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How Did El Salvador Improve Student Learning Achievement in Mathematics? —A Principal Strategy Methodology of JICA Toward Achieving SDGs 4

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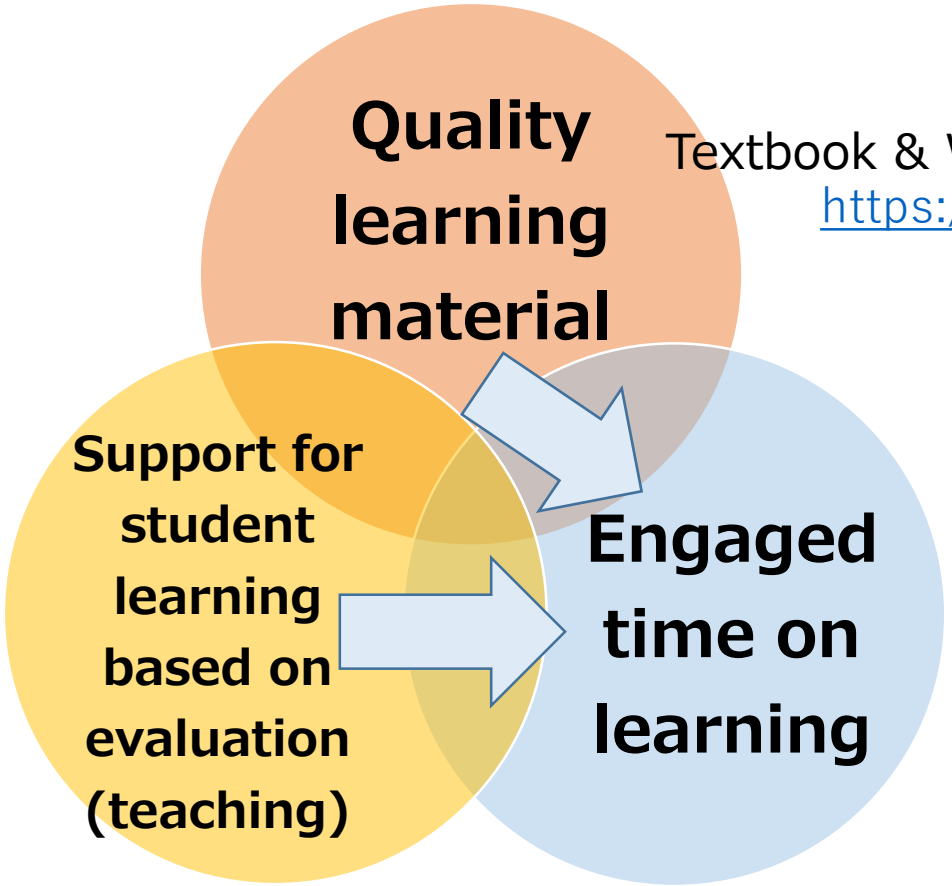
Contents

1. **Strategy of the Project ESMATE （G1 to G11）**
2. **Overview of the Results of Randomized Controlled Trial (RCT)**
3. **Behavioral change of all the stakeholders to ensure sustainability**

