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**Numeracy at Scale Cost Analysis:
A Two-Part Case Study**

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LIST OF ABBREVIATIONS

ESMATE	Project for the Improvement of Mathematics Teaching in Primary and Secondary Education
GDP	gross domestic product
JICA	Japan International Cooperation Agency
MinEd	Ministerio de Educacion, Ciencia y Tecnologia [El Salvador]
NGO	nongovernmental organization
R-Maths	Grade R Maths program [South Africa]
SDU	School Development Unit at the University of Cape Town [South Africa]
TLMs	teaching and learning materials
USAID	United States Agency for International Development
WCED	Western Cape Education Department

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While every attempt was made to ensure the accuracy of the information provided in this report, any errors remain our own.

1. INTRODUCTION

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 math 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 math learning outcomes and which were operating at scale or which showed the potential for scale in an entire region or country.

Two of the selected programs—ESMATE¹ in El Salvador and Grade R Maths (R-Maths) in South Africa²—were either piloted or rolled out at scale for one year with donor funding and NGO- or donor-provided technical guidance and implementation but have since migrated to full funding and implementation, at scale, by the government. This provides a valuable opportunity to examine and document the influencing factors and decisions made in these successful program migrations. To this end, the cost analyses presented in this report focus on ESMATE and R-Maths, examining their first-year foundational or pilot costs versus the costs to scale or sustain these programs nationally or regionally. The analyses also identify cost-relevant considerations made during scaling. The information presented in this report is meant to help governments and donors as they consider, plan for, or execute their own “migrations” from interventions that are led and funded by NGOs or donors to ones that are fully funded and implemented by the government.

¹ For more about the Numeracy at Scale study’s findings on ESMATE, see the [ESMATE Findings Brief](#).

² For more about the Numeracy at Scale study’s findings on R-Maths, see the [R-Maths Findings Brief](#).

This report is organized into two sections: the first presents a case study of the R-Maths program in South Africa, and the second presents a case study of the ESMATE project in El Salvador. In both case studies, we aim to answer the following research questions:

Project Costs

- How did the percentage of costs from the different components change when the government scaled the program?
- How did the cost per student served change when the government scaled the program?
- How did the cost per teacher trained change when the government scaled the program?

Implications for Scaling

- Why was this particular program selected for scaling?
- How was the government able to secure funding for scaled programming?
- What decisions or concessions were made throughout this process?
- What challenges did the host government face, especially cost-related challenges, when the project was transferred and scaled?

The analyses presented in these two case studies draw from a number of data sources, collected both from the current program leaders and from the donors and NGOs that supported their pilot or foundational year activities. This research uses an adapted version of the United States Agency for International Development's (USAID) Cost Reporting Guidance for USAID-Funded Education Activities (Walls, 2018) and Cost Analysis Guidance (Walls, Tulloch, & Harris-Van Keuren, 2021) as its methodological framework.³ The data sources are as follows:

- Expenditure data
- Contributions
- Dosage and program structure

³ To collect the necessary data, Learning at Scale used an adapted version of USAID's Cost Reporting Guidance. While a hallmark of this guidance is to collect data concurrent to implementation, this was not possible for all of the cost data collected due to the timing of the research. The cost data were obtained from partner organizations' accounting systems and documented in a customized Learning at Scale Excel workbook. Outcomes, outputs, dosage, program models, and qualitative data were gathered during in-depth in-person interviews in El Salvador and South Africa field visits. Desk review was conducted on formative and summative impact reports, and any remaining detailed qualitative or quantitative data were collected through email correspondence. After the findings and the case studies were drafted, the reports were sent to the partner organizations to adjust and correct as needed. Adjustments were made accordingly to increase the accuracy and clarity of the report.

- Program reach data (students served, teachers trained, etc.)
- Qualitative interviews

Following an initial round of document review, data analysis, and virtual interviews, the researcher leading this component of the study, Dr. Christine Harris-Van Keuren, traveled to Cape Town and San Salvador for one week each in September 2023. During these trips, she met with officials from the programs, as well as donor and NGO staff who supported the pilot or foundational phase implementation. In these meetings, Dr. Harris-Van Keuren led in-depth discussions of the financial data provided and conducted qualitative interviews to better understand the drivers, influencing conditions, and challenges surrounding the scaling or sustaining of these programs by government. The financial data collected during these visits were then analyzed using USAID Education's cost-economy and cost-efficiency methods (Walls et al, 2021). Qualitative interview data were also analyzed and synthesized in an effort to tell the story behind the numbers. All costs are adjusted for inflation and presented in 2022 US dollars unless otherwise noted.

2. CASE STUDY: THE R-MATHS PROGRAM IN SOUTH AFRICA

2.1 OVERVIEW

The Western Cape Education Department (WCED) in South Africa focuses on reading, writing, and calculating in grade R, the first year of South Africa's Foundation Phase.⁴ As of 2016, targeted reading and writing projects had been implemented in grade R, but projects focusing on early grade math skills had not. The implementation of the Grade R Maths Program (R-Maths) addressed this pedagogical gap effectively and quickly. Indeed, WCED and its partners were able to rollout and sustain this program within three years.

From 2016 to 2018, WCED teamed up with the University of Cape Town's School Development Unit (SDU) to develop and implement R-Maths. With external funding from the Elma Foundation, Investec, the Maitri Trust, and the Zenex Foundation, SDU developed the program's materials, WCED helped facilitate their roll out, and Kelello Consulting conducted an evaluation of the program's impacts.

In 2019, the organizations involved began the process of consolidating and integrating R-Maths directly into the WCED so that by the end of that year, the program would be fully incorporated into the government system and all external funding for R-Maths would come to an end.

This case study compares the change in cost between R-Maths' development, rollout, and consolidation using external funding, to the program's maintenance using government funding. For simplicity, these two phases will be referred to as "initial rollout" (2016–2019) and "maintenance" (2023). Costs incurred in 2020, 2021, and 2022 have been omitted due to the unprecedented impact of COVID-19 on South Africa's education system.

2.2 R-MATHS IN CONTEXT

There are several important factors to consider when thinking about replicating R-Maths in other settings. These contextual factors may make adopting and implementing the program more or less challenging or expensive in different environments.

⁴ Grade R is organized within South Africa's early childhood education portfolio.

First, in 2023, R-Maths became compulsory, and the incremental process of universalizing it within the Western Cape education system began.⁵ The program’s incorporation into the Western Cape education system means that the rules and funding that apply to primary and secondary education also apply to R-Maths. Other contexts in which early childhood education is not a part of the formal education system may have different rules and financing in this regard.

Second, R-Maths was rolled out and is now being sustained in the Western Cape, one of the nine provinces in South Africa. This geographic focus meant that R-Maths could be customized, financed, and managed by one provincial body, thus allowing for greater control than would be the case in a nationwide effort. WCED prepared for R-Maths’ sustainability in advance by funding key roles that would be needed over the long term to sustain the initiative. For example, WCED ensured that they had enough subject advisors on staff to effectively manage R-Maths prior to its initial rollout.

Third, the Western Cape provides instruction in three languages—isiXhosa, Afrikaans, and English. Those contexts that use these as a language of instruction could benefit from the R-Maths materials being open source. WCED providing these materials through Creative Commons may reduce the cost for other context

R-MATHS SIMPLIFIED TIMELINE

Early 2016: Resources are developed; Engagement is initiated between the province and University of Cape Town’s School Development Unit (SDU); implementing NGOs are trained.

Late 2016 – early 2017: SDU facilitates a “dry run” of the program with subject advisors.

January–June 2017: subject advisors introduce the program to teachers through cluster-level workshops; teachers begin implementing R-Maths in the classroom.

June 2017: SDU facilitates a training of subject advisors who in turn conduct block-level trainings for grade R teachers.

July–November 2017: SDU facilitates a second “dry run” of the program with subject advisors; subject advisors again support teachers to implement the program through cluster workshops

2018: SDU facilitates a second round of trainings with subject advisors, who then conduct another round of block-level trainings for grade R teachers

2019: Subject advisors provide ongoing teacher monitoring and support; SDU trains WCED-selected lead teachers in each district; Lead teachers in turn train new and novice Grade R teachers in order to increase the internal capacity of the WCED to sustain R-Maths.

2020 and 2021: Schools closed in response to the COVID-19 pandemic; teachers distribute lesson plans to parents via WhatsApp; Schools reopen briefly in March 2021 and reopen fully in October 2021.

2022 Onward: Subject advisors provide ongoing teacher monitoring and support; “top-up” trainings are provided to novice teachers

⁵ In the Western Cape, the integration of grade R into the education system has been an incremental process because of the changes needed to school facilities (e.g., the construction of more buildings to accommodate grade R).

to reproduce the materials. Contexts with different languages of instruction or who may not benefit from the use of the R-Maths materials may have different development costs.⁶

Fourth, R-Maths works in single shifts (7:30 a.m.–12:30 p.m. five days per week). Contexts with single-shift instruction can be more expensive on a *per student served* basis than contexts with double shifts, where one teacher trained can reach two classes instead of one class. This is not to imply that double shifts are instructionally superior as a means of fostering student learning. It is only to note that the issue of single and double shifts is important when considering the cost of the resources and personnel required to launch and sustain a new program.

