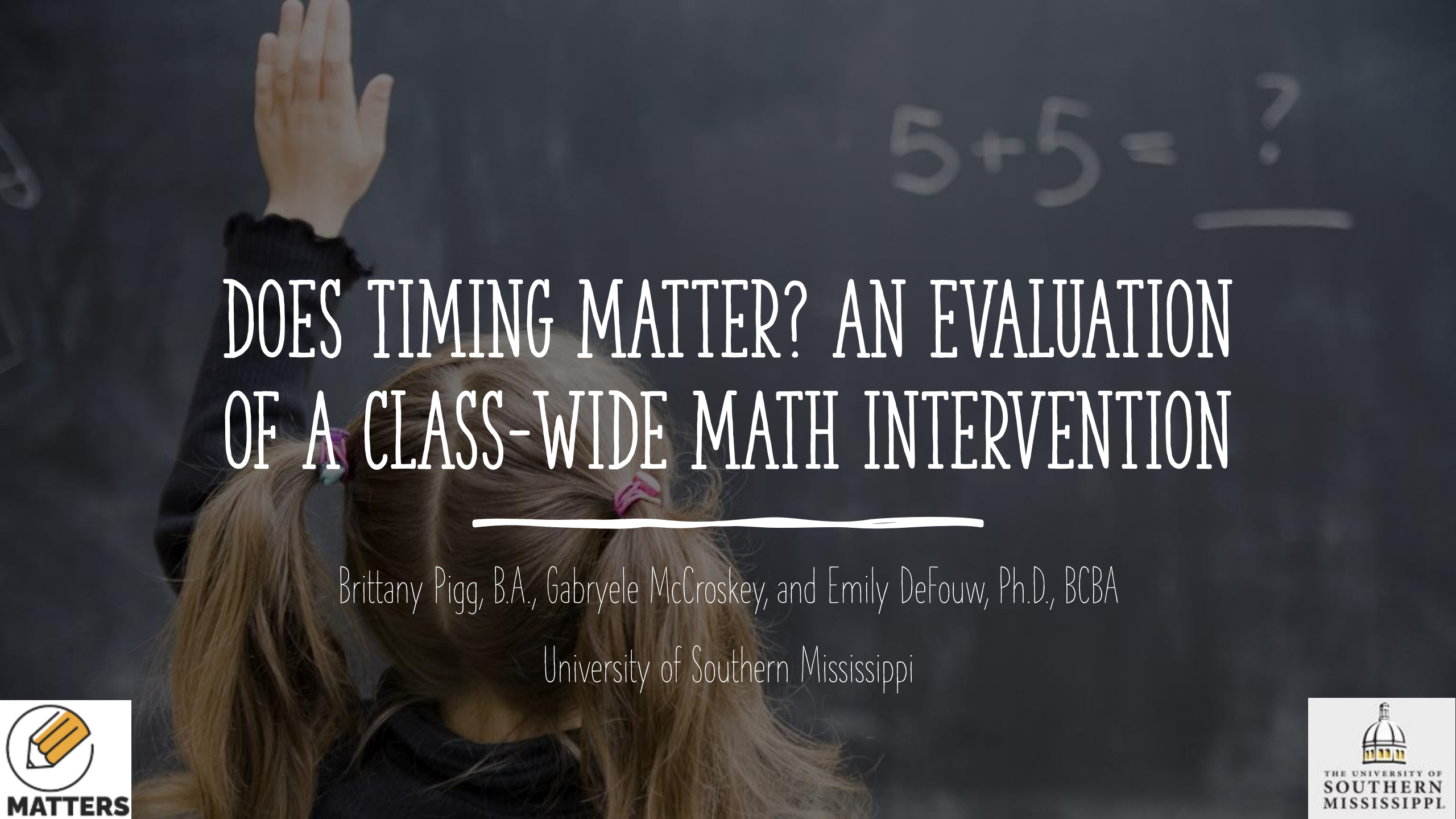


DOES TIMING MATTER? AN EVALUATION OF A CLASS-WIDE MATH INTERVENTION

Brittany Pigg, B.A., Gabryele McCroskey, and Emily DeFouw, Ph.D., BCBA

University of Southern Mississippi

THE UNIVERSITY OF SOUTHERN MISSISSIPPI: SCHOOL PSYCHOLOGY DOCTORAL PROGRAM

BRITTANY PIGG, B.A.

EMILY DEFOUW, PHD, BCBA

GABRYELE MCCROSKEY

MATTERS

MAXIMIZING ACCESSIBLE TREATMENTS TO ENHANCE RESOURCES FOR STUDENTS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

slido

Join at slido.com
#2474951

ⓘ Start presenting to display the joining instructions on this slide.

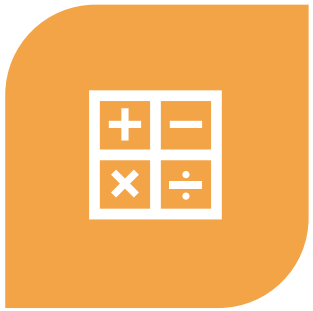
PURPOSE

- DISCUSS A 10-MIN CLASS-WIDE MATH INTERVENTION TO IMPROVE MATH FACT FLUENCY FOR ELEMENTARY STUDENTS
- LEARN THE MOST EFFICIENT WAY TO IMPLEMENT A 10-MIN INTERVENTION TO INCREASE STUDENTS' MATH SCORES TO GRADE-LEVEL EXPECTATIONS
- LEARN RECOMMENDATIONS FOR SCHOOLS PROVIDING MATH SUPPORTS WITHIN RTI

MATTERS

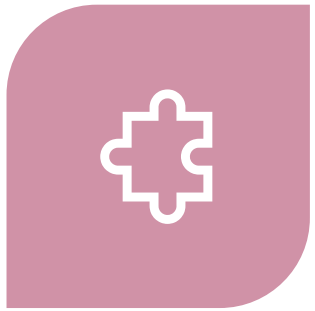
THE UNIVERSITY OF SOUTHERN MISSISSIPPI

OVERVIEW



INTRODUCTION

RESPONSE TO INTERVENTION



PROBLEM-SOLVING

INTENSITY AND TIMING

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

slido

Why is math important?

ⓘ Start presenting to display the poll results on this slide.