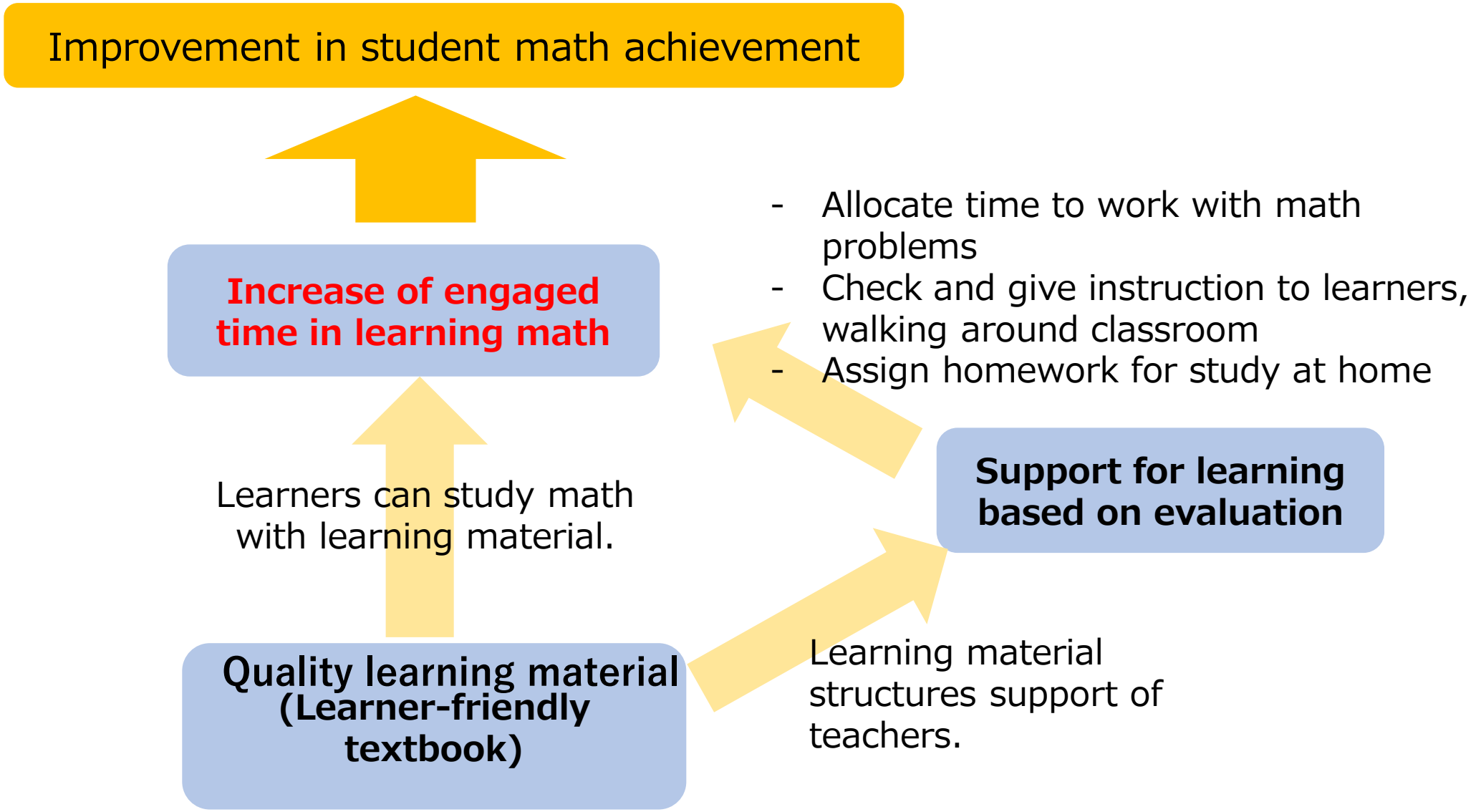
1.Strategy of the Project ESMATE G1 to G11

ESMATE strategy to improve math learning



Textbook & Workbook
https://www.mined.gob.sv/esmate/

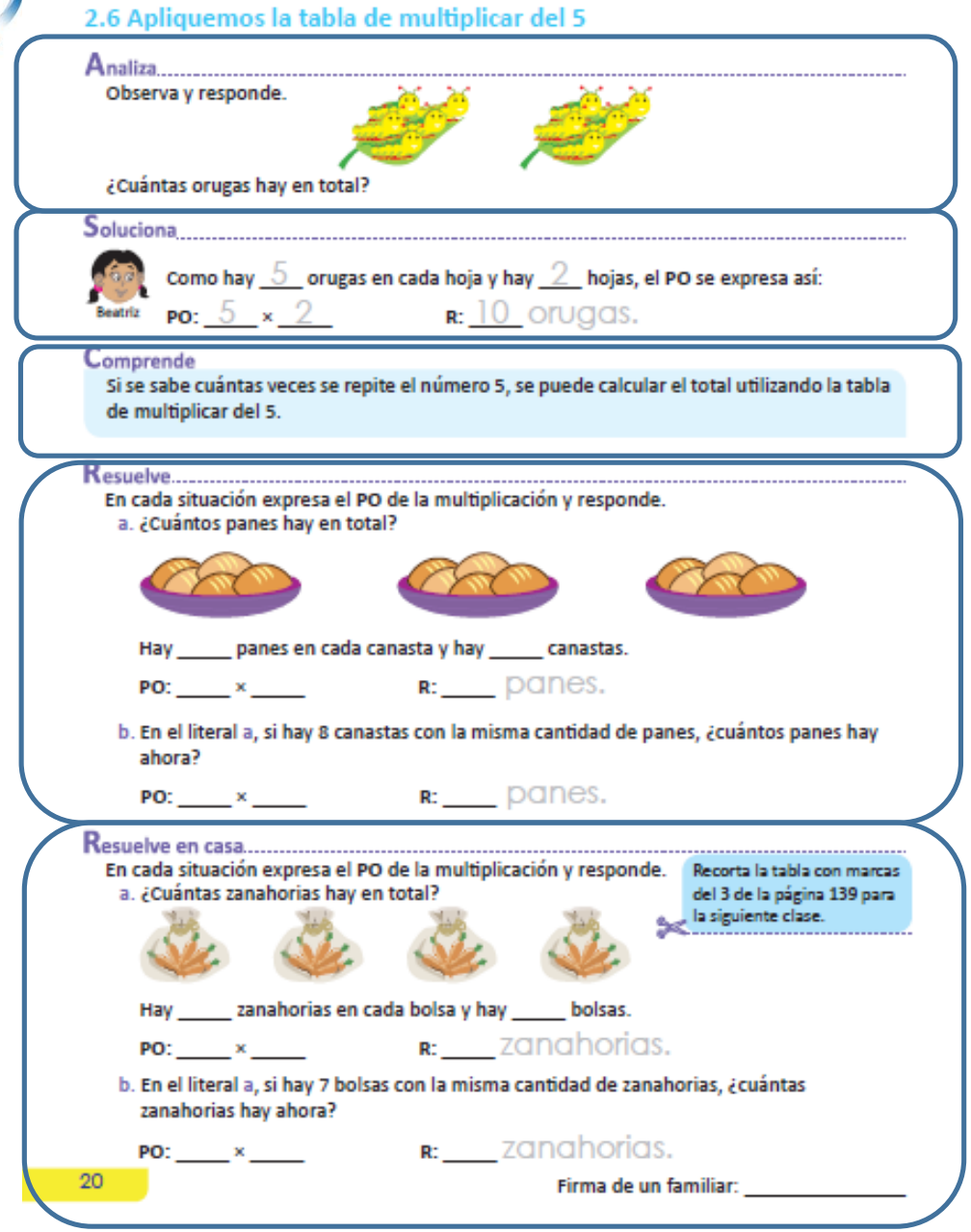
Basic concept of ESMATE strategy to improve math learning