Additionally, public school teachers in South Africa are contractually required to receive 80 hours of professional development per academic year (i.e., January through December). These professional development sessions are not allowed to take place during the school day. Therefore, WCED conducts the trainings during holidays, afternoons, and on weekends. This means that no funds are required to hire substitute teachers to cover the teachers' time while they are in a training session.

Finally, R-Maths' planned instructional dosage is about 1.4 hours per day of play-based activities. With five days per week and 32 instructional weeks per year, this is a total of about 224 hours. Other contexts may not have as many hours set aside for mathematics instruction in early childhood education, which could affect their ability to adopt a program such as R-Maths.

2.3 COUNTED COSTS: INCLUDED AND EXCLUDED

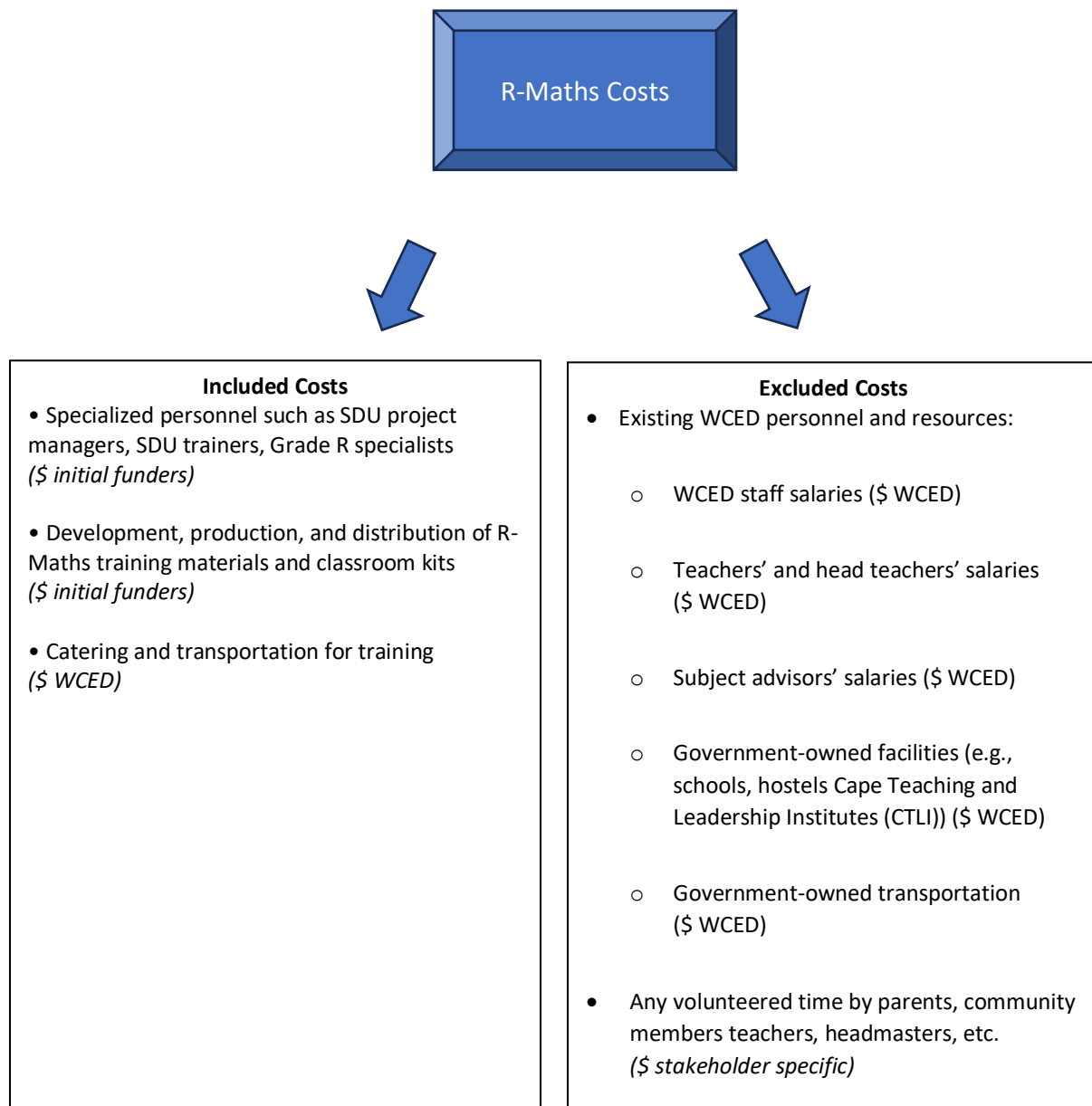
This analysis attempts to mirror and present how WCED thinks about R-Maths' cost. We felt that presenting the information in this manner would be practical and useful for the education development sector and Ministries of Education in different contexts to assist in scaling and sustaining successful projects.

For the purposes of this report, in the R-Maths context, included costs are conceptualized as: *resources financed by the initial funders or any expenses that fall outside the scope of the government's existing personnel and resources*. For example, from the government's viewpoint, government owned facilities and government vehicles have "no cost" because

⁶ R-Maths learning and teaching support materials can be found at Creative Commons <https://creativecommons.org/licenses/by-nc-sa/4.0/>

they are “already paid for” as government resources. Government salaried staff inclusive of teachers are not counted in these costs because they are government-paid personnel. However, catering expenses for training are considered “costs” because it is not a government resource. Finally, any monetized contributions such as donated time by parents or community members are also not counted as costs. **Figure 1** provides a visual depiction of the included and excluded costs for this analysis. The stakeholder who incurs the cost is identified with a US dollar sign (\$).

Figure 1. R-Maths Included and Excluded Costs



2.4 COST COMPOSITION

This section of the case study focuses on the cost incurred by the initial funders and WCED in the rollout phase (2016-2019) of R-Maths. All costs have been adjusted for inflation.

Table 1 shows that the total amount invested was \$968,009 which is, on average, about \$242,000 per year. The initial funders contributed 76% of the overall rollout costs with approximately \$733,000. WCED contributed the remaining 25% of costs, with approximately \$235,000. These funds were invested into four cost categories including WCED overhead, block trainings and dry runs, school-based cluster workshops, and learning and teaching support materials. No costs were incurred for monitoring from either the funders or WCED.⁷

Most of the funds invested, \$618,312 or 64%, went toward the creation and delivery of block trainings and dry runs. In a cascade model, as was used in R-Maths, it is not uncommon for teacher training to be the highest cost category due to the heavy reliance on specialized personnel and the number of individuals involved. In this cost category, the funders invested in hiring specialized personnel and creating a training guide.⁸ From WCED's view of costs, the Western Cape government only financed teacher transportation, catering, and accommodations in the initial rollout. However, the Western Cape's resources used in the block trainings and dry runs were more extensive than what are counted in this analysis. Important resources such as training facilities (e.g., Cape Teaching and Leadership Institutes (CTLI) and district offices), schools, and government owned hostels were utilized as were WCED personnel, subject advisors, and teachers.

In the four years of rollout, about 24% or \$230,716, of the total funds were invested into producing R-Maths learning and teaching support materials. Classroom kits, the highest single line item resource in the initial funders' rollout budget, assumed all these costs.⁹

⁷ The categorization of these costs was determined by the author who used USAID Education's cost analysis guidance as the methodological framework. See [USAID Education Cost Measurement Tools | Education Links \(edu-links.org\)](#). WCED and the initial funders may have these costs categorized differently in their accounting systems.

⁸ In WCED's teacher training and support model, grade R teachers participate in a five-day block training led by subject advisors who introduce R-Maths' pedagogy. Grade R teachers are then supported by the subject advisors through school-based cluster workshops and monitoring. The cluster workshops are organized in three-week batches— teachers participate in the workshop focusing the upcoming R-Maths pedagogical content, instruct on that content for three weeks, and then receive new guidance in the next cluster workshop for the next three weeks of instruction. To capacity build this training and support model, the initial funders invested in the University of Cape Town's School Development Unit (SDU). These funds were used to hire a project manager to collaborate with WCED on R-Maths and lead the development of trainings conducted by SDU including the train the trainer program (i.e., uptrain select NGO leaders to expand SDU's existing base of trainers). These trainers would then train the subject advisors. Other initial funders' monies were spent on the creation and production of the trainer's guide for use in the block trainings.

⁹ The classroom kits resources included one Concept Guide, four Term Activity Guides, a large full color poster book and a box of manipulatives.

These production costs, incurred by the funders in the initial rollout, allowed WCED to target funding to replace classroom kits as needed in the maintenance phase.

Twelve percent of the initial funds, or \$112,992, were spent on WCED overhead. Overhead costs in this context should be conceptualized as the extra pull on WCED staff and resources to launch R-Maths. Finally, 1% of the funds were invested in the production of facilitator’s guide for use during the school-based cluster workshops led by the subject advisors.

How the monies invested by the initial funders into the rollout were absorbed into WCED’s budgeting is discussed further in this study.