MATH MATTERS

Early math skills are a greater predictor of long-term success than early literacy skills (Duncan, 2007)

Math skills are critical for college acceptance and success
(National Mathematics Advisory Panel: NMAP, 2008)

Jobs that require math skills are outpacing other positions
(NMAP, 2008)

Math skills are linked with higher rates of employment and career advancement (Parsons & Bynner, 1997)

MATTERS

MISSISSIPPI MATH PROFICIENCY

2022 NAEP Math Proficiency

2022 MAAP Math Proficiency

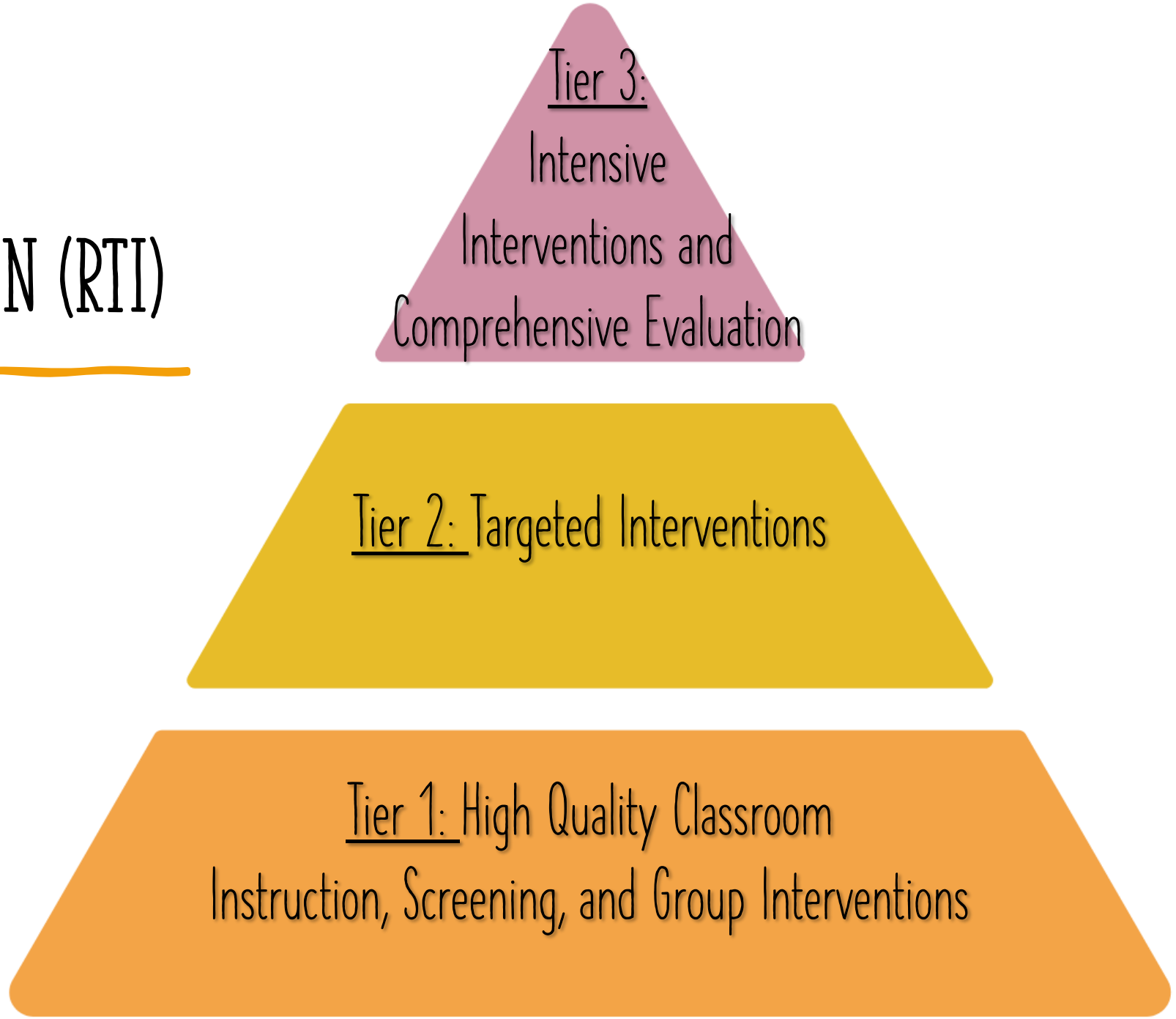
MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

- After the COVID-19 pandemic, there was a 5-point loss in 4th grade and an 8-point loss in 8th grade. 43 states experienced a decline in math scores.
- Many school districts have limited resources to offer math interventions to students who are struggling
- School personnel have numerous demands placed on them (e.g., high-stakes testing)
- Schools report that time, funding, and staff limitations are major barriers to delivering supplemental math interventions, with limited *time* being the most significant barrier

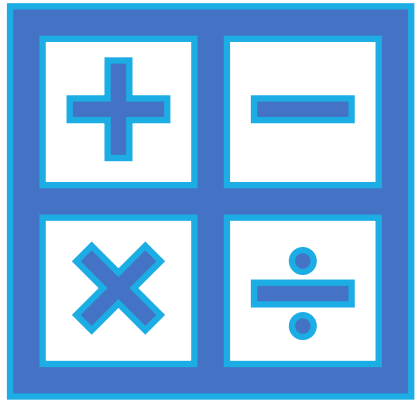
(DeFouw et al., 2018; Gersten et al., 2009; Mason et al., 2019; NCES, 2022; Spectrum K-12, 2010)

RESPONSE TO INTERVENTION (RTI)

