LEARNING FROM SUCCESSFUL EARLY-GRADE MATH PROGRAMS:
Lessons from the Numeracy at Scale study

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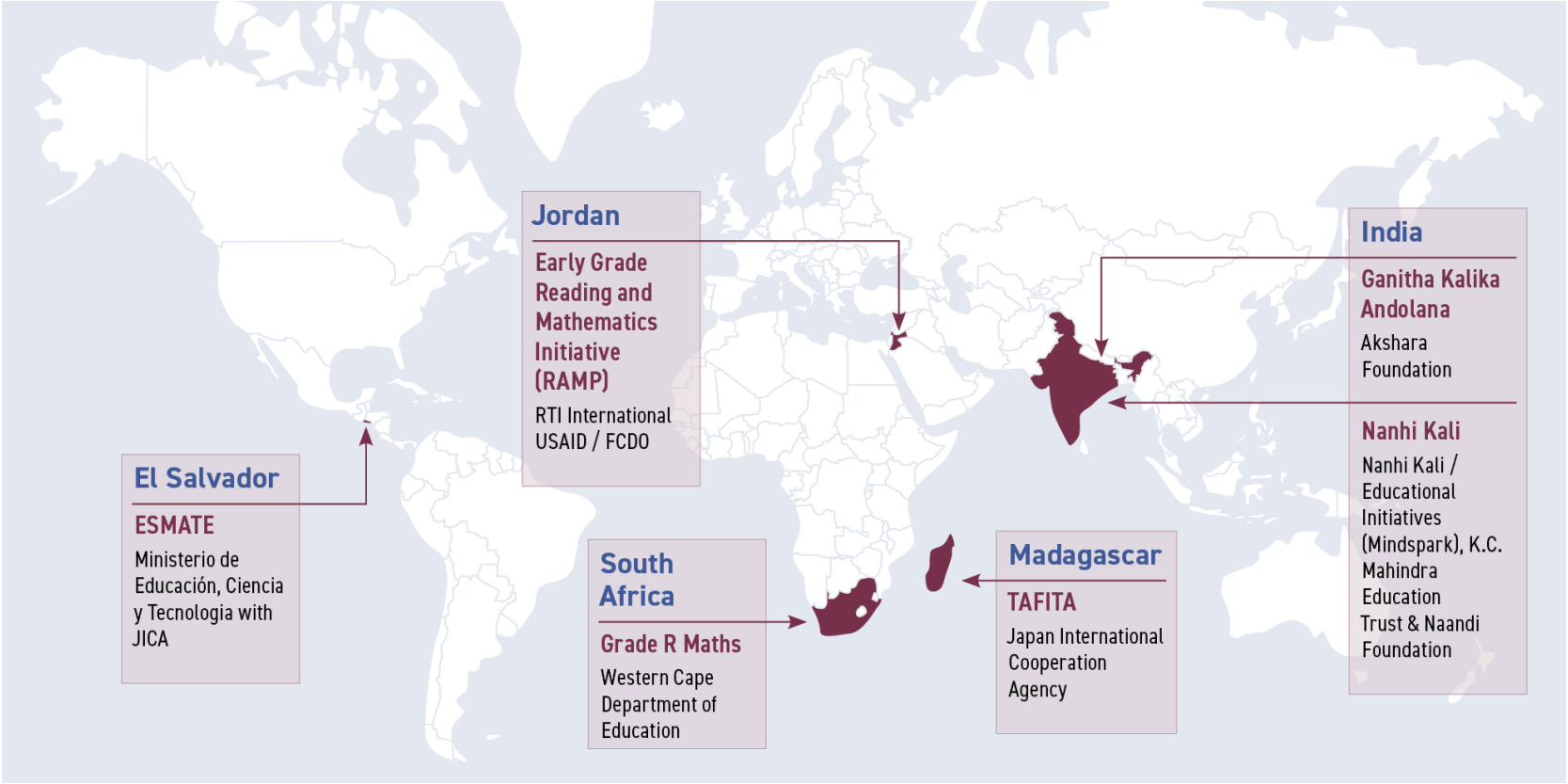
Photo credit: ESMATE

INTRODUCTION TO NUMERACY AT SCALE

- **Goal:** Examine successful programs to provide evidence-based strategies for improving instruction and learning outcomes
- **Approach:** Identify programs that have evidence of impact on numeracy and work at scale.



