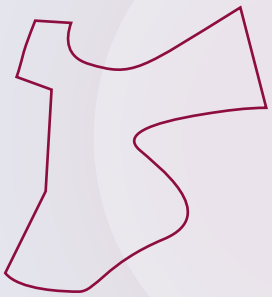
NUMERACY AT SCALE FINDINGS BRIEF

# RAMP in Jordan

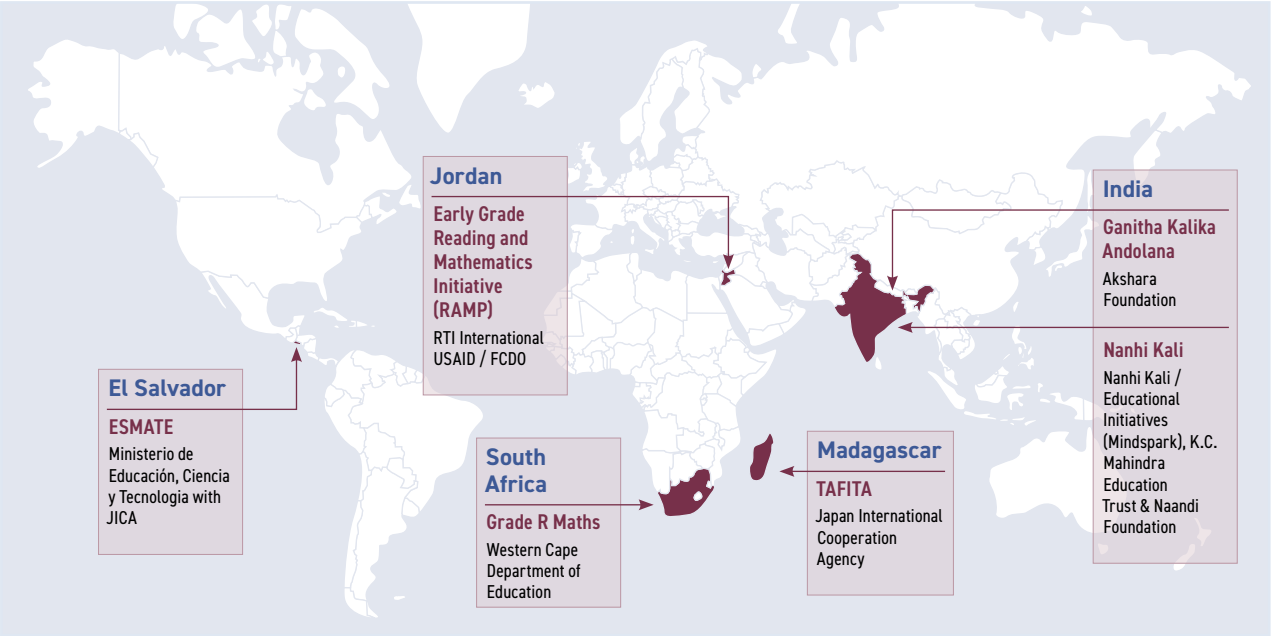


## Introduction to Numeracy at Scale

The Learning at Scale study was designed to explore programs that have a demonstrated impact on foundational learning outcomes at scale. The goal of this research is to identify and examine successful aspects of these programs to provide policy makers and development practitioners with evidence-based strategies for improving instruction and learning outcomes across contexts. The research is being led by RTI International and is part of the Center for Global Development education research consortium, funded by the Bill and Melinda Gates Foundation.

While the first phase of Learning at Scale focused on literacy, the second phase, Numeracy at Scale, is focused on (1) identifying instructional strategies that are essential for improving numeracy outcomes at scale in low- and middle-income countries; and (2) learning about the characteristics of the education systems within which successful scaled-up numeracy programs operate. To this end, the study team identified and analyzed six programs across five countries that had rigorous evidence of impact on numeracy learning outcomes and which were operating at scale (see Figure 1).

**Figure 1.** Numeracy at Scale partners



The six Numeracy at Scale programs represent a variety of designs, from providing instruction to at-risk girls via interactive software to a national-scale numeracy initiative integrated into all public primary schools. Despite their differences, these programs share a large number of common elements (see Figure 2).

**Figure 2.** Common elements across successful large-scale numeracy programs


Even with these common elements, these programs provide evidence of multiple pathways to success. For example:

- All programs provided teachers with training and support, but the forms that teachers found most impactful for student learning varied.
- In all programs, teachers incorporated independent and group work and focused on building both procedural and conceptual understanding, but their use of materials and student discussion varied.
- Head teachers were trained and relied on the use of data for decision-making, but they differed across programs in how they provided (or sought) support for struggling teachers.
- Coaches or mentors were engaged across programs, but their roles, expectations, and level of support varied greatly.