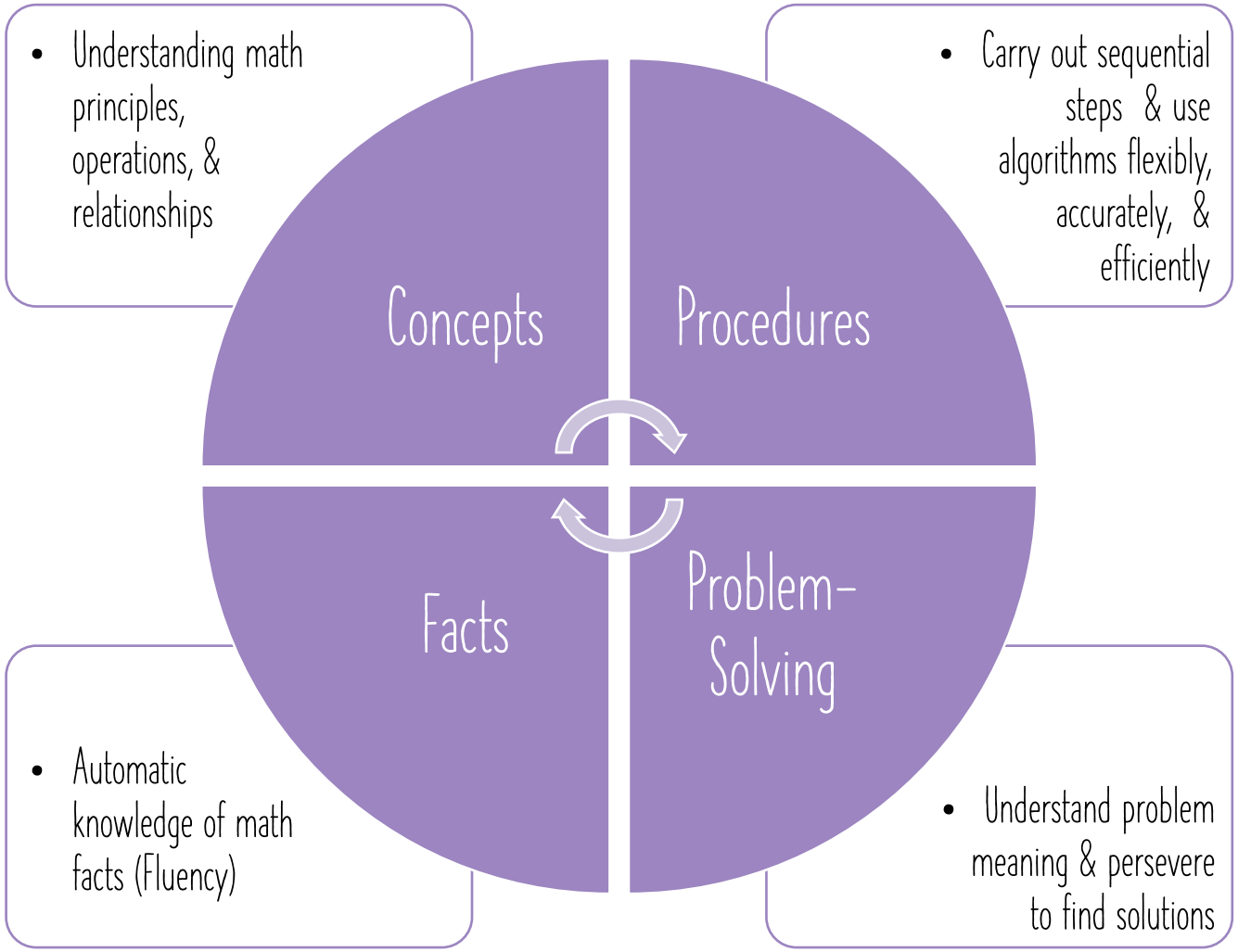


MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI



TIER 1:
APPLICATIONS FOR MATHEMATICS



Math "Big Ideas":
Key Mathematics Components

MATTERS

Core Instruction

For everyone, even students with math difficulties!

- 45 - 60 min per school day
- Focus on building math proficiency (NMAP, 2008):
  - Understand key mathematical concepts
  - Know basic facts automatically
  - Use standard algorithms accurately, fluently, and flexibly
  - Apply previous three elements when solving problems

MATTERS

1. Explicit Instruction

2. Fluency Practice (10 minutes daily)

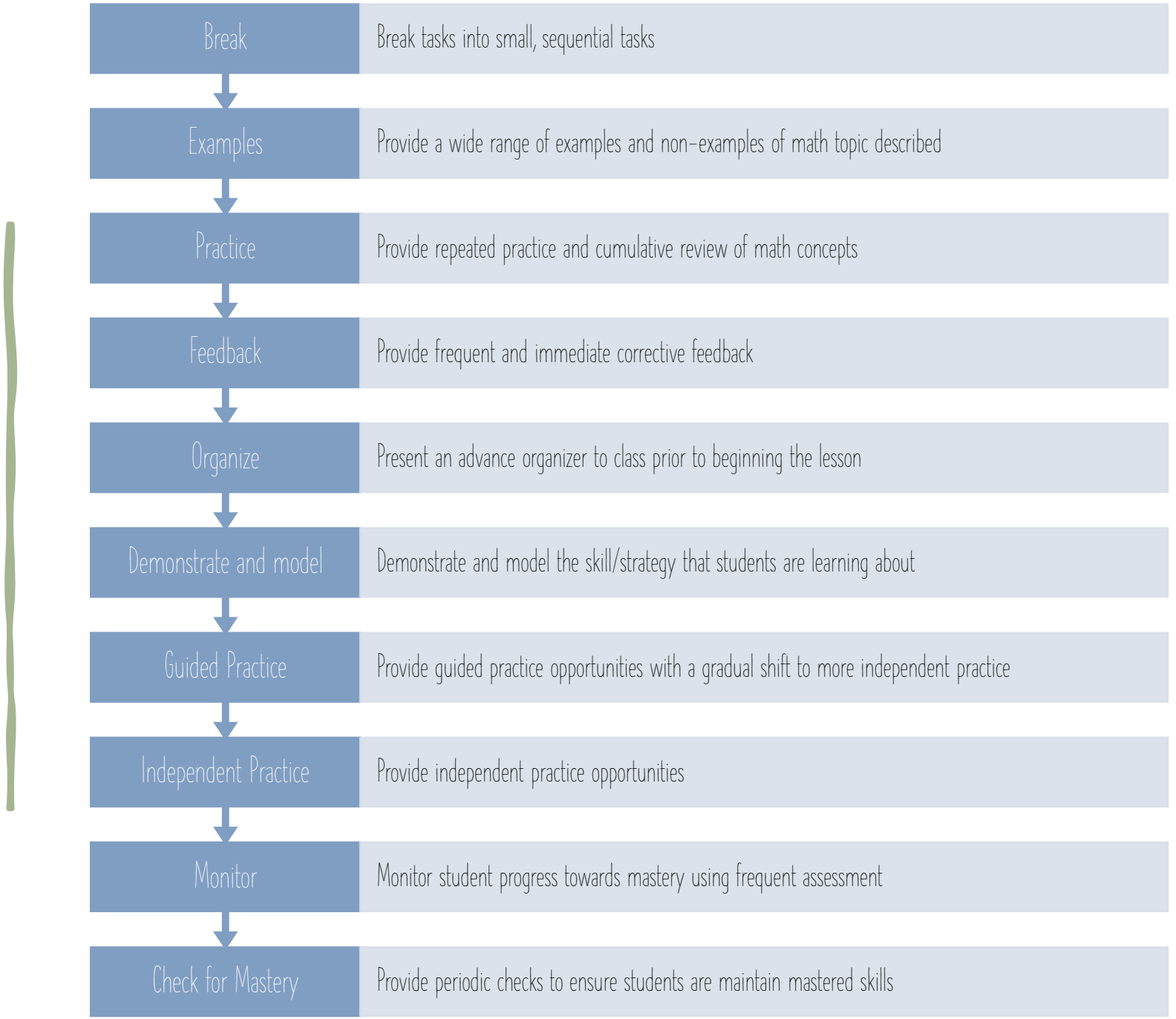
3. Problem-Solving Process

38% of students in grades 1 to 3 failed to display automaticity with basic addition & subtraction (Stickney et al., 2012)