Table 1. Cost of Rollout (2016-2019)

Cost Categories and Resources	Total by Cost Category and Resource	Initial Funders	WCED
Overhead	\$ 112,992	\$ 112,992	\$ -
Block Trainings and Dry Runs	\$ 618,312	\$ 383,342	\$ 234,970
SDU Project Manager	\$ 163,454	\$ 163,454	\$ -
SDU Trainers	\$ 74,849	\$ 74,849	\$ -
Grade R Specialist	\$ 103,289	\$ 103,289	\$ -
Trainer's Guide	\$ 41,750	\$ 41,750	\$ -
Food and Beverages	\$ 153,050	\$ -	\$ 153,050
Accommodations, Sustainment and Transportation	\$ 81,919	\$ -	\$ 81,919
School-Based Cluster Workshops	\$ 5,990	\$ 5,990	\$ -
Facilitator's Guide	\$ 5,990	\$ 5,990	\$ -
Monitoring by Subject advisors	\$ -	\$ -	\$ -
Learning and Teaching Support Materials	\$ 230,716	\$ 230,716	\$ -
Classroom Kits	\$ 230,716	\$ 230,716	\$ -
Total by Stakeholder	\$ 968,009	\$ 733,039	\$ 234,970
		76%	24%
Average per Year	\$ 242,002	\$ 183,260	\$ 58,742

2.5 COST PER STUDENT SERVED

In this section, we compare the cost per student served from the funder’s and WCED’s perspectives. To present a more nuanced view of costs, we stagger the level of specificity and cost categories included in the calculations.¹⁰ For example, as our first level of analysis if we only include the cost of the learning and teaching support materials (i.e., just what the students use in the classroom), the per student cost estimation from the perspective of the initial funders is about \$1.10. To arrive at this estimation, we take the sum of the learning and teaching support materials cost category, or \$230,716, and divide it by total number of grade R students who benefited from R-Maths instruction during the rollout, or about 210,000.¹¹ (**Table 2**). If we are interested in the cost inclusive of teacher training and support costs, the per student cost increases to \$2.95. If overhead is also included, the per student cost is estimated at \$3.49. Which costs to include in the estimations are dependent on the use of the findings. For this analysis, we would consider the high estimate of \$3.49 to be the most useful as it represents the cost of all of the resources financed by the initial funders. This is because subsequent analyses presented in this case study consider how these costs were absorbed or omitted when R-Maths moved to the maintenance phase.

Table 2. Average Cost to Serve One Grade R Student During Rollout- Initial Funders’ Perspective

Cost Categories	Cost from Initial Funders' Perspective	Number of Grade R Students (n)	Average Cost to Serve One Grade R Student
Learning and Teaching Support Materials	\$ 230,716	210,000	\$ 1.10
Including Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 620,047	210,000	\$ 2.95
Including Overhead	\$ 733,039	210,000	\$ 3.49

¹⁰ Providing more than one answer to a given cost question is an approach conceived and utilized by USAID Education. For more information, please refer to [USAID Education Cost Measurement Tools | Education Links \(edu-links.org\)](#)

¹¹ The total number of grade R students who benefited from R-Maths during the rollout is estimated at 70,000 grade R students (the average number of grade R students enrolled each year) multiplied by the three years of implementation in the initial rollout (i.e., 2017, 2018, and 2019), or 210,000 students. 2016 was a start-up year. Teachers did not begin implementation until 2017.

Assessing the average cost to serve one grade R student from WCED’s perspective shows us that, depending on what costs are included in the analysis, WCED may incur no costs (**Table 3**). For example, when we isolate the analysis to just learning and teaching support materials, the result is that WCED had no costs. To reiterate, this does not mean that no WCED resources were used. It means that WCED did not have any expenses beyond existing government personnel and resources. When we include all of the costs incurred by WCED in the rollout, we find that they paid on average \$1.12 to serve each grade R student. For the purposes of this research, we will again consider the most expensive cost estimation as the most relevant.

Table 3. Average Cost to Serve One Grade R Student During Rollout- WCED’s Perspective

Cost Categories	Cost from WCED Perspective	Number of Grade R Students (n)	Average Cost to Serve One Grade R Student
Learning and Teaching Support Materials	\$ -	210,000	\$ -
Including Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 234,970	210,000	\$ 1.12
Including Overhead	\$ 234,970	210,000	\$ 1.12

Combining the two perspectives yields a range of possible answers. The average cost to serve one grade R student is estimated from \$1.10 to \$4.51 for the initial rollout of R-Maths. (**Table 4**).

Table 4. Average Cost to Serve One Grade R Student During Rollout- Initial Funders and WCED’s Perspective

Cost Categories	Average to Serve One Grade R Student
Learning and Teaching Support Materials	\$ 1.10
Including Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 4.07
Including Overhead	\$ 4.61

2.6 COST PER TEACHER TRAINED AND SUPPORTED

A similar approach was taken to estimate the average cost to train and support each grade R teacher. Because we are analyzing both teacher training and support costs, we included the block trainings and dry runs, school-based cluster workshops, and monitoring by Subject Advisors in our first level of analysis. From the perspective of the initial funders during the rollout, the cost to train and support each grade R teacher inclusive of these three cost categories is estimated at \$132.¹² If we include the cost of learning and teaching support materials, the per unit cost increases to \$211 and if overhead is added, the estimate is \$249. (**Table 5**). For the purposes of this research, we consider the highest estimation of \$249 to be the most relevant.

Table 5. Average Cost to Train and Support One Grade R Teacher During Rollout— Initial Funders’ Perspective

Cost Categories	Cost from Initial Funders' Perspective	Number of Grade R Teachers Trained and Supported	Average Cost to Train and Support One Grade R Teacher
Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 389,331	2,940	\$ 132.43
Including Learning and Support Materials	\$ 620,047	2,940	\$ 210.90
Including Overhead	\$ 733,039	2,940	\$ 249.33

¹² The number of grade R teachers trained and supported was estimated at 2,940. This is the approximate number of grade R teachers providing R-Maths instruction each year.

Table 6 depicts the cost to train and support one grade R teacher during rollout from WCED’s perspective. In this analysis, the average cost is about \$80 per teacher. This figure does not change with each level of analysis, as WCED did not pay for learning and support materials and did not perceive overhead (i.e. current government staff salaries) as an included cost.

Table 6. Average Cost to Train and Support One Grade R Teacher During Rollout—WCED’s Perspective

Cost Categories	Cost from WCED’s Perspective	Number of Grade R Teachers Trained and Supported	Average Cost to Train and Support One Grade R Teacher
Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 234,790	2,940	\$ 79.92
Including Learning and Support Materials	\$ 234,970	2,940	\$ 79.92
Including Overhead	\$ 234,970	2,940	\$ 79.92

Finally, **Table 7** displays the range of average costs to train and support one Grade R teacher. These vary from about \$212 to \$329 depending on what resources would be included.

Table 7. Average Cost to Train and Support One Grade R Teacher During Rollout - Initial Funders and WCED’s Perspective

Cost Categories	Average to Train and Support One Grade R Teacher
Block Trainings and Dry Runs School-Based Cluster Workshops Monitoring by Subject Advisors	\$ 212.35
Including Learning and Support Materials	\$ 290.82
Including Overhead	\$ 329.25

2.7 FINANCING THE MAINTENANCE OF R-MATHS

During interviews, some Ministry of Education officials stated that a program, once integrated into the education system, has no costs. This viewpoint may be confusing to some, given the costs associated with teachers' salaries, the building and upkeep of schools, transportation for staff conducting monitoring, etc. This concept of "no cost" can be reframed as "no *additional costs for this program* beyond what is already allocated in the existing operating budget." From a Ministry official's point of view, R-Maths costs were either absorbed into the existing budget or dropped. In this section of the report, we show how the costs incurred by the initial funders were either absorbed into the existing WCED budget or deemed no longer necessary.

Table 8 shows the resources that were externally funded in the rollout phase and how each was either funded or dropped in the maintenance phase.

The first key takeaway from this analysis is that the list of externally funded resources is extremely short. WCED and the funders were careful to introduce only those resources needed to fill strategic gaps in WCED's existing personnel and financing.

Second, most of the resources that were funded filled strategic gaps but were needed on a temporary basis. Personnel, such as the SDU project manager, SDU trainers, and Grade R specialist, were vital to the rollout of R-Maths, but were not critical to the maintenance phase. All of these personnel-related expenses were not absorbed into the Ministry's budget. The integration of R-Maths into the existing system was easier because it was designed and managed to this purpose from the start. The trainers' guides and facilitators' guides were developed, printed, and distributed using the initial funders' investments.

The development, printing, and distribution of R-Maths materials took place in 2016, 2017, and 2019. As needed, these guides can be reprinted to replace worn or lost guides through the GET (Directorate General Education & Training) Programme 2.1.