The remainder of this brief provides an overview of the Numeracy at Scale research methodology generally and explores the findings from one of the programs studied—the RAMP activity in Jordan.

# Numeracy at Scale Research Methodology

The Numeracy at Scale study investigated three main research questions:

1. What classroom ingredients (such as teaching practices and classroom environment) lead to learning in programs that are effective at scale?
2. What methods of training and support lead to teachers adopting effective classroom practices?
3. What system-level support is required to deliver effective training and support to teachers and to promote effective classroom practices?

In addition, cross-cutting questions (based on previous research on mathematics teaching and learning) focused on whether and how teachers emphasized conceptual understanding, the role of representations or conceptual models, and the use of manipulatives or other hands-on activities.

In each country, the study teams carried out a mixed-methods study. See Figure 3 for an overview of the study design.

The data collection in Jordan followed the overall design for other countries, but due to the national scale of the RAMP activity, it was not possible to identify a control group. Figure 4 shows the respondents from the data collection in Jordan.

**Figure 4.** Jordan study respondents

| Respondent | | Total |
|---|---|---|
| **Quantitative** | | |
| | Schools | 80 |
| | Teachers | 80 |
| | Head teachers | 80 |
| **Qualitative** | | |
| | Schools | 9 |
| | Teachers | 9 |
| | Students | 45 |
| | District/local officials | 4 |
| | Region/central officials | 12 |
| | Program/partner staff | 7 |

**Figure 3.** Numeracy at Scale study 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:**

- 9 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

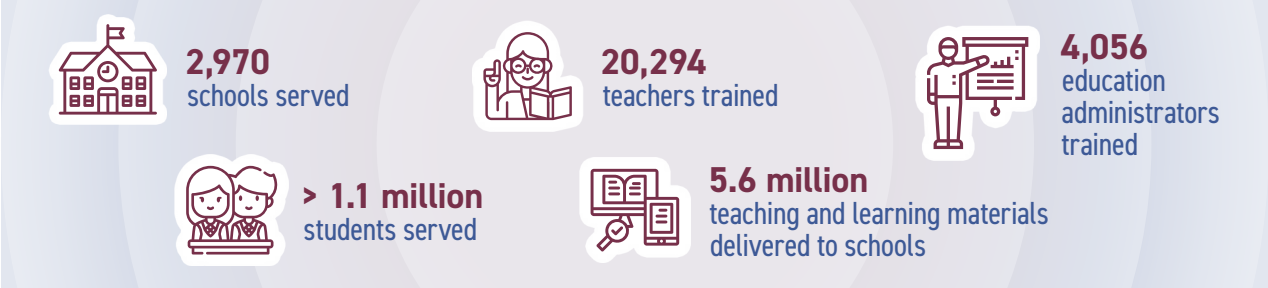
1 The Mathematics Knowledge for Teaching survey is a short survey (23 items) that measures primary-grade teachers' knowledge of mathematical concepts and their pedagogical content knowledge. For more information, see Wendi Ralaingita, Aizada Mamytova, and Yasmin Sitabkhan, "Capturing Teachers' Mathematical Knowledge for Teaching" (2023), https://shared.rti.org/content/mathematical-knowledge-teaching-survey-cies-2023-presentation.

# RAMP Program Overview

RTI International and its partners implemented the Early Grade Reading and Mathematics Initiative (RAMP), with funding from USAID and UKAID. The program ran from January 2015 through July 2023 (which included two program extensions).

RAMP was a nationwide program designed to improve the reading and mathematics skills of students in Jordan from kindergarten through grade 3 (K2–G3). More specifically, the project worked with the Ministry of Education to (1) develop and distribute improved learning materials to every K2–G3 classroom in Jordan; (2) train teachers, principals, supervisors, and field directorate and Ministry of Education administrators on how to provide more effective instruction; (3) promote community participation in reading and mathematics education; and (4) support the nationwide adoption of early grade reading and mathematics policies, standards, curricula, and assessments.

**Figure 5.** Quick facts: RAMP




## RAMP Approach to Teaching Mathematics

RAMP baseline results showed that students were performing well on procedural tasks but markedly less so on items that required both an understanding and an application of their procedural knowledge. This result aligned with the historical norm of teachers in Jordan teaching mathematics with a procedural focus, as opposed to providing students with instruction and guidance on a conceptual understanding of mathematics.