MATTERS

1. EXPLICIT INSTRUCTION

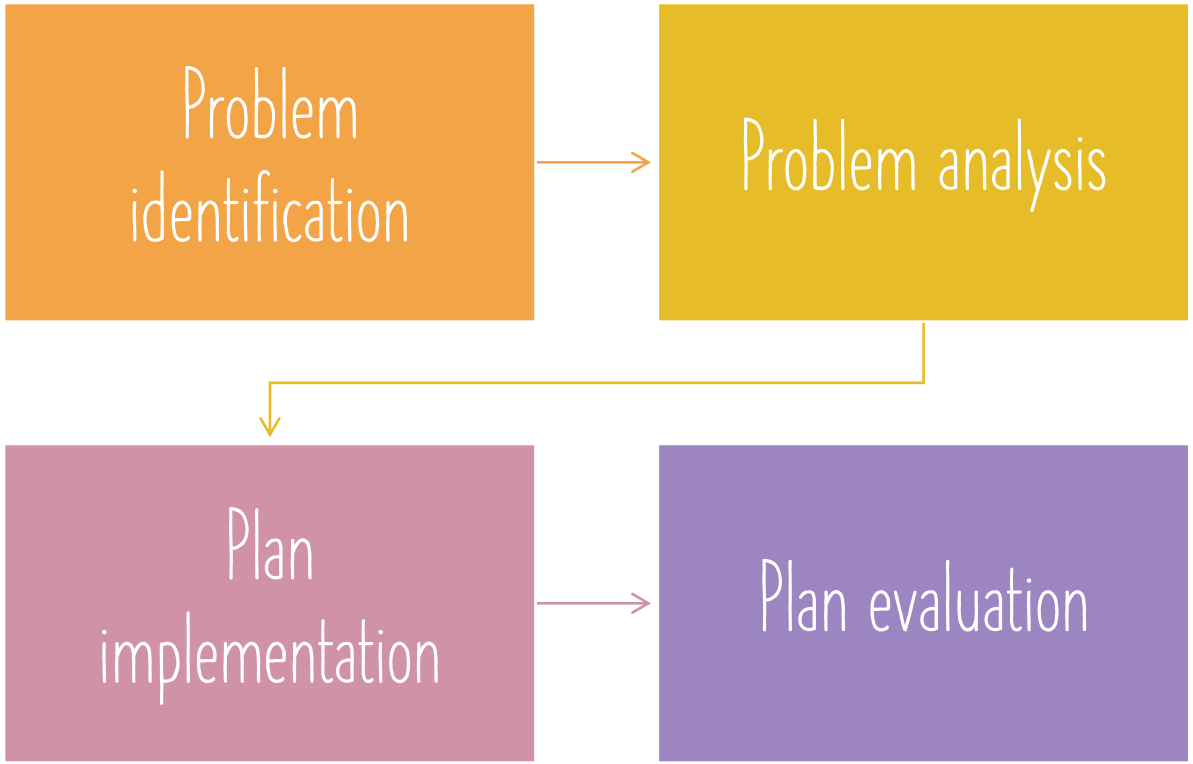
(CODDING ET AL. 2019)



MATTERS

2. Fluency Practice...

MATTERS



3. Problem-Solving Process

MATTERS

PROBLEM IDENTIFICATION: SCREENING

CBM = Curriculum-Based Measures

- M.I.N.D. Computation Probes or EasyCBM.com
- acadience learning
- aimsweb PLUS

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

PROBLEM IDENTIFICATION: GUIDING QUESTIONS

(RILEY-TILLMAN, BURNS, & GIBBONS, 2013)

- Is there a class-wide problem?
- Who needs Tier 2?
- Are there any surprises or students' missed?
- Among students identified as needing Tier 2 intervention, what is the category of problem?
- Does anyone need Tier 3 intervention right now?

MATTERS

PROBLEM ANALYSIS

Step 1: Assess Instructional Placement

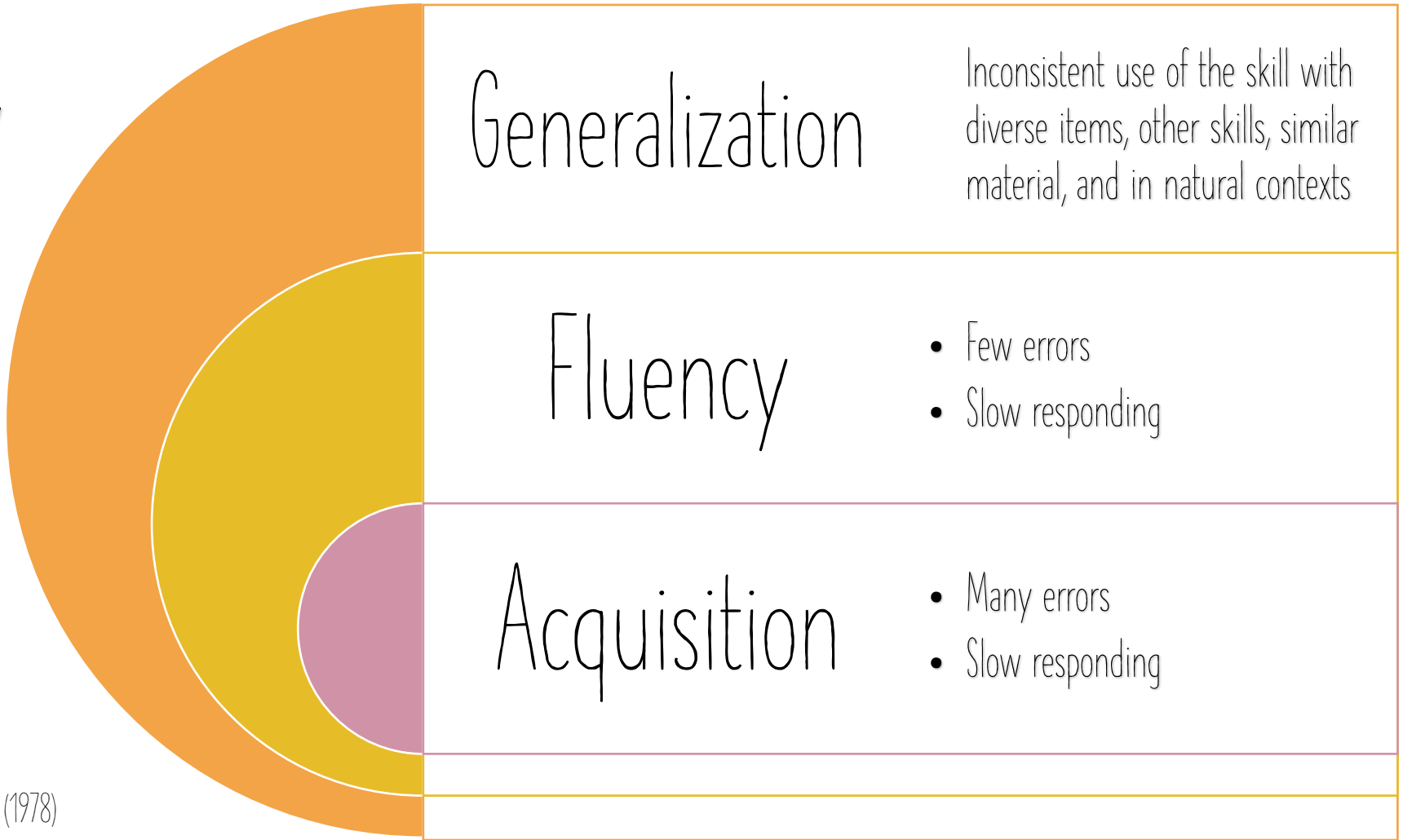
- Frustrational: Below grade level (less than 25th percentile)
- Instructional: At grade level (between 25th and 75th percentile)
- Mastery: Above grade level (above 75th percentile)