Monitoring by subject advisors required no integration into the existing WCED budget because funding for this activity was already accounted for in the existing GET Programme 2.3. Because all monitoring tools and resources are digital, there are no costs associated with printing observation tools or other support materials (See Appendix A).¹³

¹³ Subject advisors are a key resource in R-Maths' implementation. On visits to schools, Subject advisors spend the morning working with principals on administrative topics. In the afternoon, the Subject advisors conduct workshops

It would have been difficult for WCED to find money in their budget for the initial development and distribution of the R-Maths classroom kits. In the early years of R-Maths implementation, before grade R was institutionalized, replacing classroom kits was also a challenge due to the large number of teachers moving from grade R and into grade 1. When moving to grade 1 (and what they saw as more prestigious positions), the teachers would often take the grade R classroom materials with them, thus requiring classroom kits to be replaced frequently.¹⁴ In the future, WCED hopes to include these R-Maths materials in the provincial supplementary catalogue for learning and teaching support materials, so schools can order directly using their Norms and Standards Budget. Within this budget, there are funds set aside for textbooks, but because grade R doesn't use textbooks, these funds could instead be spent on the classroom kits.

Table 8. Financing Resources Funded by Initial Funders in Rollout

Cost Categories and Resources	Financing Mechanism
Overhead	None
Block Trainings and Dry Runs	
SDU Project Manager	None
SDU Trainers	None
Grade R Specialist	None
Trainer's Guide	GET (Directorate General Education & Training) Programme 2.1
School-Based Cluster Workshops	
Facilitator's Guide	GET (Directorate General Education & Training) Programme 2.1
Monitoring by Subject Advisors	Not Applicable (Already funded by GET Programme 2.3)
Learning and Teaching Support Materials	
Classroom Kits	Norms and Standard Budget

Regarding additional, external costs incurred by WCED to maintain R-Maths, WCED expects to pay for catering for refresher trainings for teachers, at a rate of approximately \$5 per

to support teachers on specific R-Maths pedagogical topics. These workshops usually run between 1.5 to 2 hours and are attended by new and experienced grade R teachers. For new teachers, these workshops are an introduction to new content. For teachers with one or more years of grade R experience, these workshops act as refreshers. The program estimates that it takes roughly three to four years for grade R teachers to be fully proficient in the R-Maths pedagogy.

¹⁴ In addition to the cost of replacing classroom kits, moving R-Maths materials to grade 1 classroom caused other problems, such as teachers using grade R pedagogical and curriculum content instead of grade 1 content.

teacher per day. This is substantially less than the original per-teacher training estimates from rollout (see **Tables 5 and 6**, above). These cost savings are a result of several factors. First, most grade R teachers received the initial block training conducted during rollout. Second, the refresher trainings are conducted by subject advisors and held at schools or nearby district offices, so transportation reimbursement is not needed.

2.8 FINANCING R-MATHS IN OTHER PROVINCES

Regarding financing R-Maths in other provinces, interviews and discussions suggested two possible routes. First, the National Department of Basic Education could generate a proposal and send it to the Treasury for funding. These funds could be used to finance R-Maths, but it would require a national priority to be set and would require more initial funding than is currently allocated for maintenance in Western Cape.

Second, individual provinces could submit proposals to the National Department of Basic Education. For example, WCED wrote a proposal to the Treasury to fund investments in grade R reading. Because the government saw reading as a national priority, and because the WCED advocated strongly for this, they received a grant to support foundational literacy.

R-Maths is currently being implemented at scale in Gauteng Province. While this activity was not included as part of this analysis, valuable lessons can be taken from the Gauteng Education Department about how they approached the initial rollout of the program, including necessary modifications made to its design.

2.9 ADJUSTMENTS WHEN MOVING TO SCALE

Since the rollout of R-Maths, important changes have taken place that influence the program's maintenance. Some of these changes were initiated by the WCED, while others are due to broader changes in the national education system.

First, as grade R subject advisors are retiring or being promoted, grade R-specific positions are not being filled. Foundation phase subject advisors, who are tasked with supporting grades R to 3, may lack specific early childhood development knowledge, experience, and training.¹⁵ This lack of grade R-specific knowledge could affect the nuanced support novice teachers receive from subject advisors. As the number of specialized grade R subject

¹⁵ At teacher colleges (now integrated into universities), students chose between foundation phase and grade R specific tracks. As a result, most foundation phase subject advisors do not necessarily have grade R specific training.

advisors reduces and time constraints increase, the remaining grade R subject advisors are now often targeting their support to novice and poor performing teachers.

Second, grade R teachers generally have a national qualification framework (NQF) level 5 or 6 qualification, appropriate for preschool teaching positions.¹⁶ Once they obtain a bachelor's in education degree, they can apply for grades 1, 2, or 3 teaching positions. As grade R teachers improve their qualifications, they have historically sought grade 1 teaching positions that enjoyed increased pay and security. With the institutionalization of grade R, however, grade R teachers are also afforded permanent government positions. As a result, while teacher turnover (and subsequent replacement of classroom kits) remains a challenge in the maintenance phase, it is not as pervasive as it was during the rollout phase.

Finally, the R-Maths training has been integrated into the grade R Curriculum Policy Assessment Statement's (R-CAPS) overall training. While R-Maths had its own training (and associated, external costs) during rollout, teachers now receive this as part of the full CAPS training package. This enables them to see how R-Maths is aligned with the broader grade R curriculum and frames the program as a support for delivering the required content (rather than as additional work).

2.10 CONSIDERATIONS FOR SCALING

In addition to Gauteng's uptake of R-Maths, this program could be used as a model for other provinces in South Africa. In addition to the financing considerations discussed above, there are several contextual factors that should be addressed.

One consideration is the multilingual environment of provinces. The Western Cape has three languages of instruction in its public schools, while other provinces have up to 12 official languages (11 spoken languages and sign language). This would require teaching, learning, and training materials to be translated.¹⁷ For example, in 2020 and 2021, as part of Gauteng's preparation for the R-Maths rollout, program materials accessible through the Creative Commons license were translated into several additional languages. More information is needed on how these costs varied from the cost of the initial materials development, production, and teaching during rollout in Western Cape. Because technical pedagogical terms and concepts may be translated into languages that may not include this

¹⁶ The South African Qualifications Authority has 10 NQF framework levels. The higher level of academic completion the higher your NQF level. For example, after completing high school, individuals have a NQF level 5. For more information, see [level_descriptors.pdf \(saga.org.za\)](https://saga.org.za/level-descriptors.pdf)

¹⁷ The Gauteng Province rollout is managed by Jet Education Services and funded by Zenex Foundation, Maitri Trust, USAID, and the GEDT and is out of the scope of this research.

specific vocabulary, translation efforts could incur unforeseen costs. For example, teachers who deliver instruction in isiXhosa have sometimes requested materials in English as well because it allows them to provide instruction in isiXhosa while using English concept-specific terms where there is no direct translation. This approach helps resolve any incongruencies in terminology, but it also increases the quantity of teaching materials for printing and distribution. Additionally, training and support delivered in multiple new languages may cost more, as trainings may need to be facilitated by trainers proficient in multiple languages (requiring greater levels of specialization), and more time may be needed to adequately cover all languages of instruction.

Another consideration for scaling is provincial management. The number of subject advisors in a province is based not on its school population but on the provincial budget and provincial priorities. This means that R-Maths, which relies on subject advisors for its implementation and teacher support, could be easier to implement in those provinces that have already invested in a substantial cadre of subject advisors. For example, Gauteng province utilized foundation phase subject advisors and department heads to train grade R teachers. Provinces considering implementing R-Maths that do not have an adequate number of foundation phase subject advisors, as Gauteng does, may either need to redirect budget to fund additional subject advisor positions (and their training), or restructure R-Maths in a way that utilizes existing provincial resources.

3. CASE STUDY: ESMATE PROJECT IN EL SALVADOR

3.1 OVERVIEW

The Project for the Improvement of Mathematics Teaching in Primary and Secondary Education (ESMATE) was launched in 2015 when the Ministerio de Educacion, Ciencia y Tecnologia (MinEd) signed a joint agreement with the Japan International Cooperation Agency (JICA). ESMATE builds on previous collaborative work between MinEd and JICA since at least 2006 with the Project for Improving Elementary Mathematics Teaching Skills (2006–2009).

To date, ESMATE has had two phases—ESMATE 1 and ESMATE 2—with the same overarching objective of improving mathematics learning among Salvadoran public-school students. The hallmark of ESMATE is the student textbooks and workbooks that are printed annually: at the beginning of each academic year, every student in grades 1–11 receives their own new textbook and workbook (Pineda Rodriguez, Cardona Alvarenga, Granados Paz, Cerros Urrutia, & Guevara Menjivar, 2022).

ESMATE 1 (2015–2019) sought to improve mathematics learning in public schools by developing and revising student textbooks and workbooks, and teacher’s guides for grades 1–11; and developing and enhancing pre-service teacher training courses and in-service teacher training. ESMATE 1 included a randomized controlled trial for grades 2 and 7, which showed positive gains in mathematics learning in both grades. ESMATE 1 also included the pilot and scaling.

ESMATE 2 was signed in 2021 and is due to be completed in 2025. As a continuation of the first phase, ESMATE 2 seeks to use the results of a learning survey to revise the teaching materials based on the evidence and lessons learned in the classroom. This second phase also includes wider regional cooperation with Honduras, Guatemala, and Nicaragua, which have taken an interest in the project given its results to date (Japan International Cooperation Agency, 2020).