NUMERACY AT SCALE RESEARCH METHODOLOGY

Research questions:

1. **RQ1:** What classroom ingredients (such as teaching practices and classroom environment) lead to learning in programs that are effective at scale?

2. **RQ2:** What methods of training and support lead to teachers adopting effective classroom practices?

3. **RQ3:** What system-level support is required to deliver effective training and support to teachers and to promote effective classroom practices?

NUMERACY AT SCALE RESEARCH METHODOLOGY: DESIGN

Quantitative:

- 80–130 schools per country
- In each school:
  - Math lessons observed
  - Interviews of teachers, head teachers, trainers, teacher meeting facilitators, and/or coaches
  - Mathematical Knowledge for Teaching survey[1]

Qualitative:

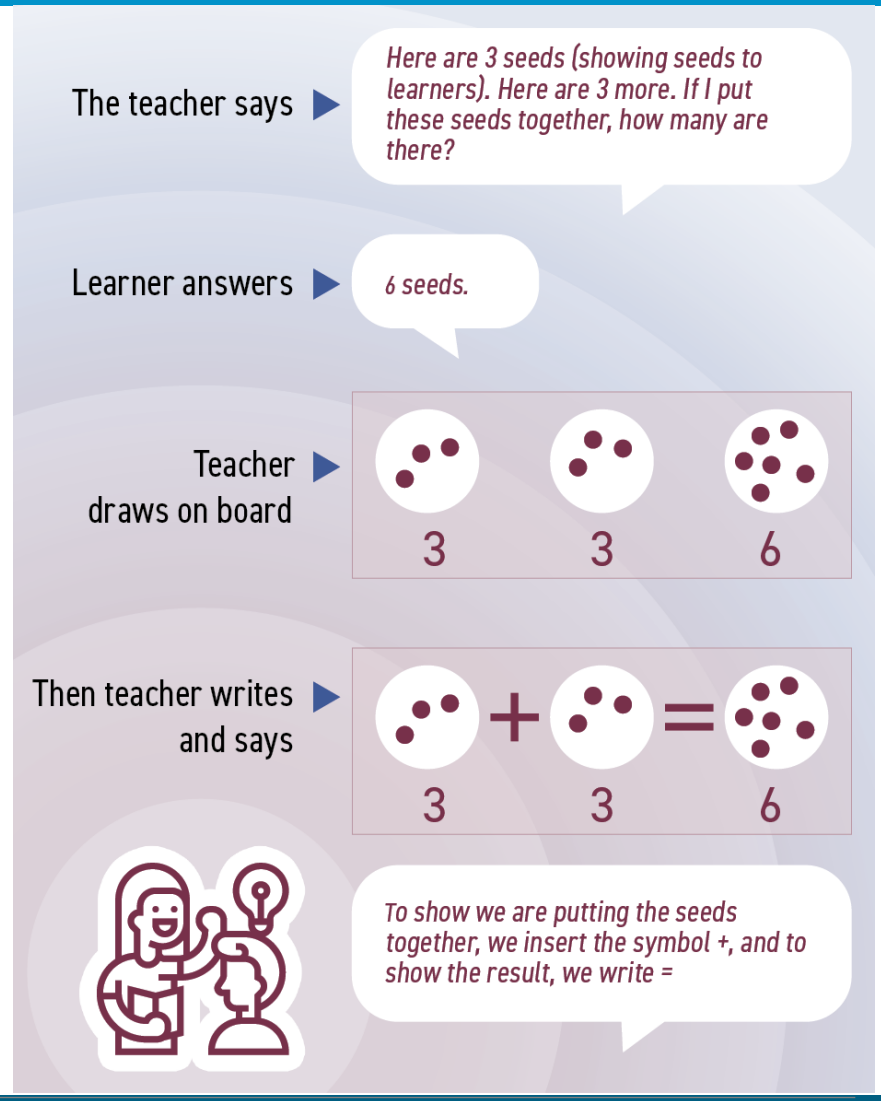
- 10 schools (subsample)
- In each school:
  - Math lessons observed for 3 days
  - Open-ended interviews of teachers
  - Cognitive interviews with students
- Semi-structured interviews with program staff and Ministry of Education officials, including those responsible for teacher training, school supervision, and curriculum and materials