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

PROBLEM ANALYSIS

Step 2: Map onto the Instructional Hierarchy



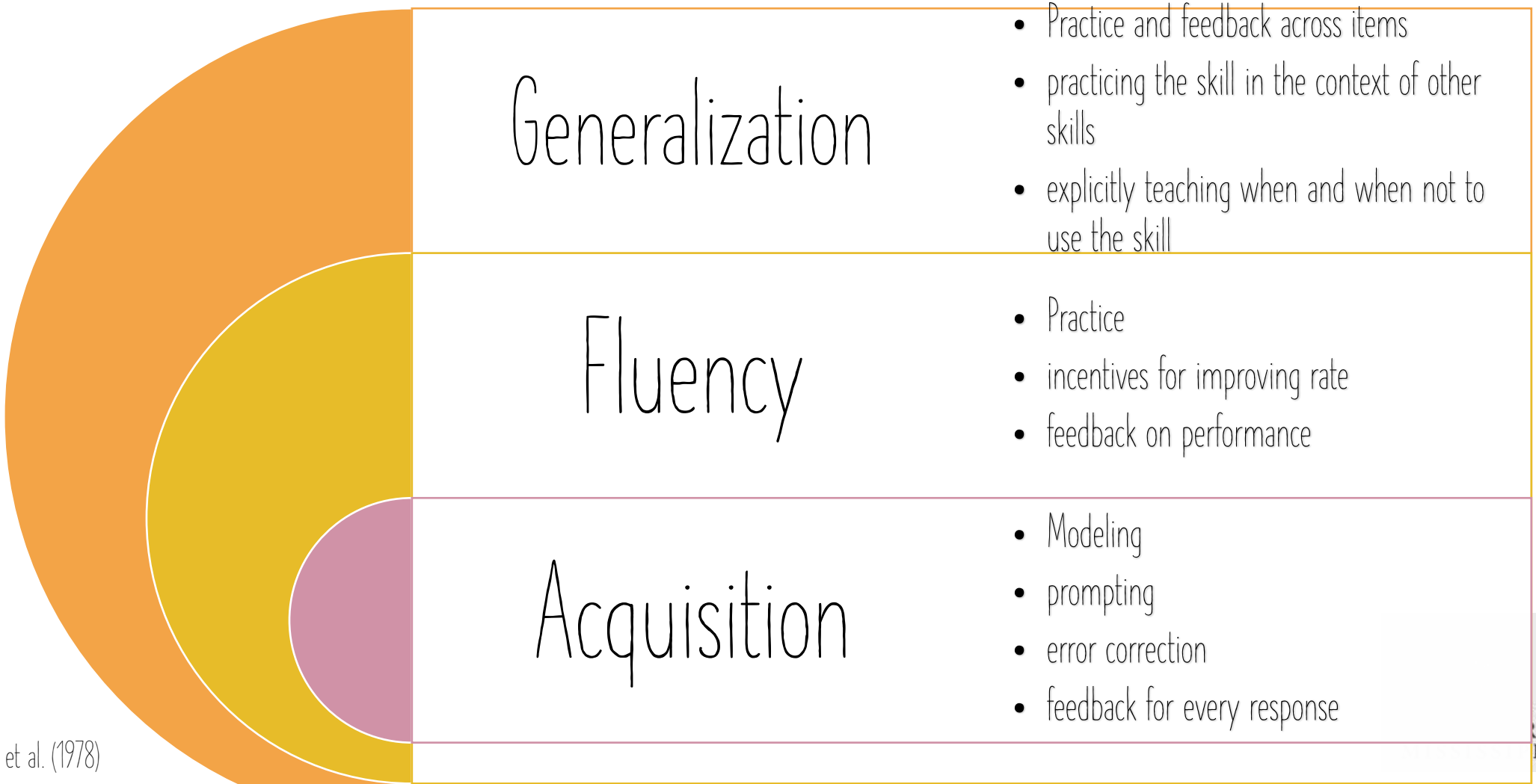
Haring et al. (1978)

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

PROBLEM ANALYSIS

Step 3: General strategies



MATTERS

Haring et al. (1978)

NOW WE KNOW:

What grade-level should the material be?

What strategies should our intervention include?

MATH INTERVENTIONS: FLASHCARD DRILLS

Accuracy & Fluency

- Practice
- Error correction
- Feedback for each response

4 x 1	4 x 2	4 x 3	4 x 4
4 x 5	4 x 6	4 x 7	4 x 8
4 x 9	4 x 10	4 x 11	4 x 12

Procedures

- look at the front of the card with the problem
- Say the answer aloud or in your head
- Flip the card to check your answer

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

MATH INTERVENTIONS: TAPED PROBLEMS

Fluency

- Practice
- Feedback for each response

Procedures

- Make a recording of problems and their answers
- Students have a sheet of problems without the answers
- Play the recording with a 4-second delay between the end of the problem and the answer
- The goal of the student is to write the answer *before* it is read on the recording

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

MATH INTERVENTIONS: TAPED PROBLEMS

Download Taped Problems Intervention Packet here - Taped Problems Intervention Packet

Taped Problems Intervention Worksheets

TP Addition: Set A	TP Subtraction: Set A	TP Multiplication: Set A	TP Division: Set A
TP Addition: Set B	TP Subtraction: Set B	TP Multiplication: Set B	TP Division: Set B
TP Addition: Set C	TP Subtraction: Set C	TP Multiplication: Set C	TP Division: Set C

Taped Problems Intervention Recordings

Addition 1A

FactsonFire / Addition Set A

00:00 04:49

1	Addition 1A	04:49
2	Addition 2A	04:34
3	Addition 3A	04:36
4	Addition 4A	04:36
5	Addition 5A	04:27
6	Addition 6A	04:35

Addition 1B

FactsonFire / Addition Set B

00:00 04:45

1	Addition 1B	04:45
2	Addition 2B	04:18
3	Addition 3B	04:08
4	Addition 4B	04:20
5	Addition 5B	04:15
6	Addition 6B	04:17

Addition 1C

FactsonFire / Addition Set C

00:00 04:22

1	Addition 1C	04:22
2	Addition 2C	04:07
3	Addition 3C	04:02
4	Addition 4C	04:01
5	Addition 5C	03:56
6	Addition 6C	04:16

MIND: Computation TP/ET Worksheet Addition 1A Name: _____ Date: _____

9 + 8	3 + 3	5 + 2	7 + 7	9 + 6	2 + 8	5 + 3	6 + 7	6 + 5
3 + 8	4 + 4	4 + 9	3 + 5	7 + 6	5 + 6	8 + 3	4 + 4	9 + 4
7 + 7	6 + 9	8 + 2	8 + 9	3 + 3	2 + 5	7 + 7	5 + 3	6 + 7
3 + 3	3 + 8	9 + 8	5 + 2	4 + 9	6 + 5	4 + 4	9 + 6	2 + 8

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

MATH INTERVENTIONS: EXPLICIT TIMING

Fluency

- Practice
- Feedback for performance
- Incentive for improving rate

Procedures

- Provide student with worksheet
- Graph previous score (DCPM)
- Give 2-min CBM
- Score and graph CBM

MIND: Computation TP/ET Worksheet Addition 1A Name: _____ Date: _____

9 + 8	3 + 3	5 + 2	7 + 7	9 + 6	2 + 8	5 + 3	6 + 7	6 + 5
3 + 8	4 + 4	4 + 9	3 + 5	7 + 6	5 + 6	8 + 3	4 + 4	9 + 4
7 + 7	6 + 9	8 + 2	8 + 9	3 + 3	2 + 5	7 + 7	5 + 3	6 + 7
3 + 3	3 + 8	9 + 8	5 + 2	4 + 9	6 + 5	4 + 4	9 + 6	2 + 8

https://youtu.be/zyp1OZQG04U?t=290

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

MATH INTERVENTIONS: COVER, COPY, & COMPARE

MIND: Computation CCC Standard Worksheet Addition 1A Name: _____ Date: ___

9 + 8 = 17		5 + 3 = 8		6 + 9 = 15		3 + 5 = 8	
3 + 3 = 6		6 + 7 = 13		8 + 9 = 17		9 + 4 = 13	
5 + 2 = 7		3 + 8 = 11		7 + 7 = 14		8 + 3 = 11	
7 + 7 = 14		6 + 5 = 11		3 + 3 = 6		4 + 4 = 8	

