



Summary of *Mathematics Curriculum: A Tool for Fostering Continuity Across Preschool and Elementary Grades*, by Sihua (Adrienne) Hu, Megan Franke, & Cynthia Coburn.

Research Brief – February 2020

The presentation, *Mathematics Curriculum: A Tool for Fostering Continuity Across Preschool and Elementary Grades* by Sihua (Adrienne) Hu, Megan Franke, & Cynthia Coburn<sup>1</sup>, presents results from the COHERE study. This study analyzes the efforts of the San Francisco Unified School District (SFUSD)<sup>2</sup> to connect educational experiences from Pre-K through the early elementary grades, specifically in the area of mathematics. The study also investigates how teachers and students experience these efforts and how these efforts influence students' perceptions of, and proficiency in, mathematics.

The study specifically investigates strategies that facilitate **continuity**, defined as *the degree to which teaching and learning connect and are scaffolded across grade levels* and **alignment** defined as *the degree of connection among different elements of policy at a given level of schooling*. This presentation reports the results related to curriculum continuity. Although the authors focus on mathematics, they assert that continuity is important across all subjects, as *students who have more seamless educational experiences across grades have better educational outcomes* (Abrey et al 2015). *At the same time, students do less well when content they know is re-taught or does not build on what they already know* (Engel et al 2013).

The authors analyzed 2018/2019 curriculum material related to number sense from Pre-K to grade 2. This included 27 curriculum units and 1621 activities. The activities were coded for content, to both identify how specific topics were linked to the California Preschool Learning Foundations and the Common Core State Standards - Mathematics and to assess the degree to which there was a similar mix of cognitive demand across grades..

## Findings

1. When analyzing the curriculum material to identify continuity across grade levels, the authors found that there is:
  - No missing content in Pre-K through grade 2 curriculum, and
  - Strong continuity across grades, specifically there is a logical progression with limited overlap.
2. The authors investigated cognitive demand, specifically four levels of challenge that students will encounter based on instructional activities. The four levels are: Level 1 - *recall/reproduction*; Level 2 - *application of concepts*; Level 3 - *strategic thinking*; and Level 4 - *extended thinking*. The authors found that:
  - Level 2, defined as *students make choices to solve, classify, organize, notice, and compare to solve problems* is predominant across all years and there is no Level 4 (*extended thinking*).

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<sup>1</sup> Hu, S., Franke, M., & Coburn, C. (2020). *Mathematics Curriculum: A Tool for Fostering Continuity Across Preschool and Elementary Grades*. [PowerPoint Slides].

<sup>2</sup> This study also investigated a second urban school district, not discussed in this research brief.

- Overall, there is somewhat lower cognitive demand in Pre-K/TK than the upper grades. There are more Level 1 activities and less Level 2 and 3 activities in Pre-K/TK than the upper grades.
- A more precise way to analyze the data was to look at the two topics with the most activities - adding and subtracting within 20 and adding and subtracting word problems within 20. In these activities, the authors found more consistent cognitive demands across grade levels.

### **Implications for the San Francisco Unified School District**

The authors present the following implications of this approach to assessing the continuity of curriculum to subjects beyond mathematics.

1. Strong tools that scaffold continuity are a good first step in fostering connection and continuity across grades.

Although the enactment of curriculum does not always correspond with the design, the design does matter. If the curriculum design exhibits lack of continuity, teachers will have greater challenges creating curriculum coherence and cognitive demand. This can be particularly difficult for establishing coherence between Pre-K and Kindergarten because of the long history of disconnect, especially in mathematics, between these grade levels.

2. When studying continuity, it is important to focus on continuity of cognitive demand in addition to content.
3. When studying characteristics of a curriculum within the framework of developing cognitive demand and coherence, it is important to investigate the phases of lessons and students' tasks.
4. In addition to continuity in curriculum, the alignment between curriculum, student assessment and teacher learning are essential elements of connecting educational experiences from Pre-K through the early elementary grades