KEY FINDINGS FROM RQ1: *What instructional strategies lead to learning?*

Theme 1: Use of multiple representations.

Teachers:

- use **multiple representations** (concrete materials, pictures, symbols).
- Explicitly **link representations**

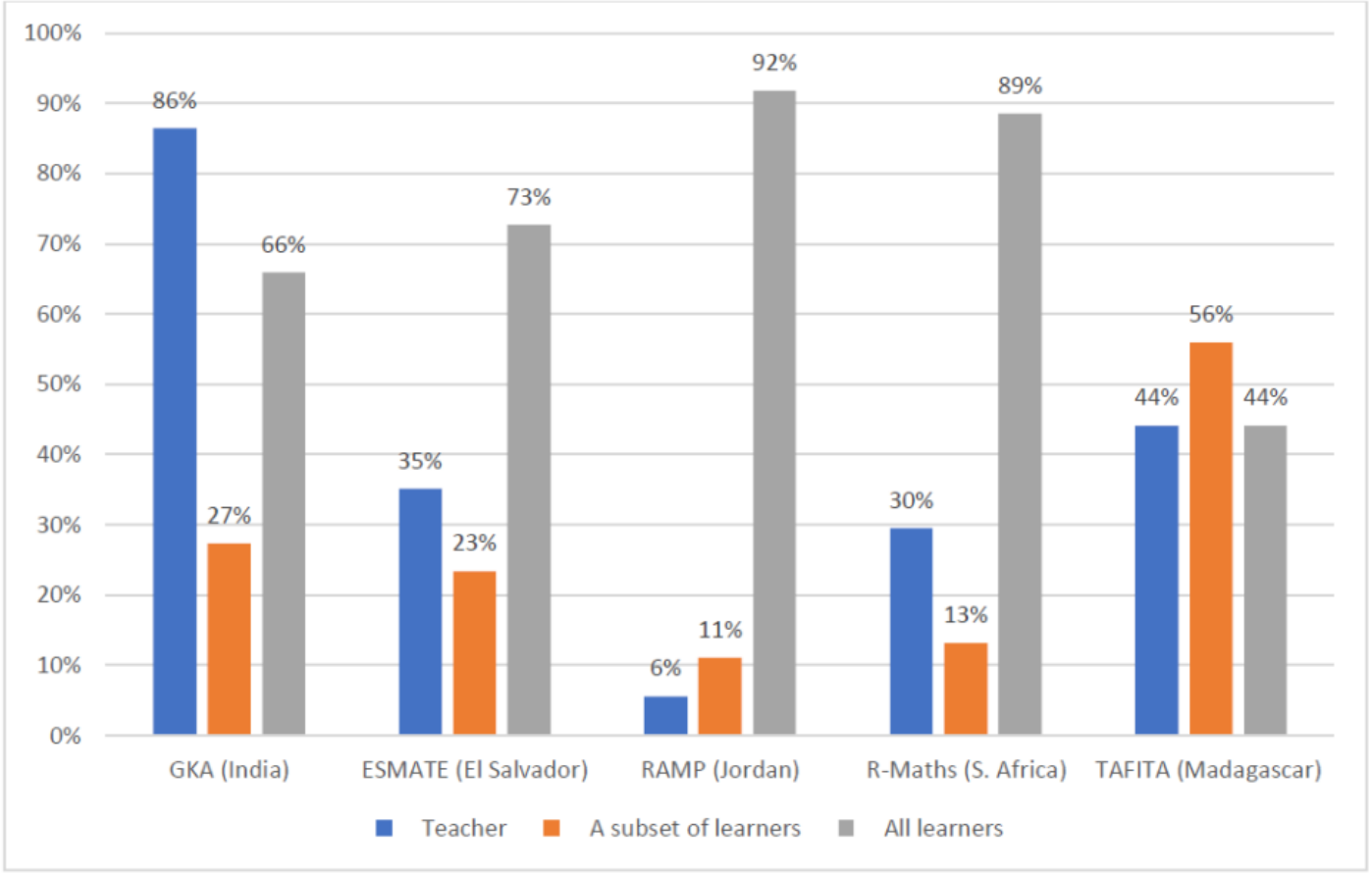


Data source: Qualitative Observations

KEY FINDINGS FROM RQ1: *What instructional strategies lead to learning?*

Theme 1: Use of multiple representations.

- Teachers ensure that **students use the concrete materials and other models themselves**



Who use materials during independent or groupwork?

Data source: Quantitative Observations

KEY FINDINGS FROM RQ1: *What instructional strategies lead to learning?*

Theme 1: Use of multiple representations.

Students use concrete and pictorial representations when solving problems

Percentage of students who used counters, drawings, or fingers to solve the problem.

	ESMATE (El Salvador)	**RAMP (Jordan)**	**TAFITA (Madagascar)**
Simple addition (13 + 6)	76%	47%	64%
Simple subtraction (16 – 4)	59%	42%	68%
Complex addition (38 + 26)	32%	9%	59%
Complex subtraction (52 – 37)	18%	4%	52%

Student Responses from ESMATE

13 + 6 Can you tell me how you solved the problem?
ID32: I counted the total of both groups of counters, one by one.
ID40: I counted 13 counters and here I counted 6. Then I continued counting: 14, 15, 16, 17, 18 and 19.
ID28:. First I said 13, then I counted 14, 15, 16, 16, 18, 19 using my fingers.