In response to a lack of improvement in student mathematics outcomes from baseline to midline, RAMP introduced a mathematics booster training, which exposed teachers to a new instructional approach that embraced (1) a conceptual understanding of mathematics; (2) learning progressions; (3) an initial focus on foundational skills; and (4) targeted remediation.

The goal of this revised approach was to develop a program focused on problem-solving skills, in which students would learn to resolve complex problems requiring critical thinking, reasoning, and the application of mathematical concepts to real-life situations. Accordingly, teachers were trained to engage children in activities in which they formulate problems, devise strategies, analyze the information provided, and explain how they arrived at their solutions. Teachers were also expected to introduce each new mathematical concept with the use of manipulatives and concrete examples before to moving to more abstract representations.

RAMP also provided a range of structured materials to teachers, including teachers' guides, student workbooks, formative assessments, and remediation worksheets—all of which were designed to incorporate more discussion around the conceptual learning of mathematics in the classroom and to provide teachers with guidance on how to use differentiated instruction approaches.

# Findings from RAMP

Findings from the Numeracy at Scale study's qualitative and quantitative data collection activities in Jordan provide insights into how RAMP was able to achieve improved outcomes at scale.

The following subsections discuss the findings from Jordan in relation to the Numeracy at Scale research questions.

## Research Question 1

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

To understand what instructional practices may be leading to improvements in learning outcomes, the study team analyzed data from both quantitative and qualitative classroom data, as well as teacher interviews.

Overall, the majority of teachers noted that their class instruction improved under RAMP due to three main factors: (1) a greater focus on using multiple strategies (64%); (2) the adoption of a new instructional approach (60%); and (3) a reliance on more materials (51%). Similar themes emerged from the classroom observation data, as well as interviews with other stakeholders.

### THEME 1 Teachers used modeling and discussion to focus on problem solving and a conceptual understanding of mathematics.

Teachers in all observed classrooms modeled strategies and/or explained how to solve problems. The qualitative observations revealed three approaches that teachers used consistently when modeling:

- **The use of multiple representations.** All nine of the teachers observed in the qualitative sample used more than one representation of a concept in their instruction and used a variety of models to demonstrate or explain a concept or procedure. For example, teachers used number lines, LEGO cubes, and everyday objects when demonstrating how to do a simple multiplication or division problem.

- **Drawing linkages between mathematical concepts.** These teachers also consistently made explicit linkages between mathematical concepts. In the majority of lessons, teachers began by reminding students of the previous day's lesson and discussed

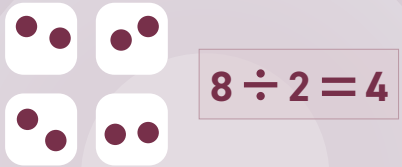
**Figure 6.** Linking mathematics concepts

The teacher showed the students a number line and reminded them of the previous day's lesson, where they had used repeated subtraction to find the solution to 8 ÷ 2. She modeled how to do this on the number line:


Asking students how many times they had to subtract 2 (4 times), the teacher concluded that 8 ÷ 2 = 4.

Then, the teacher showed 8 circles on the board

and explained how they could be distributed into groups, giving the same result as repeated subtraction:



how the day's topic built on the previous one. In their explanations, teachers also utilized mathematical connections to help students understand new concepts. For example, the teachers showed students how division can be thought of as repeated subtraction or as distribution into groups. See Figure 6 for an example.

- **Introducing and supporting the use of multiple strategies for solving problems.** Teachers built on the use of multiple representations and linkages between mathematical concepts to model and support students in using multiple strategies to solve a given problem. These approaches were used not only to develop conceptual understanding, leading to more abstract concepts, but also to support a flexible approach to problem solving. Teachers demonstrated multiple strategies and then encouraged students to try different strategies or choose which one they wanted to use. See Figure 7 for an example.

**Figure 7.** Emphasizing multiple problem-solving strategies

When assigning a set of problems for independent practice, the teacher said,

*Each of you can solve it in your own way.*

While students were working, she observed

*You are wonderful, I can see different ways to solve this question.*

And after having some students show their solutions on the board, she remarked,

*Some of you solved it through drawing, some solved directly, some solved through repeated subtraction, and some of the students linked division to multiplication. You are wonderful.*

Throughout all of the lessons observed in the qualitative sample, teachers encouraged and supported students to share their mathematical ideas and thinking and to explain how they selected and used different strategies for solving problems. The focus in such dialogue emphasized the process and students' thinking, as opposed to just giving the correct answer. See Figure 8 for an example.

