FINDING THEORY IN THE CLASSROOM:

VALIDATING A TEACHER-LED NUMERACY SCREENER USING CLASSICAL EFFECTS FROM NUMERICAL COGNITION

Taeko Bourque[1], Michael Slipenkyj[1], Ayushi Chitranshi[1], Charles Anifowose[2], Rebecca Merkley[1], Heather Douglas[1], Jo-Anne LeFevre[1,3]

[1]Department of Cognitive Science, Carleton University, [2]Vretta Inc., [3]Department of Psychology, Carleton University

taebourque@gmail.com www.carleton.ca/arc www.vretta.com/ema-school

Researchers have identified a variety of ***classical effects*** that explain **how people learn and process numerical information.**

found by trained experimenters in controlled lab settings

DO THESE SAME EFFECTS APPEAR IN THE 'REAL WORLD'? YES!

Analyzing data from a teacher-led version of the DEMA showed:

the same patterns emerge in the lab and real-world educational contexts!

universal screener *to assess early numeracy skills*

Early Math Assessment @ School (Douglas & LeFevre, 2021)

- Based on **30+ years of research** on early math learning
- Paper-and-pencil formative assessment
- For students from Kindergarten to Grade 4
- Helps teachers identify & address gaps in early numeracy skills

In partnership with Vretta, a Canadian company specializing in digital assessment, our team developed a digital version of the EMA, the **DEMA**.

This platform supports a **student-centered environment**, with:

- Simple instructions
- Efficient pacing
- Easier data collection for teachers and researchers

This tool was piloted with over

20 000 Canadian students

To learn more about the

Digital EMA

SCAN QR CODE

THEORY

CANONICAL DISTANCE EFFECTS

Number Comparison

Cross out the larger digit of a pair of numbers

1 2 close distance trial

1 6 far distance trial

greater error rates on **close distance** trials vs far distance trials

REVERSE DISTANCE EFFECTS

Ordering Numbers

Check if three numbers are in increasing order

1 2 3 ✓ adjacent ordered sequence

1 4 5 ✓ non-adjacent ordered sequence

lower error rates for **adjacent** ordered sequences vs non-adjacent ordered sequences

PROBLEM SIZE EFFECTS

Number Facts (Addition)

Solve addition facts (timed)

1 + 2 small operands

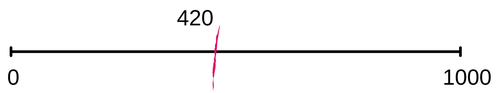
6 + 7 large operands

more errors on problems with **larger operands** vs smaller operands

MIDPOINT ADVANTAGE

Number Line

Mark the location of a number on a line



smaller errors for numbers closer to the **midpoint** of the line

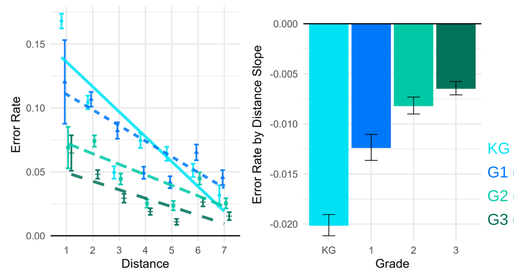
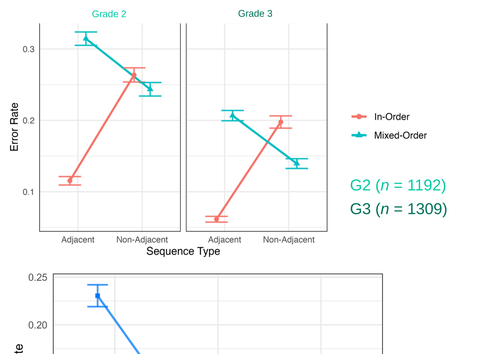
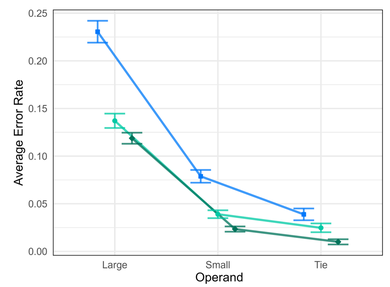
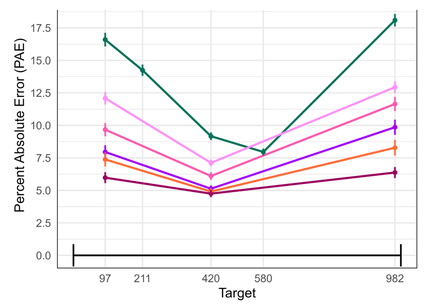
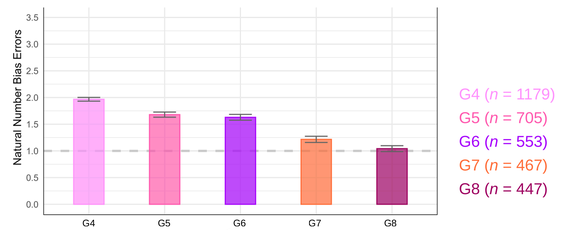
NATURAL NUMBER BIAS

Fractions

Demonstrate knowledge of fraction concepts

What fraction is greater than $\frac{6}{9}$?

$\frac{2}{3}$ $\frac{5}{9}$ $\frac{6}{8}$ $\frac{7}{18}$

errors due to **treating fractions like natural numbers** (e.g., thinking $\frac{7}{18}$ is larger than $\frac{6}{9}$ because 7 > 6 and 18 > 9)

IN THE CLASSROOM