Accuracy & Fluency

- Modeling
- Practice
- Feedback for each response
- Error correction

Procedures

- look at the mathematics problem with the answer
- cover the mathematics problem with the answer
- record the answer
- uncover the mathematics problem with the answer
- compare the answer

https://youtu.be/USYGcy1Di0k?t=95

End at 3:05

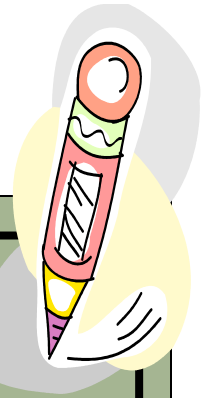
MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

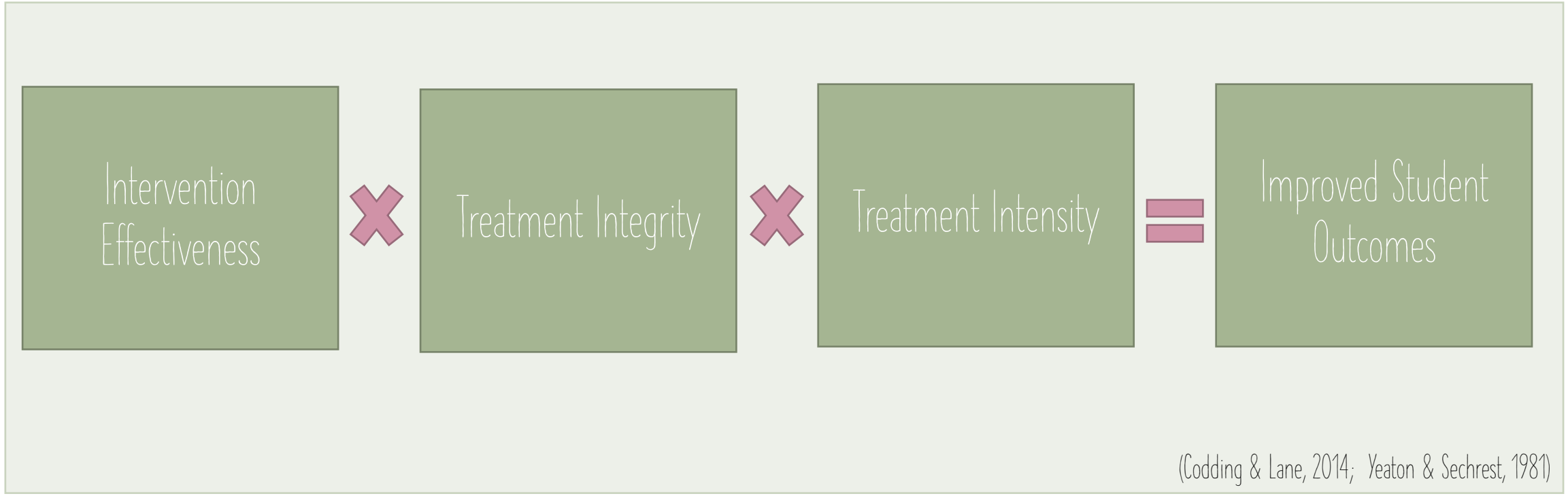
Cover-Copy-Compare

9 +9 18	+

	9 +9 18



	9 +9 18



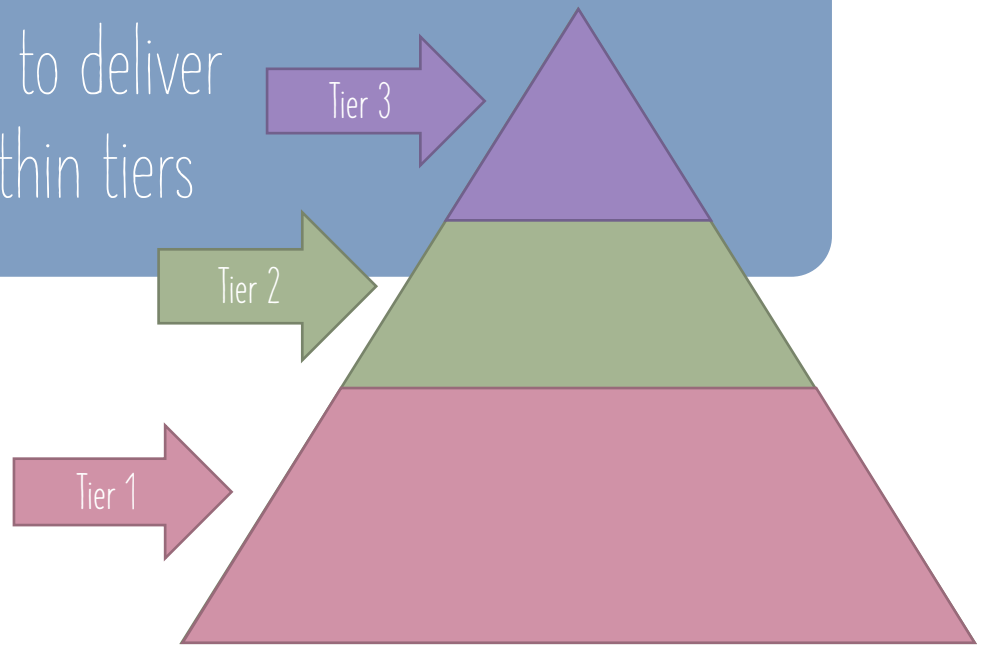
(Codding & Lane, 2014; Yeaton & Sechrest, 1981)