JICA invested about 200 million yen (approximately \$2.1 million) into ESMATE 1 and 300 million yen (about \$2 million) into ESMATE 2. The following sections of this case study discuss how these JICA funds, together with the investments made by MinEd, were allocated and how ESMATE has been financed for ongoing implementation by MinEd.

3.2 ESMATE IN CONTEXT

ESMATE was motivated by the combination of MinEd’s long and successful history of working with JICA on projects focused on mathematics and a former El Salvadorian Minister of Education who had a background of in mathematics. MinEd has a deep respect for JICA’s work and JICA’s ability to be “cost-efficient” in its approach to developing and implementing projects. In particular, JICA places special attention on increasing the project’s chances of sustainability by incorporating the project into the host country’s education system from the outset. This focus on sustainability and integration into the existing education system helps keep projects costs low and speed up scaling, including in the case of ESMATE.

ESMATE went from a randomized controlled trial to being implemented at scale in just two years. There are several reasons that help explain this rapid scaling. First, as previously mentioned, ESMATE was incorporated into El Salvador’s education system from the start. Often, projects are created that are unsustainable due to a mismatch between the capacity of the education system and the project, or a misalignment of the per-student costs of the project and the per-student allocations of the government.

Second, El Salvador is geographically small but densely populated.¹⁸ This means that greater numbers of students can be reached relatively easily. That said, El Salvador’s eastern departments do have infrastructural challenges that make the

ESMATE SIMPLIFIED TIMELINE

2015: Engagement on ESMATE1 is initiated between JICA and MinEd.

2016 and 2017: Teaching and learning materials (TLMs) are developed; MinEd begins hiring new technical staff to collaborate with JICA; theory of change is tested in a small sample of pilot schools.

2018: Randomized controlled trial begins for grades 2 and 7 in 4 departments; TLMs are distributed; teacher induction sessions and pedagogical reflections begin.

2019: Randomized controlled trial ends; ESMATE is scaled to grades 1–11 in all 14 departments; TLMs are distributed to all students and teachers nationwide; teacher induction sessions and pedagogical reflections continue.

2020: New TLMs are distributed to all students and teachers nationwide; instruction is delivered online due to COVID-19; teacher induction sessions and pedagogical reflections continue online.

2021: ESMATE 2 is initiated with JICA; online instruction continues due to COVID-19; TLMs are updated based on lessons learned in the classroom (intention is to update one grade each year).

2022 and 2023: Student textbooks and workbooks are delivered to grades 1–11 nationwide; teachers continue to use the 2020 methodological guide (digital or printout); teacher induction sessions and pedagogical reflections continue.

2024 and 2025 [planned]: Student textbooks and workbooks to be delivered to grades 1–11 nationwide; teachers to use the 2020 methodological guide (digital or printout); teacher induction sessions and pedagogical reflections to continue.

¹⁸ El Salvador’s total land area is about 21,000 square kilometers (8,100 square miles), and its population is approximately six million.

schools in these areas more difficult to reach, monitor, and support. This is discussed further below.

Third, El Salvador's education system is monolingual, which reduces the complexity and costs of developing, producing, and distributing teaching and learning materials, as well as the costs of training and supporting teachers compared to projects being implemented in countries with multilingual education systems.

Fourth, El Salvador's public education system is largely a "double-shift" system in which schools receive two separate groups of students during the school day—one group in the morning and another in the afternoon. It should be noted that some percentage of teachers prefer to work single shifts. For those teachers that do work double shifts means that fewer teachers need to be trained and supported than would be the case if all teachers worked single shifts. This is not to say that double shifts are superior in fostering student learning—it is simply to note that contexts in which teachers instruct two classes, the government can reach two classes for every teacher trained.

Additionally, MinEd has worked with teachers' unions to incorporate some training and professional development into the academic calendar (see Appendix B). This means that a certain portion of professional development is incorporated into a teacher's salary and into the typical workday, which lessens the potential costs incurred due to per diems and other expenses. Some trainings, however, are not held during school hours (e.g., Saturdays) and are voluntary for teachers to attend. This is discussed in more detail below.

Finally, for most grades, each student receives about 120 hours of instruction per year. Grade 1 students have 168 hours of planned instruction time, and grades 10–11 have 144 hours. At the end of 11 years of public school, a student will have had approximately 1,416 hours of ESMATE instruction. (See Appendix C). This is important because some education systems may have more or less planned instruction time for mathematics. Furthermore, MinEd is committed to keeping this instruction time allocated to ESMATE. For example, if a new course were to be introduced into the El Salvadoran public education system, this would mean that time would need to be pulled from other courses to accommodate the new course; in such a case, ESMATE would not be considered for a reduction in instructional hours.

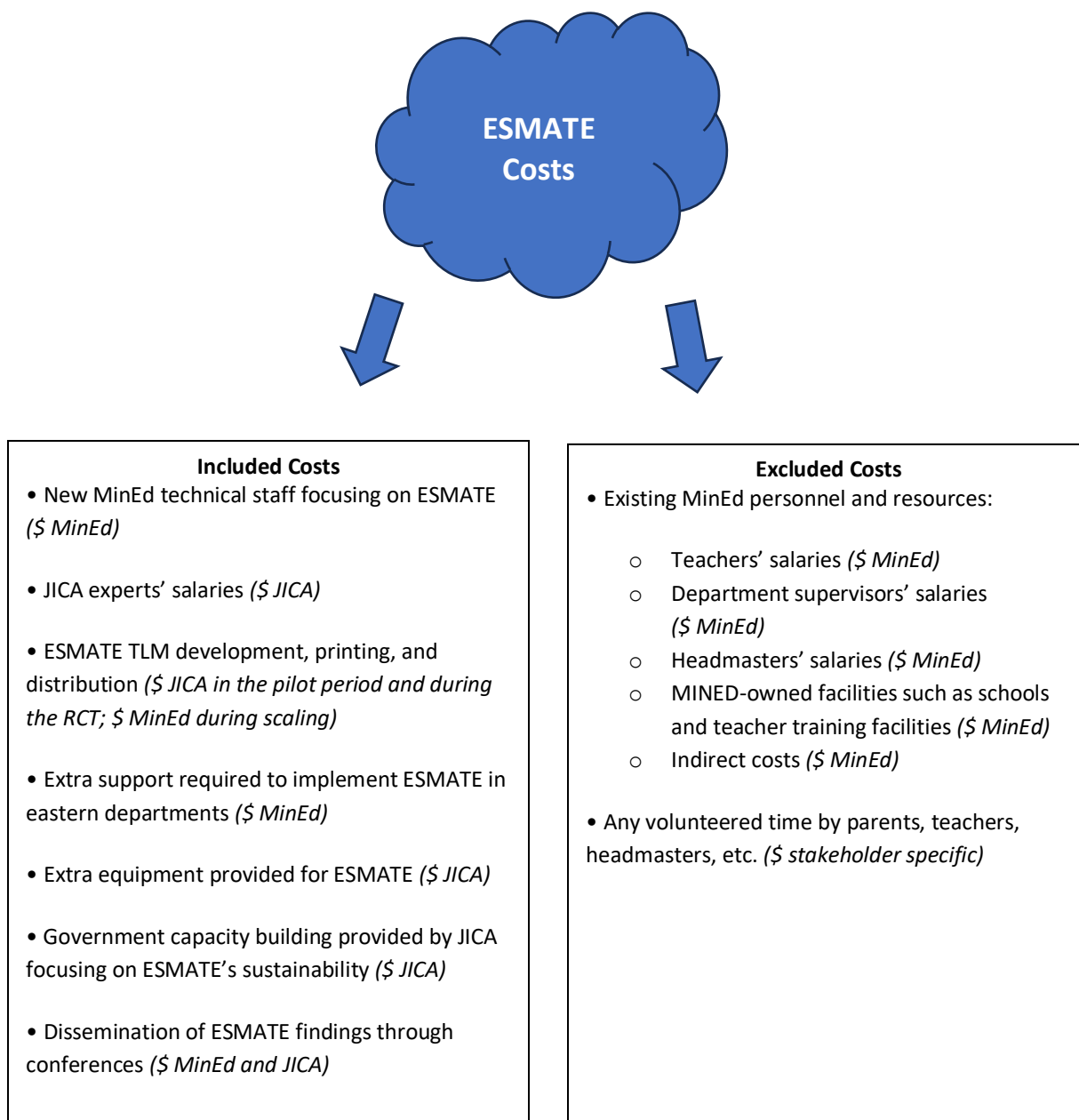
These are important contextual factors to consider when the education development sector conceptualizes ESMATE and potentially compares it to other programs or considers it for replication in a different context.

3.3 COUNTED COSTS: INCLUDED AND EXCLUDED

This section attempts to present how MinEd thinks about ESMATE's costs. We felt that presenting the information in this manner would be practical and useful for the education development sector as it works with Ministries of Education in different contexts to assist in scaling and sustaining successful projects.

