomposition by Place Value	Break down numbers into whole place values, solve left to right
3. Decomposition not by Place Value	Break down numbers in any way, solve left to right
4. Other (e.g., cheating, vague response)	Using other resources or lacking information on strategy use



Parent–Educator Communication

- Based on the work of Lin et al. (2019), parents were asked to report the frequency of different communication behaviors they might engage in with their child’s math teacher using a 7-point likert scale (0 = never, 1 = about once a year, 2 = a few times per year, 3 = about once a month, 4 = a few times per month, 5 = about once a week, 6 = a few times per week).

How often does your child’s math teacher...	Min.	Max.	Mean	SD
Give you information about what your child is learning?	0	6	4	1.489
Help you understand what to expect from your child at each age and stage?	0	6	3	1.675
Give you information about your child’s developmental assessments or screening results?	0	6	3	1.452
Give you information about how to help your child learn at home?	0	6	3	1.678

Parents’ Attitudes Towards Children’s Math Homework

- Also based on the work of Ganley et al. (under review), parents were asked to indicate their level of agreement with four statements focused on their views towards their children’s homework. Responses were recorded using a 7-point likert scale (0 = strongly agree, 1 = disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = agree, 6 = strongly agree).

How much do you agree with the statement...	Min.	Max.	Mean	SD
My child complains too much about homework.	1	7	3	1.792
I feel that my child has too much homework.	1	7	3	1.638
I do not understand some of the strategies my child is being taught in math.	1	7	4	1.974
It is difficult for me to help my child with his or her math homework.	1	7	3	1.982

Children’s Math Achievement

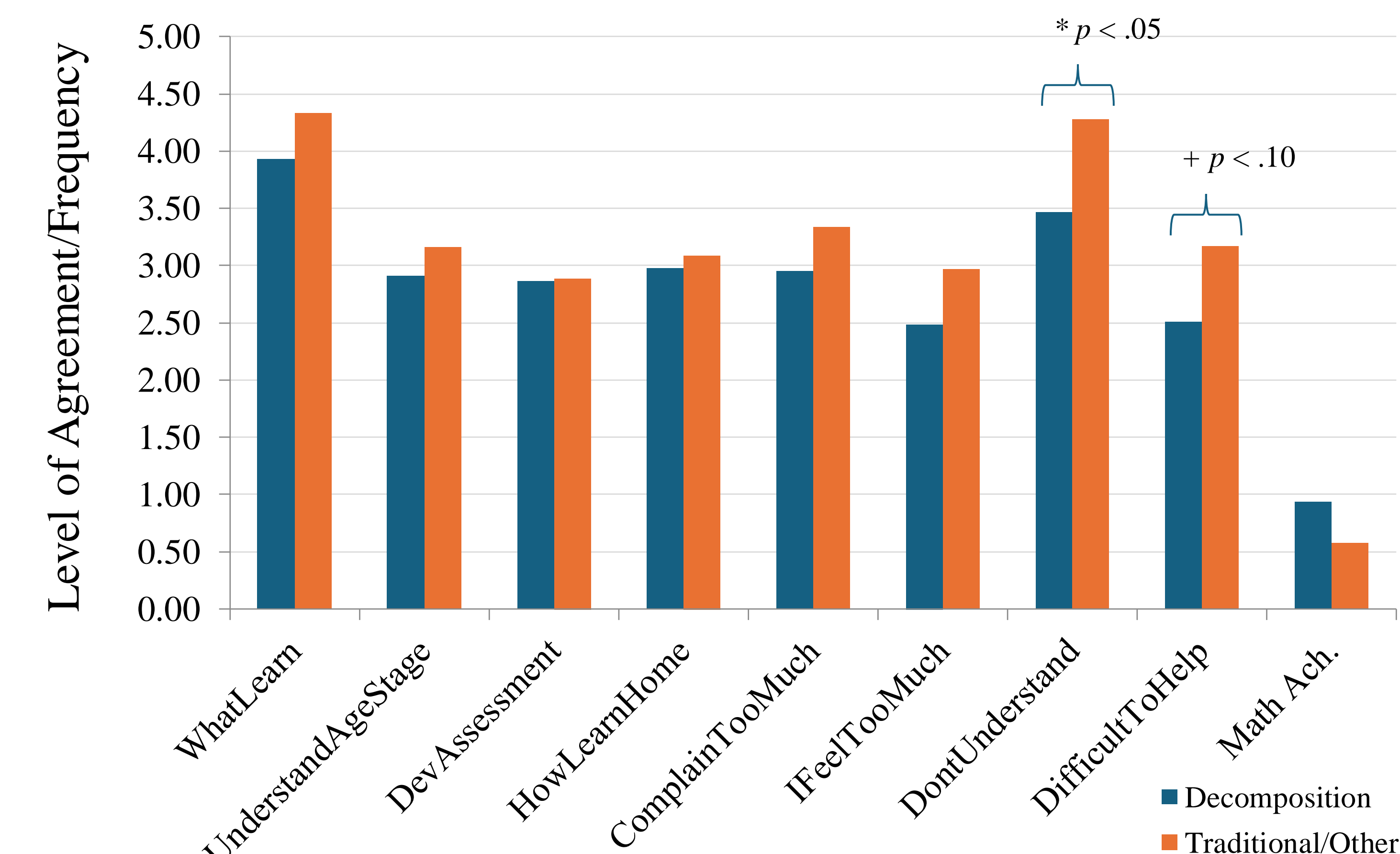
- Students completed grade- and season-specific versions of the Elementary Mathematics Student Assessment (EMSA; Schoen et al., 2021), a standardized measure designed to test grade-level appropriate math knowledge
- Domains tested include counting and cardinality, word problems, number relations, fractions, basic number facts, and multidigit computation.
- Standardized scores were operationalized as theta scores, with a higher score indicating a higher level of math knowledge.



	Min.	Max.	Mean	SD
Overall Scores	-2.279	3.617	0.641	1.336
Descriptive Statistics Conditionalized by Parents’ Mental Math Strategies				
Traditional/Other	-2.279	3.617	0.649	1.147
Decomposition	-1.980	2.881	0.606	1.181

RESULTS

Differences in Parent–Educator Communication and Math Homework Attitudes by Mental Math Strategy



- Parents who used decomposition strategies were significantly less likely to report that they didn’t understand the strategies their child was being taught in math ($\beta = -.80$) and marginally less likely to report that they found it difficult to help their child with math homework ($\beta = -.56$), even after accounting for parent education level. No significant effects were found when predicting children’s math achievement.

DISCUSSION

- These findings indicate that not only did parents vary in their approaches to solving a basic arithmetic problem, but this variation predicted differences in (a) their ability to understand current strategies being taught to their children and (b) their perceptions of how difficult it is to help their children with math homework. Parents who used strategies aligned with Common Core State Standards, such as decomposition, reported facing fewer difficulties when helping their children with math homework than parents who used traditional or vague strategies.
- Future directions include observing parents’ strategies across multiple contexts (e.g., subtraction, multiplication), the complexity of their strategy descriptions, and their teaching practices during homework help. It is recommended that schools provide additional resources to parents who may face difficulties supporting their children’s completion of homework – such *what* their child is learning and *why* these “new math” strategies underlie students’ long-term success. In doing so, homework routines may create less stress and conflict between and children and their caregivers.

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Thank you to the children, families, teachers, and research assistants who make this work possible. The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305A170463 to Florida State University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.