FRAMEWORK FOR INTERVENTIONS

MATTERS

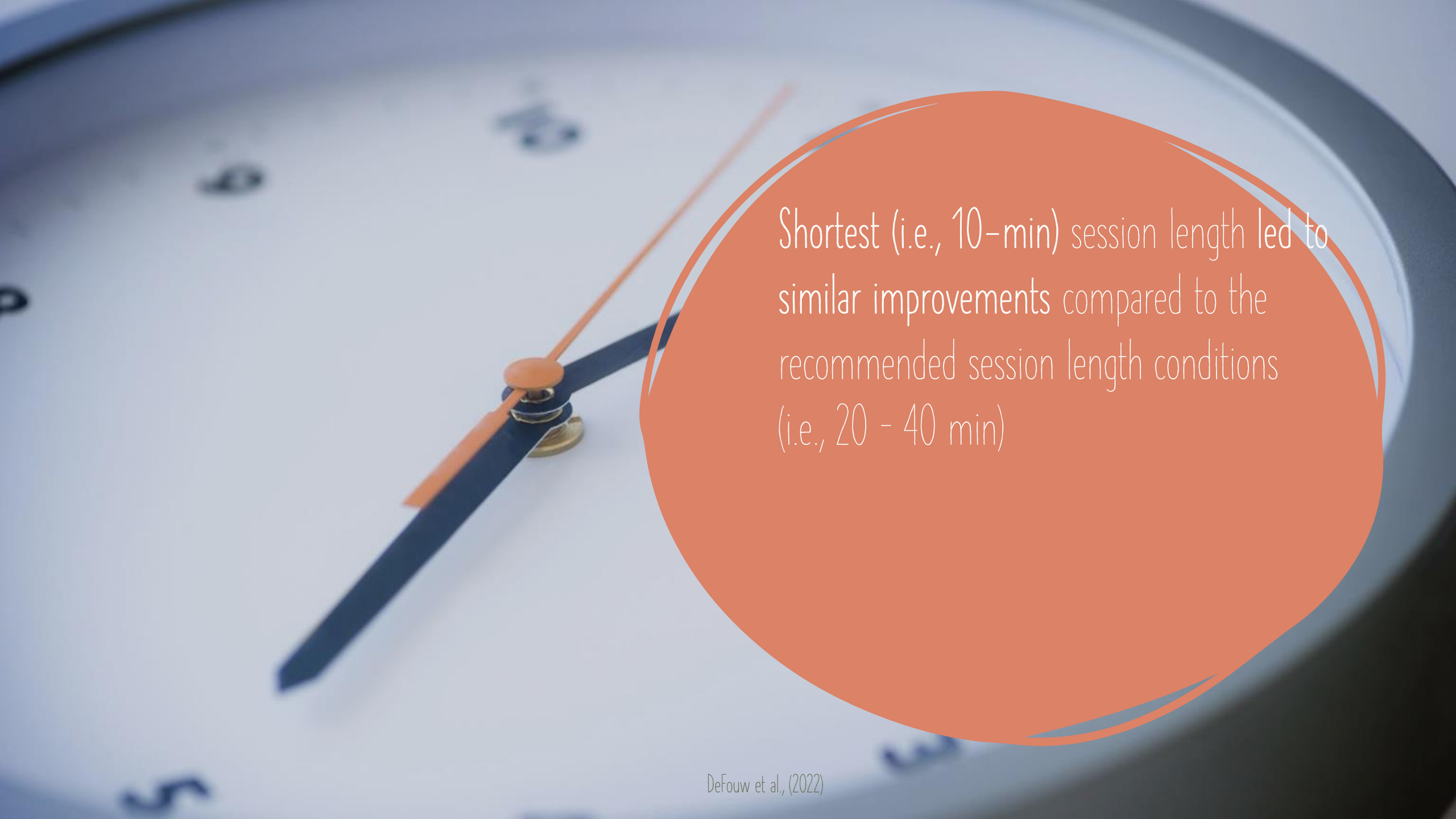
Instruction and interventions is intensified to match student needs across tiers

Educators need to know the most efficient way to deliver an intervention within tiers



WHAT IS THE MOST RESOURCE-EFFICIENT WAY TO INTENSIFY INTERVENTIONS WITHIN RESPONSE TO INTERVENTION (RTI)?

MATTERS



Shortest (i.e., 10-min) session length led to similar improvements compared to the recommended session length conditions (i.e., 20 - 40 min)

DeFouw et al., (2022)

PROCEDURES

We compared mass vs. spaced practice of a 10-min daily fact math practice across dosage schedules

Second graders were randomly assigned to one of the three conditions

Provided pre-tests and post-tests as well as 2-week and 4-week follow-ups.

Student and teacher acceptability was assessed once intervention was complete

MATTERS

Condition Scheduling

Conditions
(Total Session Length = 10-min)

Condition 1:	Condition 2:	Condition 3:
10-min, 1x/day	5-min, 2x/day	3-min, 3-min, & 4-min per day

Example of Scheduling

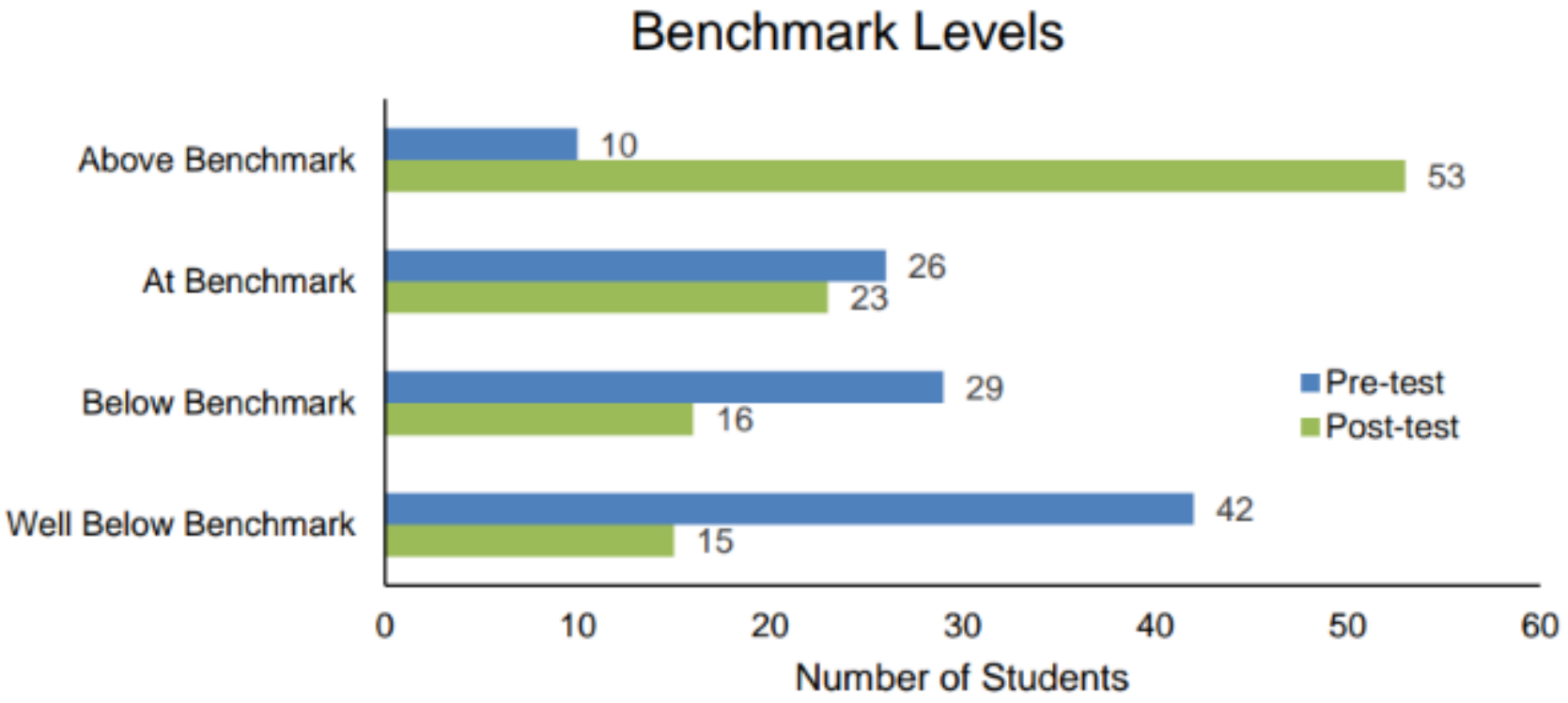
Condition 1:	Condition 2:	Condition 3:
Morning work: • 10-min math practice Mid-day: • 0-min math practice (non-math activity) End of day: • 0-min math practice • (non-math activity)	Morning work: • 5-min math practice Mid-day: • 0-min math practice (non-math activity) End of day: • *At least 3-hr break* • 5-min math practice	Morning work: • 3-min math practice Mid-day: • *At least 2-hr break* • 3-min math practice End of day: • *At least 2-hr break* • 4-min math practice