For the purposes of this report, in the ESMATE context, costs are conceptualized as: resources externally financed or any expenses that are new to the MinEd budget and incurred as a result so ESMATE. **Figure 2** depicts this conceptualization. It denotes the costs that are included and excluded from ESMATE's cost estimations. The stakeholder who incurred the cost is identified with a US dollar sign (\$). For example, this analysis includes the salaries of new MinEd technical staff who were hired specifically to collaborate with JICA experts on the development and implementation of ESMATE. Because MinEd incurred these costs, the Ministry is identified with a dollar sign. The omitted costs are those that are not new or different to the MinEd budget as a result of ESMATE. For example, teachers' salaries are not counted. Also, stakeholders other than JICA and MinEd are omitted from this analysis. Therefore, costs incurred by parents or the community are excluded.

Figure 2. ESMATE’s Included and Excluded Costs



3.4 COST COMPOSITION

To begin the analysis, we look at the cost of ESMATE from MinEd’s perspective. Please note that MinEd expenditures for 2024 and 2025 are not included in these estimations. Also, JICA’s expenditures were aggregated, and we were unable to disaggregate them in a meaningful way to include them in this portion of the analysis. JICA expenditures are

discussed in financing. The cost estimations presented in this section should be considered lower than actual. All costs have been adjusted for inflation.

Table 9 shows the costs of piloting versus scaling the program across different cost categories. The cost categories include General Management and operations, Teacher Training and Support, Teaching and Learning Materials, and Other. These cost categories are disaggregated by different types of costs such as personnel and materials. The total amount invested by MinEd from 2016-2023 was \$14,719,601. The cost for piloting ESMATE was about 9%, or about \$1,300,000, of the total costs and the cost for the scaled version of ESMATE was \$13,416,636 or 91% of the total cost.¹⁹

Looking at the costs incurred in the pilot, the largest category was Teaching and Learning Materials at \$862,631. Within this category is the highest line item, teaching and learning materials development with about \$851,000. It is common in the start-up period of a project as new resources are being created. Other less expensive costs included teachers' methodological guides and student textbook and workbooks.

General Management and Operations was the second most expensive category at about \$385,000. These costs were incurred as new personnel were brought on board to collaborate with JICA. Under Other, extra implementation support for the pilot was provided to schools located on the eastern side of the country. This support costs about \$55,000. The percentage of the costs associated with this support is small relative to the overall costs of the pilot, accounting for only 4% of the total costs. This shows that while schools might require more support, at least in the context of ESMATE, the amount is low.

While student textbooks and workbooks might have been one of the lowest costs in the pilot, it became the largest cost in the scaled version at \$11.5 million. In the scaled version, Teaching and Learning Materials was nearly \$13 million. While ESMATE's theory of change rests on three elements (the provision of high-quality textbooks for every student, teacher support for student learning, and active time on task with students working independently), the project's emphasis has been on the development, printing, and distribution of the student materials. Under the project, each student in grade 1 through 11

¹⁹ The categorization of these costs was determined by the author who used USAID Education's cost analysis guidance as the methodological framework. See [USAID Education Cost Measurement Tools | Education Links \(edu-links.org\)](#). MinEd and JICA may have these costs categorized differently in their accounting systems.

receives a new mathematics textbook and a new mathematics workbook each year.²⁰ How these books are financed at scale is discussed further in the study.

In early years of ESMATE, JICA used a private printer due to the expedited printing process, but after going to scale MinEd has used a bidding process.²¹ From 2020 to 2023, the books were printed in Guatemala, and in 2024 printing will take place in China. The current quote is \$1 for each student workbook and textbook together. Government salaries and conference related costs rounded out the final expenditures in the at scale expenditures. There are no costs associated with Teacher Training and Support. This will be discussed later in the report.

Table 9. MinEd stakeholder perspective—pilot and scale

ESTMATE Resources	Pilot	Scale	Totals
General Management and Operations	\$ 385,436	\$ 261,416	\$ 646,852
Government Staff Salaries	\$ 385,436	\$ 261,416	\$ 646,852
Teacher Training and Support	\$ -	\$ -	\$ -
Teaching and Learning Materials	\$ 862,631	\$ 12,990,172	\$ 13,852,803
Teaching and Learning Materials Development	\$ 851,272	\$ 927,516	\$ 1,778,788
Teacher's Methodological Guide	\$ 6,059	\$ 516,732	\$ 522,791
Student Textbook and Workbook	\$ 5,300	\$ 11,545,924	\$ 11,551,224
Other	\$ 54,898	\$ 165,047	\$ 219,945
Implementation Support-Pilot	\$ 54,898	\$ -	\$ 54,898
Conferences	\$ -	\$ 165,047	\$ 165,047
Total	\$ 1,302,965	\$ 13,416,636	\$ 14,719,601
% of Total	9%	91%	

²⁰ Students in grades 1, 10, and 11 each receive only one book, as the textbook and workbook are printed as one.

²¹ Due to the country's dearth of local printers equipped to print large numbers of books quickly and at high quality, El Salvador does not have an in-country print mandate. In previous projects, MinEd used local printers but found that the quality didn't meet the need.

3.5 COST PER STUDENT SERVED

Table 10 shows ESMATE’s per-student cost during the pilot and **Table 11** shows what happened to the per-student cost when ESMATE went to scale.

As a means of having a more nuanced view of costs, we staggered the cost categories and resources included in these calculations.²² For example, if we only include the cost of student textbooks and workbooks (i.e., just what the students use in the classroom), the per student cost estimation from the perspective of the MinEd about \$1.06. To arrive at this estimation, we take the cost of the student textbooks and workbooks, or \$5,300 and divide it by total number of students in the pilot who benefited from the ESMATE instruction, or about 5,000. If we include the development of all of the teaching and learning materials and the teacher’s methodological guide, the average per student cost jumps to \$170. If all of the costs of the pilot are included the average per student cost is about \$261.

Table 10. Per-student costs: Pilot

Cost Categories	Cost Pilot	Number of ESMATE Students	Average Cost to Serve One ESMATE Student
Student Textbooks and Workbooks	\$ 5,300	5,000	\$1.06
Including Teaching and Learning Materials Development Teacher's Methodological Guide	\$ 851,272	5,000	\$170.25
Including All Else	\$ 1,302,965	5,000	\$260.59

While we most often expect to see a decrease in per unit costs as programs increase the number of people they serve, sometimes the per unit costs does increase. When ESMATE went to scale, the average cost to serve one ESMATE student rose to about \$11. There are several logical reasons for this increase. First, the textbooks and workbooks in the pilot may not have had the same specifications as the textbooks and workbooks used at scale. Second, we are estimating the average amount per student across grades 1-11 while the pilot only catered to grades 2 and 7. Therefore, we aren’t comparing apples to apples. Finally, JICA and MinEd changed printers. These estimations may include the costs of different printers, who had different specifications and quantities.

²² Providing more than one answer to a given cost question is an approach conceived and utilized by USAID Education. For more information, please refer to [USAID Education Cost Measurement Tools | Education Links \(edu-links.org\)](https://www.usaid.gov/education-cost-measurement-tools)

The second and third level of analysis illustrates the trend we are most familiar with, lower prices at scale than at in the pilot. Including all costs, the average per student cost is \$12 at scale and during the pilot the cost is estimated at around \$261. For the purposes of this analysis, we are most interested in highest average cost to serve one ESMATE student at scale. This is because we are interested in exploring how ESMATE is financed at scale as discussed in detail further in the report.

Table 11. Per-student costs: Scale

Cost Categories	Cost Scale	Number of ESMATE Students	Average Cost to Serve One ESMATE Student
Student Textbooks and Workbooks	\$ 11,545,924	1,075,641	\$10.73
Including Teaching and Learning Materials Development Teacher's Methodological Guide	\$ 12,473,440	1,075,641	\$11.60
Including All Else	\$ 13,416,636	1,075,641	\$12.47

3.6 COST PER TEACHER TRAINED

Tables 12 and **13** depict the average cost of training and supporting each teacher for ESMATE in the pilot and at scale.

In the pilot and the scaled versions of ESMATE’s in-service training and support for teachers, all of the resources used to implement the inductive trainings and the pedagogical reflections have come from MinEd’s general budget, or from time volunteered by different stakeholders. Therefore, from MinEd’s perspective, there are no additional costs associated with teacher training and support under ESMATE. Personnel (i.e., headmasters, teachers, department supervisors, and MinEd staff), facilities (i.e., schools), and transportation are all covered in the annual MinEd budget. The materials used during the induction trainings and pedagogical reflections in ESMATE are the same used for classroom instruction.

Table 12. Per-teacher trained and supported costs: Pilot

Cost Categories	Cost Pilot	Number of ESMATE Teachers Trained and Supported	Average Cost to Train and Support One ESMATE Teacher
Teacher Training and Support	\$ -	250	\$0.00

Table 13. Per-teacher trained and supported costs: Scale

Cost Categories	Cost Scale	Number of ESMATE Teachers Trained and Supported	Average Cost to Train and Support One ESMATE Teacher
Teacher Training and Support	\$ -	37,818	\$0.00

Induction training is not formally scheduled but typically takes place in January or November. This training occurs during working hours but before classes are in session. This means that MinEd does not need to hire substitute teachers to lead instruction or pay for teacher travel since the trainings take place at school. Since the COVID-19 pandemic, MinEd has offered the training remotely in addition to in person.²³

Pedagogical reflections are scheduled in the academic calendar for three hours every three months.²⁴ They are led by department facilitators who are teachers who volunteer for the position. The facilitators help motivate the discussion among the teachers using agenda topics set by MinEd. These costs are incorporated into the salaries of teachers and MinEd technical officers. MinEd incorporates resources in the methodological guide such as yearly planning and test results analysis. These are included as points of discussion in the agenda for the pedagogical reflections.