**Figure 8.** Helping students engage in discussion about mathematics

The teacher showed how the problem 6 ÷ 3 can be solved by breaking 6 objects into groups of 3. She reminded students that it can also be solved through repeated subtraction. Then she asked,

*How can we benefit from the multiplication process, especially the multiplication by 3, in solving the same question?*

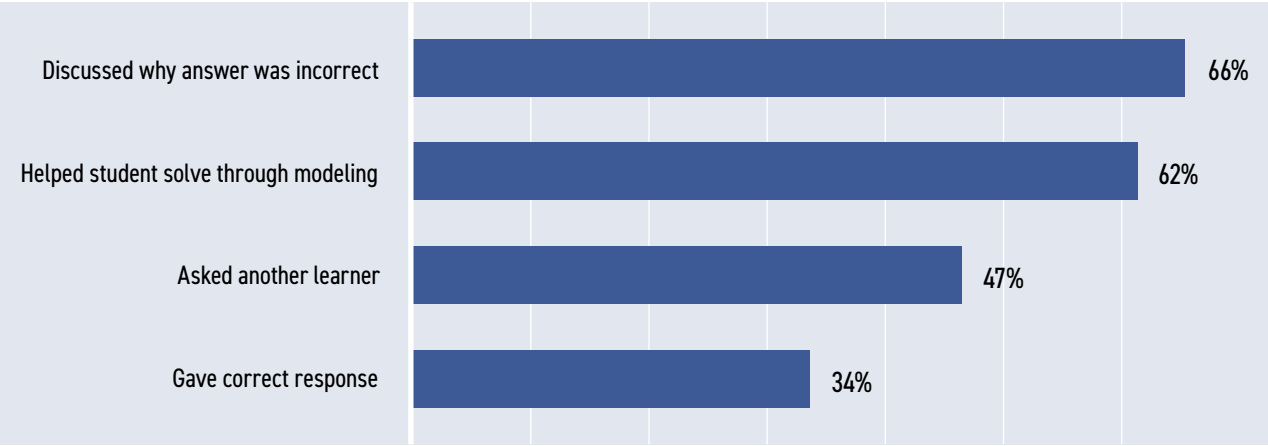
A student replied,

*By converting from division to multiplication 6 ÷ 3, where I asked myself: what is the number I multiply by 3 to get 6, and the answer is 2.*

The cognitive interviews with students reflect the approaches that teachers used for modeling, explaining, and discussing mathematical ideas. All of the students interviewed were able to describe how they solved problems. Across the different problems presented, students used a variety of strategies. For double-digit addition, most students applied place value concepts, while some used decomposition (breaking the numbers apart to make them easier to add) and did not use concrete materials—whereas for world problems, the majority used counters. This indicates that the majority of students were selecting among a variety of strategies to aid in problem solving.

Additionally, when students provided incorrect answers, teachers applied a range of strategies to address their needs. In lieu of just providing the correct response (which they did about one-third of the time), teachers more commonly discussed why the answer was incorrect (66%) or helped students solve the problem through modeling (62%) (see Figure 9).