2ND GRADE ADDITION

	Condition 1: 10 minutes		Condition 2: 5 min 2x/day		Condition 3: 3 x 3 x 4 min	
	n	M (SD)	n	M (SD)	n	M (SD)
Pre-Test 1	36	12.17 (5.90)	40	14.69 (7.50)	36	14.96 (7.87)
Pre-Test 2	38	12.16 (6.02)	35	14.14 (7.59)	39	15.51 (8.43)
Post-Test	32	17.67 (7.78)	39	20.26 (9.00)	34	20.65 (9.25)
2-wk F/up	34	17.43 (9.68)	39	20.28 (11.55)	34	22.32 (10.36)
4-wk F/up	37	18.00 (9.87)	40	20.63 (9.00)	37	23.08 (11.12)

MATTERS MATH TIME

107 second graders in [redacted] School District completed a 20-day math intervention targeting math computation fluency skills for addition and subtraction. The MATTERS Math Time occurred 4x per week for 10-min across 5 weeks. Below are results.

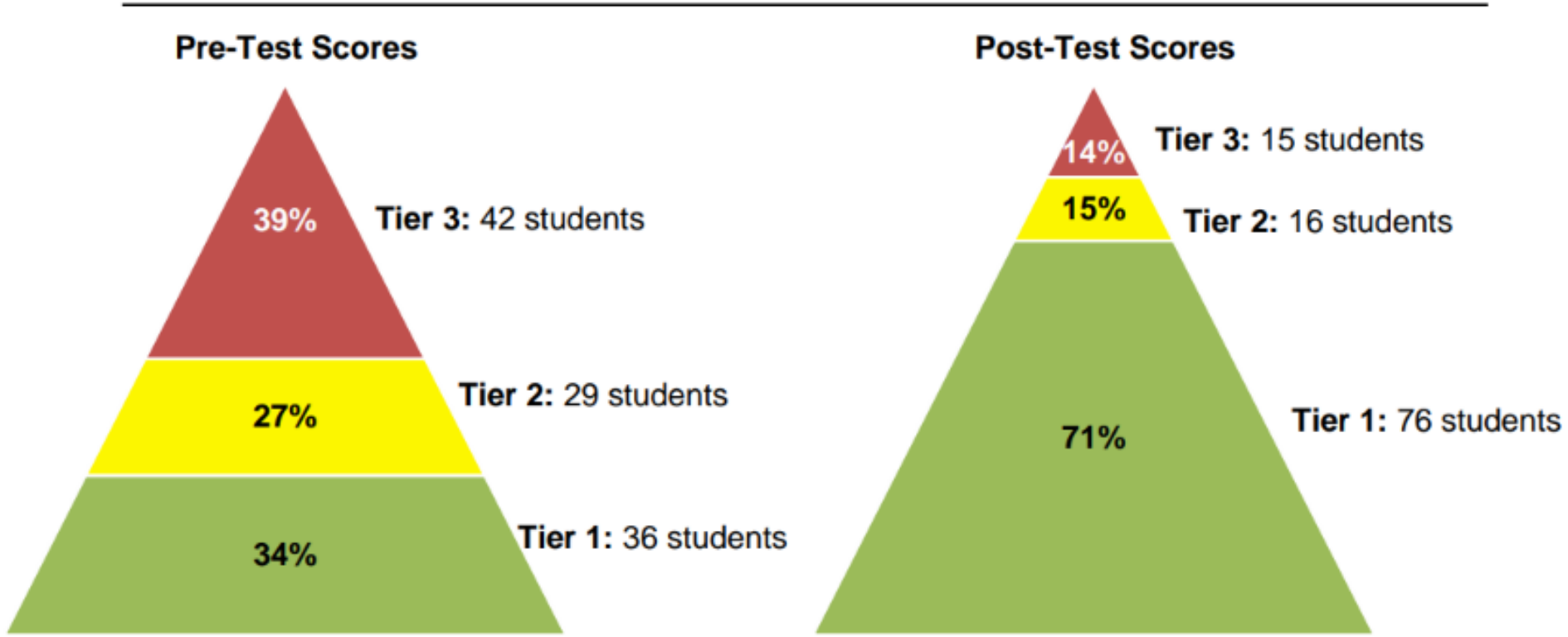


MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

MATTERS MATH TIME

Before the intervention, 36 students (34%) were meeting grade-level expectations in math. Following the intervention, **76 students** (71%) are now meeting grade-level expectations in math.



MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

LIMITATIONS

- We only looked at 2nd and 3rd grade
- Subtraction scores were much lower- might have been at accuracy level vs. fluency
- 20-day intervention
- Difficulties with scheduling
- Small n

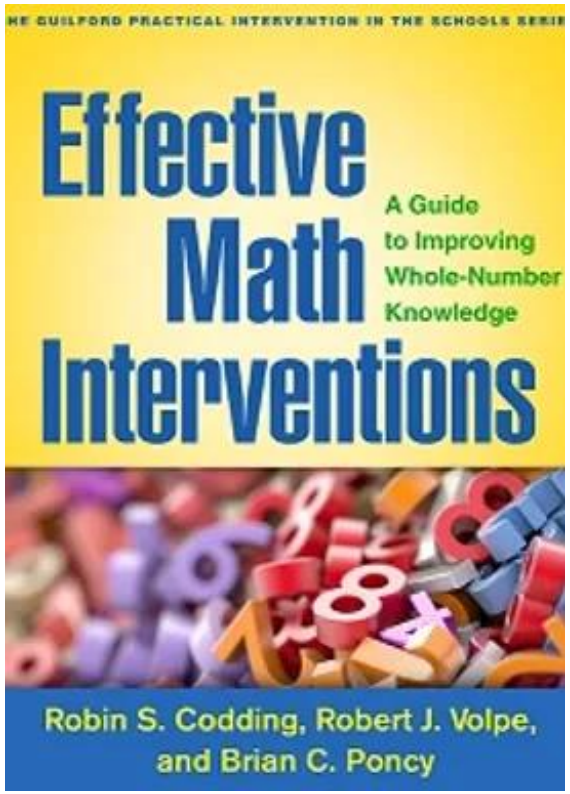
MATTERS

BRING IT TO YOUR CLASSROOM!

- Assess class wide
- Determine whether students are on grade level
- If majority on grade level
  - fluency
    - ex. taped problems
- If majority not on grade level
  - accuracy
    - ex. Flashcards
- 1 10 min block < 2 5 min blocks < 3x3x4
- Progress monitor

MATTERS

MORE RESOURCES



THE SCIENCE OF MATH

SpringMath by Sourcewell

M.I.N.D. https://brianponcy.wixsite.com/mind

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

Visit our website to contact us!

Emily.DeFouw@usm.edu

MATTERS

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

slido

Audience Q&A Session

ⓘ Start presenting to display the audience questions on this slide.