²³ After the COVID-19 pandemic, MinEd found that teachers had to relearn how to teach in person. In El Salvador, schools closed in March 2020 and remained closed throughout 2021. In 2022, hybrid teaching began (some in person and some online), and in 2023 classes were fully open again. Once the schools were opened, teachers found that they needed to navigate the new atmosphere and students who had been learning online or hybrid for years. They had to adjust to the “new normal,” which took some time. It is unclear if pedagogical reflections were adjusted in time or content to support this transition.

²⁴ When these pedagogical reflections take place, each teacher’s students—in both the morning and afternoon shifts—are off for that day. For example, if the teachers for grades 2-grade 6 are called together on the same day, then these students are off for the day. Then when teachers from grades 7 through grade 11 are called, those students are off. Some schools will call all teachers grades 2 through grade 11 together for pedagogical reflections. In these instances, all students are off for the day.

MinEd is beginning to offer general trainings on Saturday in which teachers can volunteer their time to attend. These sessions focus on more challenging areas, such as fractions, and provide structured instructional support to teachers. MinEd is moving these general trainings to an online format to allow for greater flexibility and lower costs, as teachers will not need to be reimbursed for travel expenses.

3.7 FINANCING

ESMATE is financed from two different MinEd budgets: Inversión por parte de la Dirección Nacional de Educación Media (i.e., Secondary Education Budget) and Inversión por parte de la Dirección Nacional de Prevención y Programas Sociales (i.e., Prevention and Social Programs Budget). As shown in **Table 14**, the Secondary Education Budget has invested about \$3.2 million in ESMATE since 2016, and the Prevention and Social Programs Budget has financed approximately \$12 million. JICA's investment has been about \$4.1 million to date. (See Appendix D for a more detailed breakdown of resources provided by MinEd and JICA).

The Secondary Education Budget has been used to cover the costs incurred to hire new MinEd technical staff, develop the teaching and learning materials, print the teachers' guide, provide extra support to eastern departments, and disseminate findings at conferences. To be as cost-efficient as possible, MinEd has not increased the Secondary Education Budget to cover these new costs. Instead, it has reallocated monies from different existing line items to cover these costs.

One way that MinEd has reallocated existing funds was to restructure teacher training. Before ESMATE, traditional teacher training—which involved hiring university professors to travel and train teachers—cost about \$2,400 for eight Saturdays of training. University professors could have five or six of these training contracts thus earning about \$12,000 to \$14,400 in training fees. Teachers volunteered their time on Saturdays for the trainings, which were located in teacher training buildings. Very few teachers attended these trainings, and the costs were high. MinEd and JICA restructured ESMATE's teacher trainings and support to be less costly and more efficient. They stopped using university professors and instead utilized existing MinEd personnel. This decision reduced teacher training costs that could then be reallocated to other purposes.

Also, in addition to being compensated for the teacher trainings, for a fee, university professors used to refer teachers to serve as department facilitators for pedagogical reflections. However, MinEd has stopped asking professors for referrals and has begun

relying on departmental supervisors to identify these teachers. There is no fee provided to departmental supervisors, as it is part of their job, and they have more teacher-specific knowledge than university professors.

The cost of printing the TLMs is by far the most expensive single component of ESMATE. MinEd finances the cost of the TLMs through the Prevention and Social Programs Budget, specifically the line item for uniforms, shoes, and school supplies. Established in 2014 and with a current budget of \$73 million, this popular social program provides uniforms, shoes, notebooks, and backpacks to children attending public school. The program includes a \$54 annual allocation for every student in grades 1–11 in public school. MinEd uses this allocation to cover the cost of ESMATE’s student textbooks (\$1.05 per textbook) and workbooks (\$1.05 per workbook) with a combined unit cost of about \$2.10. MinEd also invests \$4 per student to print books for other subjects. The cost for all of the books (including ESMATE and non-ESMATE books) totals about \$6.50, leaving nearly \$48 for uniforms and other supplies. The cost of teachers’ guides, which is about \$1.45 per guide, is funded from the Secondary Education Budget. Each teacher received one guide.

As noted by the National Director of Curriculum, Mr. Wilfredo Alexander Granados Paz, “Instead of giving them blank notebooks, we gave them textbooks and workbooks.”

In the pilot, JICA paid for grade 2 TLMs (see the second bullet under “JICA investment” in **Table 14**).²⁵ Aside from this, JICA’s investments were centered on developing ESMATE and building the capacity of MinEd to sustain and consistently improve the project moving forward. When ESMATE went to scale, MinEd assumed the cost of printing grade 2 TLMs. No other costs originally incurred by JICA needed to be assumed by MinEd.

²⁵ JICA paid for printing grade 2 TLMs, while MinEd paid for grade 7 TLMs, as well as grades 8 and 9, which fell outside of the pilot.

Table 14. Financing ESMATE 1 and ESMATE 2

MinEd Secondary Education Budget	MinEd Prevention and Social Programs Budget	JICA investment
<ul style="list-style-type: none"> • New MinEd technical staff to collaborate with JICA in developing ESMATE inclusive of pedagogy, teaching and learning materials, and training and support • Personnel to create ESMATE training, teaching and learning materials, graphic designers • ESMATE teachers' methodological printing and distribution • Extra support required to implement ESMATE in eastern departments • Dissemination of ESMATE findings through national and international conferences 	<ul style="list-style-type: none"> • ESMATE student textbook and workbook printing and distribution (less grade 2 in the RCT) 	<ul style="list-style-type: none"> • JICA experts to collaborate with MinEd in developing ESMATE inclusive of pedagogy, teaching and learning materials, and training and support • ESMATE printing grade 2 students' textbook and workbook; and teachers' methodological guide for RCT (grade 2) • Extra equipment for ESMATE • Government capacity building provided focusing on securing ESMATE's sustainability • Dissemination of ESMATE findings through conferences • Scholarships for MinEd technical staff to study in Japan for 2 year terms
\$3,204,139	\$12,140,367	\$4,147,453
ESMATE 1 and ESMATE 2 total to date		\$19,491,959

3.8 ADJUSTMENTS WHEN MOVING TO SCALE

MinEd made several important adjustments to ESMATE when it was moved to scale. The first is that teachers' guides are funded from a different MinEd budget than the student textbooks and workbooks. Therefore, obtaining funds to print teachers' guides is a challenge. In 2022, a different program provided laptops to all public-school teachers. While these laptops were not intended for ESMATE's use, some teachers are using them to access the digital version of the methodological guide. With the current voluntary retirement in place, MinEd has found that younger teachers moving into the system opt for the digital version of the methodological guide. When a laptop breaks, the teacher prints out the digital version at school, if possible, or at their own cost.

Second, when the project was initially rolled out, department supervisors were assigned to monitor teachers. But given supervisors' other responsibilities, the position being understaffed in general, and challenges in accessing schools due to poor roads, monitoring

each teacher twice per year, as had been done in the pilot, was found to be unsustainable. MinEd is working to remove some of the administrative burdens of department supervisors to free up time for increased teacher monitoring.²⁶ However, interestingly, there may be evidence that supervision has not been shown to improve student learning outcomes. There are several possible reasons for this. First, the supervisors do not have the capacity to provide assistance to teachers, such as math education. Second, due to time constraints, it is not possible from a time perspective to provide technical assistance to every teacher on an annual basis. Finally, many supervisors do not believe that their role is that of professional technical advisors. MinEd has found it difficult to change these supervisors' mindset.²⁷

Further, MinEd is planning to update the teaching and learning materials on a regular basis. With JICA's technical assistance in ESMATE 2, MinEd is trying to establish a "Circle of Curriculum Policy Based on Evidence" (Circle of PDCA). The purpose of the Circle of PCDA is to try to guarantee the sustainability of a curriculum policy based on evidence when the government changes. Through the establishment of a national examination system, MinEd is trying to build evidence of ESMATE's effect. The Circle of PDCA is to reflect--replan--implement—national exam. Currently, MinEd and JICA are using this process to analyze any misalignments between student math skills, textbook content, and teacher knowledge in grades 10 and 11. The process takes about four years to complete for each grade.

Finally, in the pilot, there was a parent induction session designed to introduce ESMATE to the communities and describe the books and the pedagogy. Since going to scale and having been implemented for several years now, MinEd has dropped the parent inductions because ESMATE is well established in the education system and is familiar to families.