**Figure 9.** Teacher responses to incorrect student answers: Percent of observed lessons



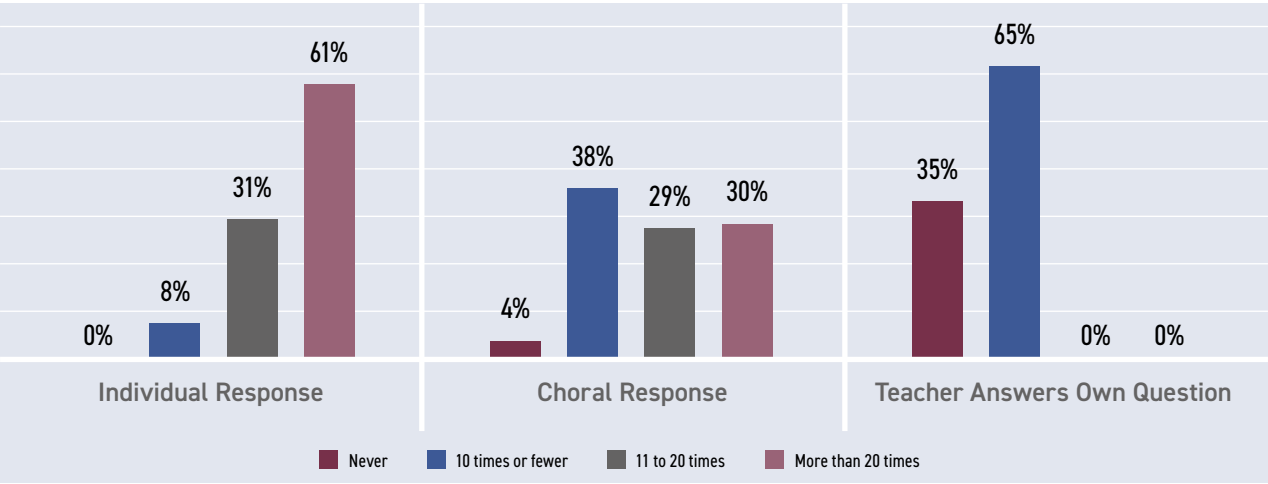

Based on qualitative interviews with students, children in RAMP classrooms were generally successful in doing math problems with understanding and were able to explain and justify their thinking. Furthermore, they used their knowledge of mathematics to explain why an answer was correct (or incorrect) and they used abstract and complex problem-solving strategies. These are all positive outcomes of instruction focused on problem-solving and a conceptual understanding of mathematics.

## THEME 2 Teachers focused on high levels of student engagement and active learning during mathematics lessons.

Teachers reported that, as a result of RAMP, students not only are better at problem solving and conducting basic operations but also are more engaged and enjoy math.

This is explained in part by the improved approaches to engagement under the RAMP model. For example, teachers connected math concepts to real-life examples from students' lives in 71% of observed lessons. Additionally, teachers ensured that classrooms were interactive through question-asking. As shown in Figure 10, one-third of teachers never answered their own questions, while two-thirds did so ten times or fewer. By contrast, there was an individual student response more than 20 times in nearly two-thirds of observed lessons. The amount of choral response fell squarely between these two other approaches.

**Figure 10.** Response to teacher questions (percent of observed lessons)



In qualitative observations, teachers also made an effort to incorporate fun and engaging activities and to encourage and motivate students. The teachers were observed integrating poems and songs, as well as games, into their lessons. One teacher created a device for her students to use for practicing multiplication facts, where a light would come on when they selected the correct answer. This and other teachers also repeatedly made encouraging remarks to their students, such as by telling students after completing an activity, "You are able to solve and think so because you are math geniuses," and by telling students who tried different strategies, "You are creative."

## THEME 3 Using targeted materials, teachers provided students with dedicated time to practice independently.

Approximately 30% of observed lesson time was dedicated to independent student work, including both group work and individual practice. Students spent this time solving problems from the board, textbook, or workbook, as well as engaging in active learning activities. As seen during the qualitative lesson observations, group work was often used for students to work together to solve a problem, and then the teachers provided worksheets for students to complete individually, giving them an opportunity for further practice.

In the majority of quantitative and qualitative lessons, all students used manipulatives during independent work. Linking back to the approaches used by teachers for modeling and explanation, the students similarly used a range of representations when solving problems and used a variety of strategies (see Figure 11). As noted previously, teachers explicitly encouraged students to try more than one strategy or to consider different possible strategies and choose one.

**Figure 11.** Students using a variety of representations, materials, and strategies to solve problems

When asked about the most useful material they received from the program, teachers overwhelmingly selected manipulatives and other teaching aids. They also noted that these materials were better organized and easier to follow and that manipulatives kept students more engaged.

## Research Question 2

*What methods of training and support lead to teachers adopting effective classroom practices?*

Data from interviews with teachers, head teachers, trainers, coaches, and teacher meeting facilitators, as well as coaching and teacher meeting observations, reveal how RAMP's teacher training and support model led to successful implementation of the program's instructional approach.