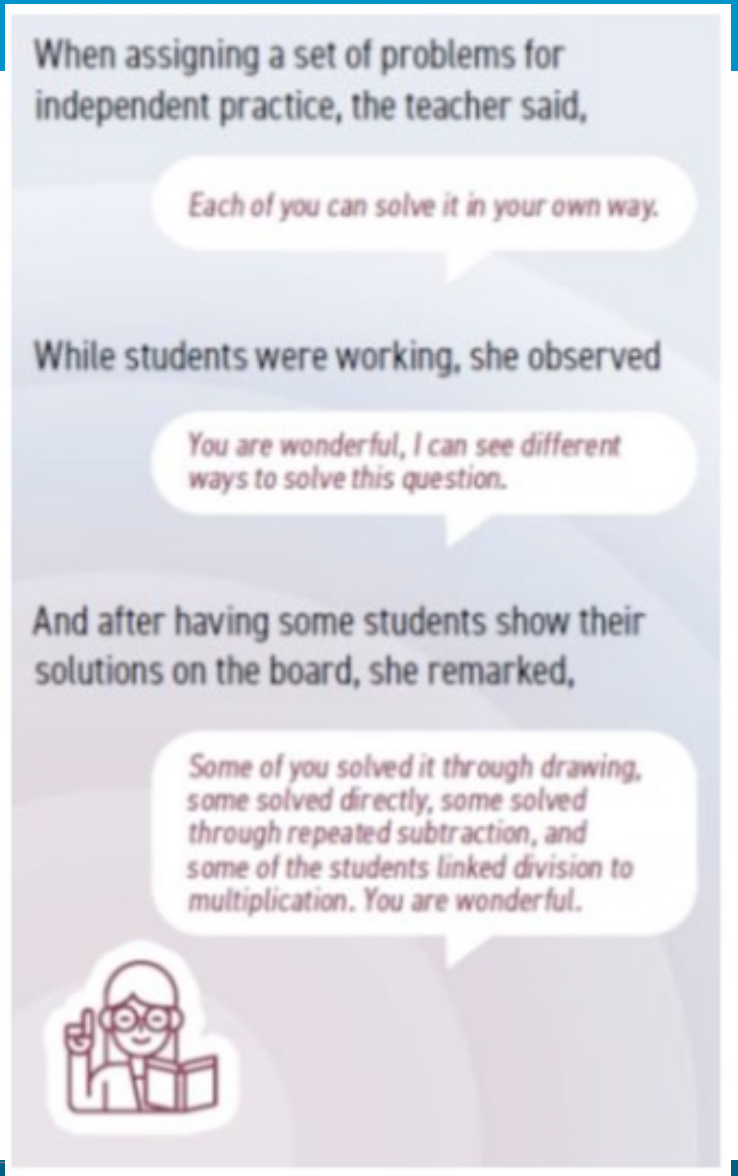
Data source: Student Interviews

KEY FINDINGS – RQ1: *What teachings practices lead to learning?*

Theme 2: Focus on understanding.

Teachers ensure that there is a focus on conceptual understanding and procedural fluency by:

- **asking questions** for which there is **more than one right answer**.
- responding to a student who gave incorrect answers **by helping them reach the correct solution or discuss why the answer was incorrect**
- **Encouraging students to use multiple strategies** and in some cases to **discuss their mathematical ideas**.