3.9 CONSIDERATIONS FOR SUSTAINABILITY

While MinEd and JICA were conscientious to embed ESMATE into El Salvador's public education system from the outset, there are several potential threats to the project's sustainability. The first relates to political agendas. In El Salvador as elsewhere, education programs—and the education system as a whole—can be threatened by a lack of political

²⁶ MinEd is working to reduce the administrative burden on department supervisors by reassigning those tasks. Prior to the COVID-19 pandemic, most schools had a computer room with a technical support person. After schools reopened, these positions, approximately 400 nationwide, were eliminated by MinEd. However, to stay compliant with the teachers' unions, MinEd needed to reassign tasks to these individuals so they could remain on payroll. MinEd is hoping that with the technical support staff taking on more of the administrative work previously done by the department supervisors, this will allow more time for supervisors to conduct monitoring visits for teachers. The expectation is that department supervisors will be able to visit each school once every three months.

²⁷ Thank you to JICA for this insight.

will. Although the current administration is fully supportive of ESMATE, and in fact has increased education spending from 3.53% of the GDP in 2021 to 4.53% in 2022,²⁸ changes in the administration or the administration's focus could impact ESMATE's sustainability.

Second, it is unclear to what extent universities have integrated ESMATE's pedagogy into pre-service training for teachers. While MinEd has seen an increase in the number of proposals received from professors citing ESMATE, there is no pre-service monitoring in place to assess what aspects of ESMATE, if any, are being integrated into professors' instruction. If universities do not fully prepare future teachers to instruct ESMATE, this makes new teachers reliant on "on-the-job training" once they are in the classroom. This could potentially influence the effectiveness of the project, especially if universities teach content that does not pedagogically align with ESMATE or if newly minted teachers do not have a consistent foundation for conducting ESMATE instruction. These pedagogical conflicts or inconsistencies could lead to varying levels of ESMATE instruction across the country and hinder the effectiveness of the project as a whole.

Third, there are infrastructural challenges in El Salvador. Roads, especially those in the eastern departments, are often poorly maintained, which impacts the accessibility of schools and in turn makes it more challenging to support and monitor teachers in these areas. For example, MinEd technical staff must allow extra time or spend the night in these departments when providing support to schools there. This means that the schools that may need the most support are potentially more expensive.

Finally, because there is no plan for MinEd to print the teacher's methodological guides again, and as laptops undergo wear and tear over time, teachers could face challenges in accessing the ESMATE content. MinEd may need to revert to its original plan of printing the methodological guides every three years or devise a strategy to help teachers access the digital version.

²⁸ See sdq4-data.uis.unesco.org.

4. CONCLUSION

There are several important takeaways for other governments when thinking about replicating either of these successful programs. The first is that contextual details matter. As mentioned in each case study, these include the number of languages of instruction in the government's education system, the dosage of instruction per day and over the course of an academic year, the role of teachers' unions in determining the number of hours for teacher professional development and when those activities can take place, target population size, and if the government's education system runs on single or double school shifts. Any of these factors, and more, can influence replicating a successful program in a different location.

Second, how financing is structured matters. Both case studies utilized external funding for a pilot or initial roll out and then provided internal government funding for either maintenance or scaling. The role of the external funders was vital in both case studies. External funders invested in initial resources that were difficult for the government to finance through its existing budget and provided personnel to augment the governments' existing staff. These strategic investments allowed both the WCED and MinEd to focus on maintaining the programs financially and through current government staff.

Finally, while political priorities may shift beyond their control, how the WCED and MinEd manage the financing of each program and the personnel needed to sustain the impact is critical. As the workforce demographics and operating environments shift, it will be important for these governments to collect information about implementation and uptake, to inform fine tuning as needed.

5. REFERENCES

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APPENDIX A. KEY RESOURCES PROVIDED BY WCED FOR R-MATHS INITIAL ROLLOUT

For R-Math, resources were either funded by the Norms and Standards Budget or one of three programme options within the GET (Directorate General Education & Training) Budget:

- Programme 1.2 Payment of salaries and expenses including traveling and accommodation for Head Office staff.
- Programme 2.3 Payment for catering, traveling and accommodation for teachers and subject advisers.
- Programme 2.1 Use for resource provisioning

Ingredient Category	Resources	Tasks and Purposes	Financing Mechanism
Personnel	WCED staff	Management, R-Math program design inclusive of pedagogy, learning and teaching support materials, and training structure and content	GET (Directorate General Education & Training) Programme 1.3
	Subject advisors	Lead block trainings, participate in dry runs, lead cluster workshops, conduct monitoring	GET (Directorate General Education & Training) Programme 2.3
	Teachers	Participate in and lead block trainings, lead cluster workshops, Classroom instruction	GET (Directorate General Education & Training) Programme 2.3
Facilities	Cape Teaching and Leadership Institutes (CTLI)	Block trainings	GET (Directorate General Education & Training) Programme 2.3*
	District offices	Dry runs	GET (Directorate General Education & Training) Programme 2.3
	Schools	Cluster workshops, monitoring, classroom instruction	GET (Directorate General Education & Training) Programme 2.3
	Hostels	Dry runs	GET (Directorate General Education & Training) Programme 2.3
Materials and Supplies	CAPS manual	Block Trainings	GET (Directorate General Education & Training) Programme 2.1
	Global monitoring tool (digital)	Monitoring by Subject Advisors	No Budget

Transportation	Travel Reimbursement or Stipend	For teachers to and from block trainings	GET (Directorate General Education & Training) Programme 2.3
	Government Cars	For subject advisors to and from block trainings	GET (Directorate General Education & Training) Programme 2.3
Food and Beverages	Catering	For teachers and subject advisors in	GET (Directorate General Education & Training) Programme 2.3

* Only for catering in top-up training. For the original block a school venue was used which SDU paid for. WCED did not pay for CTLI as that is our own facility.

APPENDIX B. OVERVIEW OF EL SALVADOR'S PUBLIC EDUCATION SYSTEM

El Salvador Grade Levels	
Basic Education	Early childhood education (4, 5, and 6 years of age)
	1st cycle (grades 1, 2, and 3)
	2nd cycle (grades 4, 5, and 6)
	3rd cycle (grades 7, 8, and 9)
Secondary School	General high school (grades 10 and 11)
Academic Calendar	Last week of January through the last week of October. The first two weeks of January are set aside for teacher planning and professional development. Pedagogical reflections are incorporated into the academic calendar. November is set aside for students' final exams.
Double Shifts	About 60% of schools are double shifts: 4.5 hours of instruction in the morning, (7 or 7:30 a.m.–11:30 a.m. or 12 p.m.) and 4.5 hours in the afternoon (12:30 p.m. or 1:30 p.m.–5 p.m. or 5:30 p.m.)
Multilingual classrooms	No
Multigrade classrooms	Yes, in rural or remote areas
Meal program	Yes (breakfast for morning shift; lunch for afternoon shift)

APPENDIX C. ESMATE'S PLANNED INSTRUCTIONAL DOSAGE CALCULATIONS

Planned Instruction Time	Hours Per Class	Classes Per Week	Weeks Per Academic Year	Percentage of Classes Allocated to Instruction	Total Hours Per Grade
G1	0.75	7	40	80%	168
G2	0.75	5	40	80%	120
G3	0.75	5	40	80%	120
G4	0.75	5	40	80%	120
G5	0.75	5	40	80%	120
G6	0.75	5	40	80%	120
G7	0.75	5	40	80%	120
G8	0.75	5	40	80%	120
G9	0.75	5	40	80%	120
G10	0.75	6	40	80%	144
G11	0.75	6	40	80%	144
Total					1,416

APPENDIX D. DETAILED LIST OF RESOURCES PROVIDED, BY STAKEHOLDER

Resources	ESMATE 1		ESMATE 2	
	JICA	MinEd	JICA	MinEd
Overhead	Provision of equipment (vehicles, computers, software, copiers, office supplies, etc.)		Provision of equipment (vehicles, PCs, software, copiers, etc.)	Office space, desk and chair, utilities, communication expenses (telephone, internet expenses)
Personnel	Long-term experts: chief advisor, math and mathematics education/CPD, business coordination/educational planning	MinEd technical staff	Long-term experts: chief advisor, math and mathematics education/CPD, business coordinate Short-term specialist: educational evaluation, other (if necessary) on educational planning	Mathematics and mathematics education, project director, project coordinator, arithmetic and mathematics expert, educational evaluation expert, arithmetic and mathematics specialist, etc.
Teaching and learning materials	Printing of grade 2 student textbook and workbook and teacher's methodological guide	Desktop publishing operators and proofreaders for revision of teaching materials Printing and distribution of all grade 7, 8, and 9 materials since pilot; distribution of grade 2 student textbooks and workbooks		Desktop publishing operators and proofreaders for revision of teaching materials Printing and distribution of arithmetic and mathematics teaching materials

Training and support	Pedagogical sessions and instructional sessions: hotels, transportation, food for MinEd technical staff (3 people for San Miguel, La Union; 2 people for Cabañas, San Vicente)	MinEd technical staff, department supervisors, department facilitators, teachers		Domestic seminar holding fee Travel costs (including fuel costs) and other expenses for project activities
M&E, assessment		Department supervisors		Department supervisors Learning status survey fee
Strengthening of government systems			Country training (scholarships for MinEd technical staff to study in Japan for 2-year terms)	
Other	International conferences to disseminate findings		Expenses for strengthening overseas projects (including expenses for wide-area cooperation activities wide-area seminars, etc.)	Other expenses required for project activities

Note: When provided by MinEd, facilities and transportation are not included.