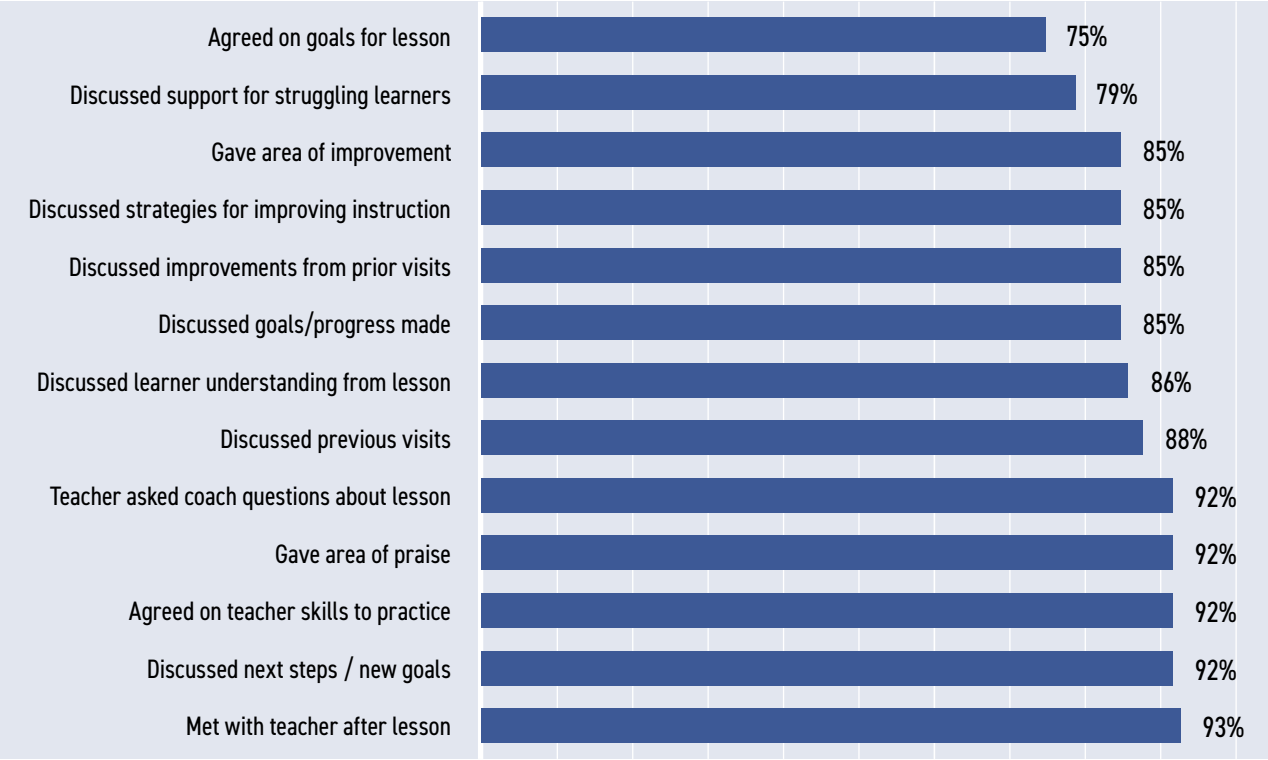
### THEME 1 Teacher supports focused explicitly on improving instruction in the classroom.

RAMP was successful in shifting head teachers' role away from a managerial and accountability one and more toward a role focused on instruction. For example, two-thirds of head teachers reported that as a result of RAMP, they now provide more instructional support and emphasize the importance of instruction to teachers.

However, head teachers still recognized that there are others in the system who are better positioned to provide additional support to teachers when needed. Notably, three-quarters of head teachers reported that they request additional support from coaches if a teacher is not performing as expected. (Nearly 90% of head teachers reported that they know how teachers are performing based on student results.)

The reliance on coaching support seems appropriately placed, given the results of observed coaching visits under this study. All coaching visits included an observation of a mathematics lesson, but the support did not stop there. As shown in Figure 12, coaches consistently used these opportunities to provide comprehensive, structured instructional support to teachers.

**Figure 12.** Coach-teacher interactions (percent of observed coaching visits)



Additionally, 94% of coaches reported that when a teacher is struggling with instruction, the coach will provide targeted support or training for the struggling teacher.

## THEME 2 Coaching roles transitioned from accountability to support.

More than half of the RAMP teachers interviewed for this study reported that coaches are more supportive than they were prior to the program. Additionally, teachers noted that they find coach feedback and discussions very helpful.