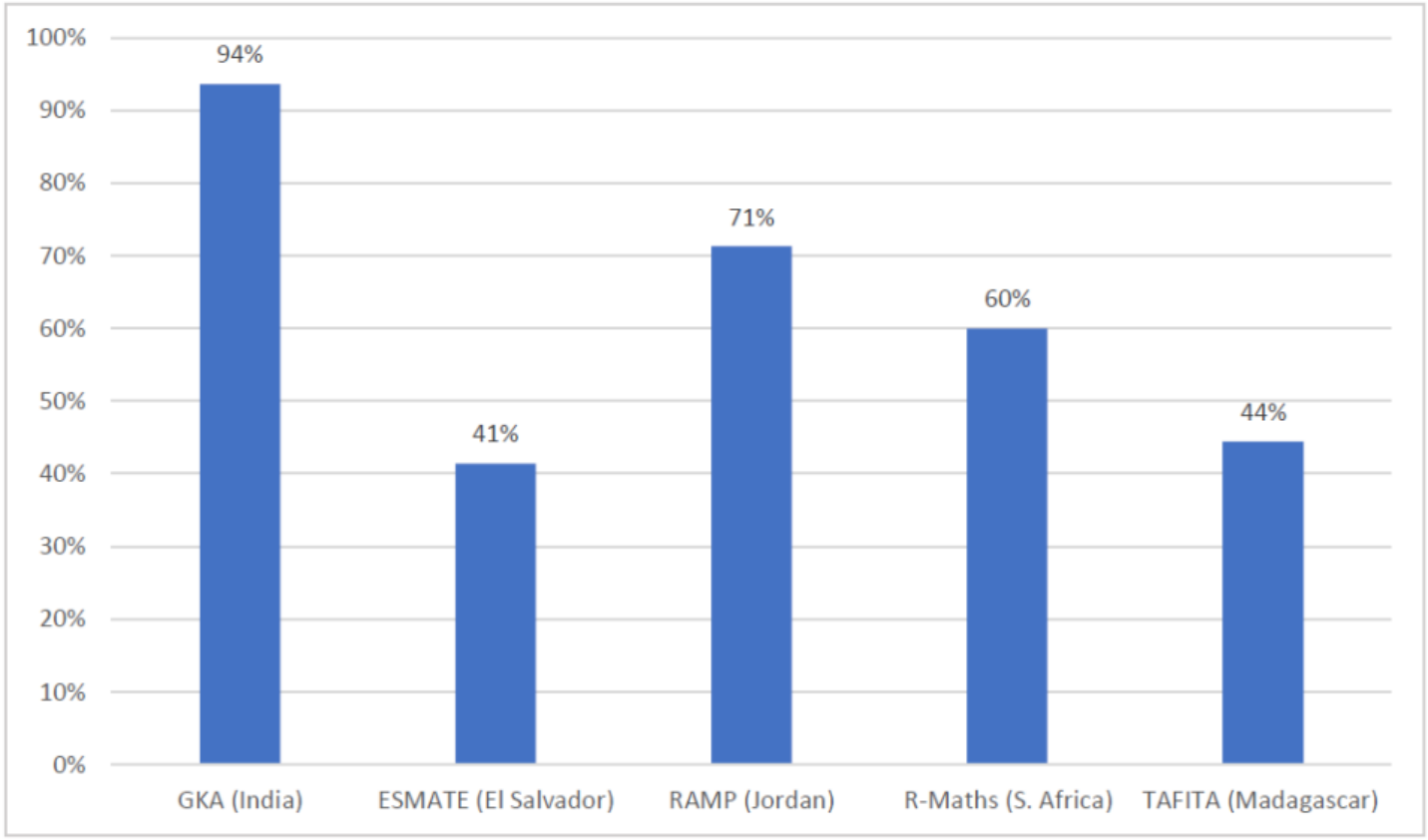
Data source: Qualitative Observations

KEY FINDINGS – RQ1: *What teachings practices lead to learning?*

Theme 2: Focus on understanding.

Teachers ensure that there is a focus on conceptual understanding and procedural fluency by:

- **Making connections between math concepts and the real world or students' experiences.**



Percent of lessons where teacher connects math concepts to real-life examples or lives of students.