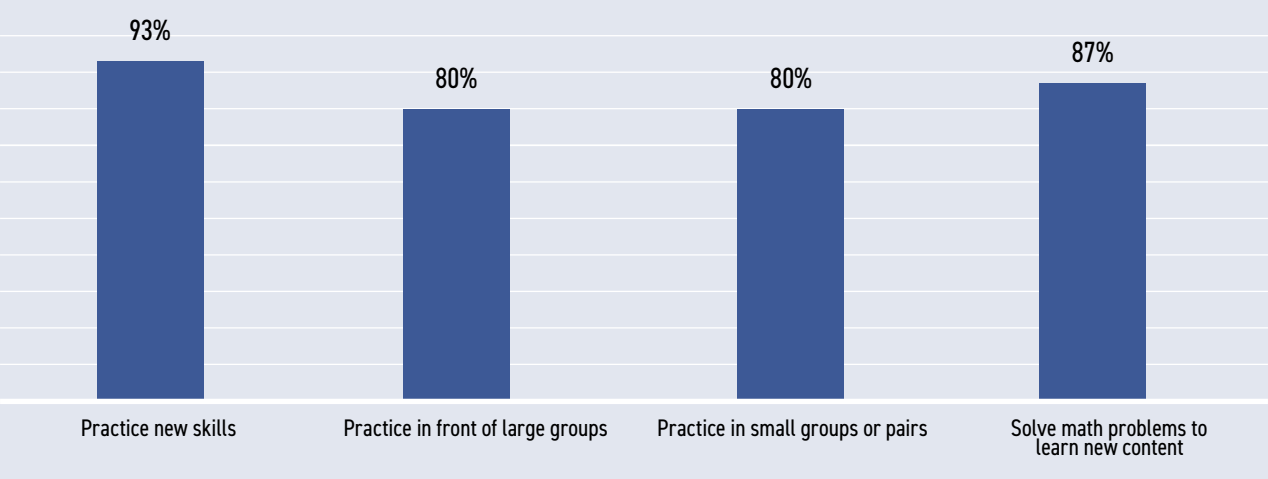
This shift was noted by coaches as well. For example, nearly 90% of coaches described their main purpose as a coach as improving teaching in schools. A similar proportion noted that their motivation for visiting classrooms is to improve teaching. Lastly, coaches noted that the most helpful training they received as a coach was on how to help teachers reflect on practice and how to give feedback to teachers.

## THEME 3 Teachers have opportunities to practice new skills and discuss their instructional approaches.

The vast majority of teachers noted that modeling and/or demonstration was the most helpful part of teacher trainings—and that RAMP trainings contained significantly more modeling than prior trainings. Trainers also noted that modeling was the most useful approach for training and that RAMP trainers included more teacher practice and a greater focus on skills than prior trainings.

As shown in Figure 13, at least 80% of trainers reported that teachers practiced new skills (including in front of large groups and in small groups or pairs) and solved math problems to learn new content during trainings. This significant time for practice was essential for teachers to learn the new instructional approaches embraced by RAMP.

**Figure 13.** Teacher practice during training (percent of trainers)




Additionally, the content of all observed teacher meetings was related to instructional practice. In all meetings, teachers reviewed previously learned skills, learned new skills, reflected on their teaching practice, and worked on problem solving. Relatedly, teachers found the most useful part of teacher meetings to be discussions with other teachers (71%).

## Research Question 3

*What system support is required to deliver effective training and support to teachers and to promote effective classroom practices?*

Coupled with the quantitative data, qualitative interviews with program staff and government officials allowed the study team to develop a portrait of the systems support elements that helped promote effective teaching and learning under RAMP.

Early on, RAMP recognized that teachers had concerns about being asked to use a new approach in the classroom that was seen as "extra" work. Therefore, the program worked alongside the Ministry of Education to ensure that the RAMP approach was integrated into the ministry's official curriculum and materials. In this way, the RAMP approach became synonymous with the country's official approach to early grade instruction.

Despite its familiar design, RAMP's "reflective approach" set it apart from its peer programs: throughout its life cycle, the program relied on monitoring and evaluation data to shape its program decision-making and worked relentlessly to garner ministry buy-in, eventually leading to its widespread institutionalization.

### THEME 1 RAMP introduced a reflective approach to Ministry of Education decision-making, which centered around the analysis and application of high-quality data.

As one high-level ministry official reported, **"RAMP is really successful because it is based on data that comes from real, authentic assessment. Once the data are received, interventions are developed based on evidence."** This sentiment was echoed by nearly all ministry officials interviewed as a part of this study—and it seems that this approach was used from the very start of the program. For example, RAMP gained the interest of decision-makers at the highest levels (including the Queen and various ministers) by designing activities that were intended to address the low learning levels identified by a national early grade reading assessment.

Furthermore, Ministry of Education officials highlighted the adaptative approach to program design used by the RAMP team. **"The first issue that we learned from RAMP was the circle of data: start with evaluation, identify implementation, collect more data, refine and adapt, assess again," noted one high-level ministry official. Another shared that "the reflective approach of RAMP was unique. There would be an assessment, then RAMP would share the results, then we would sit together to discuss the results and plan together to address the needs."**

This collaborative, data-driven decision-making approach was consistently reported as one of the major factors of RAMP's success. This approach included the use of regularly administered formative and summative assessments, as well as the introduction of diagnostic tools in the early grades.

RAMP also modeled data-driven decision-making approaches for the Ministry of Education. The program even established a community of practice for ministry leaders so that ministry leadership could learn and apply these approaches to other projects and discussions.

## THEME 2 RAMP was based on joint planning, ensuring that program activities and materials aligned with the Ministry of Education's needs and expectations.

Ministry of Education officials noted that RAMP planning was based on group work from the beginning, with workshops and planning sessions led by both RAMP experts and ministry staff. This approach was important for ensuring buy-in from school-level stakeholders, as it showed that RAMP was based on strategies promoted by the ministry as opposed to an external actor. As one Ministry of Education official put it, **"We believe that RAMP is part of [the Ministry of Education]; we cannot say that we are two different parties. We are part of planning, implementation and sustaining of RAMP activities … We own RAMP, so there are no expectations about how to work 'with' it because it's just part of our work."**

Another example relates to RAMP materials. The Ministry of Education noted that educational materials produced by donors or implementing partners do not typically have National Centre for Curriculum Development (NCCD) approval and that such materials are therefore not aligned with ministry priorities. However, NCCD representatives made it clear that this was not an issue with RAMP. RAMP engaged NCCD throughout its material development process, and when NCCD was updating the ministry textbooks, it held meetings with and sent all drafts to the RAMP team for feedback. The goal was to ensure that the textbooks were aligned with RAMP materials such that teachers were receiving streamlined guidance and materials.

According to one ministry official, when teachers saw the draft of the new textbooks for the first time, they said **"we know this from RAMP!"** Since all of the strategies were the same as those used in RAMP for the prior few years, teachers were very familiar and found it easy to integrate and use.

Differentiated instruction had also been a point of discussion within the ministry for years, but it wasn't until RAMP came along that the ministry was able to adopt a practical approach to incorporating such instruction into teacher practice. This included the use of diagnostic tools—as well as early grade reading assessments, early grade mathematics assessments, and lot quality assurance sampling (LQAS)—that provided teachers with strategies to support students during class time, and teacher support from coaches and mentors.

This integration is summed up by the following sentiment from one Ministry of Education official: **"There is no RAMP and [Ministry of Education], separately."**

## THEME 3 RAMP focused on institutionalization from the outset, which led to high levels of sustainability.

In addition to planning its program activities in conjunction with the Ministry of Education, RAMP sought to ensure that program elements were integrated into Jordan's education system to the extent possible.

For example, all assessment approaches under RAMP have been adopted by the Ministry of Education and have become official policy. Early grade reading assessments, early grade mathematics assessments, and LQAS were initially administered by RAMP but have since been taken over by the ministry. Further, diagnostic assessment tools (such as RAMP's "course grain tool") are being integrated into ministry-issued textbooks.

Moreover, based on RAMP's approach, the Curriculum Department and NCCD have developed a new framework for the early grades. One major component of this new framework is the integration of basic skills, which was a key focus of RAMP. The new materials also incorporate many best practices from RAMP (including "math talk" and other activities to improve students' conceptual understanding of mathematics).

In addition, the ministry's national literacy strategy includes a remedial program from RAMP that extends to 2025, while the School District Development Plans also include RAMP activities.

Lastly, but perhaps most impressively, RAMP's continuous professional development model is now official ministry policy.

## Future Considerations

As discussed above, the analysis undertaken by the study team includes evidence that echoes the positive findings of the previous impact study on RAMP and identifies some of the key elements that appear to have contributed to that success. As the Jordanian government seeks to learn from and expand these impacts, the analysis also highlights some areas that could be considered for further strengthening RAMP's impact and uptake.

- While students are beginning to gain a more abstract and conceptual understanding of mathematics, there is still room for growth. This additional growth must begin with a continued focus on mathematical knowledge for teachers in order to ensure that they fully understand the math concepts that they are teaching, as well as the most effective ways to teach them. In particular, some teachers may need more support in differentiation and ensuring that all students receive the support they need. Qualitative researchers noted that during the modeling and explanation portions of lessons, teachers often interacted with a subset of students to provide examples—and these were usually drawn from students sitting at the front of the class. While three of the nine teachers used grouping and sometimes assigned different activities to these groups, some of the teachers demonstrated less skill in differentiation—for example, one of the teachers noted there were two students whom she felt unable to support. Similarly, within the quantitative classroom observations, 45% of teachers did not provide constructive tasks for students who finished early, and 30% of teachers did not review students' work. Just as students need differentiated support, teachers require differentiated support for their continued development, so it will be useful in the future to ensure that this is a focus.
- The Ministry of Education is currently working on a national remedial plan for education (grades 4–11). Several ministry officials suggested that this plan this should incorporate best practices from the RAMP approach.

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