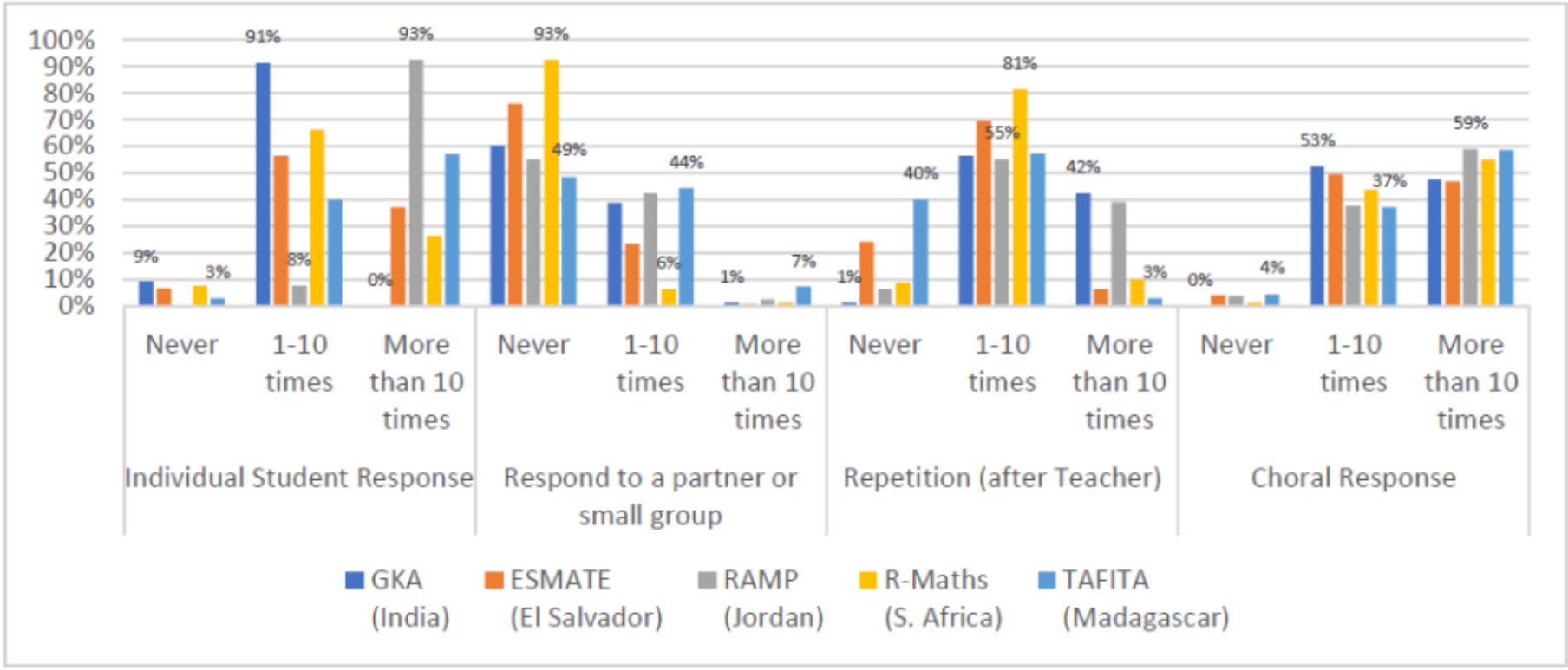
Data source: Quantitative Observations

KEY FINDINGS – RQ1: *What teaching practices lead to learning?*

Theme 3: Active student engagement

Teachers ensure that all students are **engaged** and have opportunities to **participate actively** by:

- Using a **variety of questioning techniques**



Data source: Quantitative Observations

KEY FINDINGS – RQ1: *What teaching practices lead to learning?*

Theme 3: Active student engagement

Teachers ensure that all students are **engaged** and have opportunities to **participate actively** by:

- Providing **dedicated time for independent and group work**

		GKA (India)	ESMATE (El Salvador)	RAMP (Jordan)	R-Maths (South Africa)	TAFITA[10] (Madagascar)
Independent or group work: Students working on their own	Percent of lessons (frequency)	58%	86%	61%	78%	57%
	Average time (duration, in minutes)	10	19	10	18	11
	Average % of total class time	25%	43%	29%	40%	27%

Independent or groupwork, by program

Data source: Quantitative Observations

KEY FINDINGS – RQ1: *What teaching practices lead to learning?*

Theme 3: Active student engagement

Teachers ensure that all students are **engaged** and have opportunities to **participate actively** by:

- Ensuring **independent and groupwork is spent in active learning**

Photo: Madagascar TAFITA Program

KEY FINDINGS – RQ1: *What teaching practices lead to learning?*

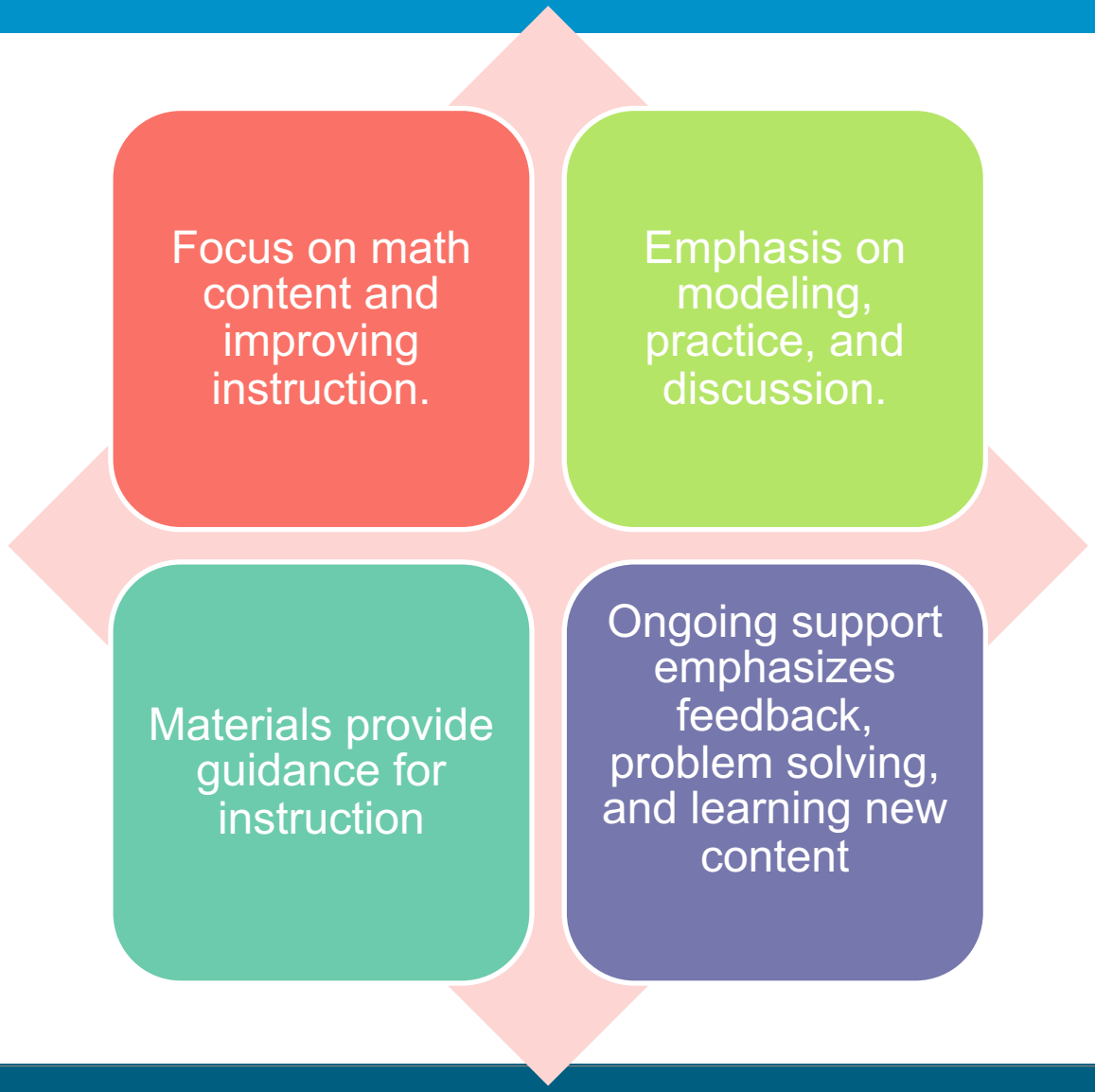
Theme 4: Assessment-informed instruction.

Teacher use formal and informal assessment to inform instruction by:

- **Monitoring students while they work** and **helping students who appeared to be struggling**.
- Using informal or formal assessment to group and instruct students at their level in some programs, but not all
- More work is needed

IMPLICATIONS FOR TEACHER PROFESSIONAL DEVELOPMENT

RQ2 Key Findings:



IMPLICATIONS FOR TEACHER PROFESSIONAL DEVELOPMENT

- Having concrete materials is important – HOW they are used is equally important.
- No one prescribed way to build conceptual understanding and procedural fluency – but one of most important components of instruction.
- There are multiple possible pathways for building student engagement – helping teachers to increase and ensure engagement is essential.
- More work is needed so teachers can use assessment information to adjust or differentiate their instruction.

THANK YOU!

Read more about the Numeracy at Scale study at https://learningatscale.net/numeracy-findings/.

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