Quality learning material
Basic concept of the ESMATE textbook

- Traditional approach to teaching mathematics in El Salvador
  - Students merely copied the answer without understanding how it was derived. Teachers did not pay attention to how much students learned, and moved to the next new topic (JICA 2019).
- Basic concept of the ESMATE textbook
  - Subject contents are carefully subdivided considering the student assessment conducted by the project, and the contents are sequenced in the textbook to assure small-step learning by students.
  - Standard learning process in each math lesson is designed, considering the capacity of teachers in the country, to increase the engaged time in a lesson.
  - “Engaged time is the proportion of instructional time during which students are cognitively and behaviorally on task or engaged in learning” (Gettinger & Walter, 2011)

Quality learning material: learning process in ESMATE textbook



2.6 Apliquemos la tabla de multiplicar del 5

Analiza

Observa y responde.

¿Cuántas orugas hay en total?

Soluciona

Beatriz

Como hay 5 orugas en cada hoja y hay 2 hojas, el PO se expresa así:

PO: 5 × 2 R: 10 orugas.

Comprende

Si se sabe cuántas veces se repite el número 5, se puede calcular el total utilizando la tabla de multiplicar del 5.

Resuelve

En cada situación expresa el PO de la multiplicación y responde.

a. ¿Cuántos panes hay en total?

Hay _____ panes en cada canasta y hay _____ canastas.

PO: _____ × _____ R: _____ panes.

b. En el literal a, si hay 8 canastas con la misma cantidad de panes, ¿cuántos panes hay ahora?

PO: _____ × _____ R: _____ panes.

Resuelve en casa

En cada situación expresa el PO de la multiplicación y responde.

a. ¿Cuántas zanahorias hay en total?

Recorta la tabla con marcas del 3 de la página 139 para la siguiente clase.

Hay _____ zanahorias en cada bolsa y hay _____ bolsas.

PO: _____ × _____ R: _____ zanahorias.

b. En el literal a, si hay 7 bolsas con la misma cantidad de zanahorias, ¿cuántas zanahorias hay ahora?

PO: _____ × _____ R: _____ zanahorias.

20

Firma de un familiar: _____

1. Student understands the theme of the lesson
2. Student solves problem example
3. Student understands the mechanism
4. Student works on exercises in class

Student works on exercises at home

Textbooks, workbooks and teachers' guidebooks developed by the project are posted on the following website by the Ministry of Education in El Salvador.
https://www.mined.gob.sv/esmate/

Support for student learning based on evaluation: Instructional routine of ESMATE

1. Allocate students time to work on math problem

- Pose math problem
- Allocate time to solve math problem for students

2. Check student understanding, and provide feed back

- Check student notebook and walk around in a classroom
- Provide a hint
- Explain correct answer and instruction
- Ask students to check their own answer

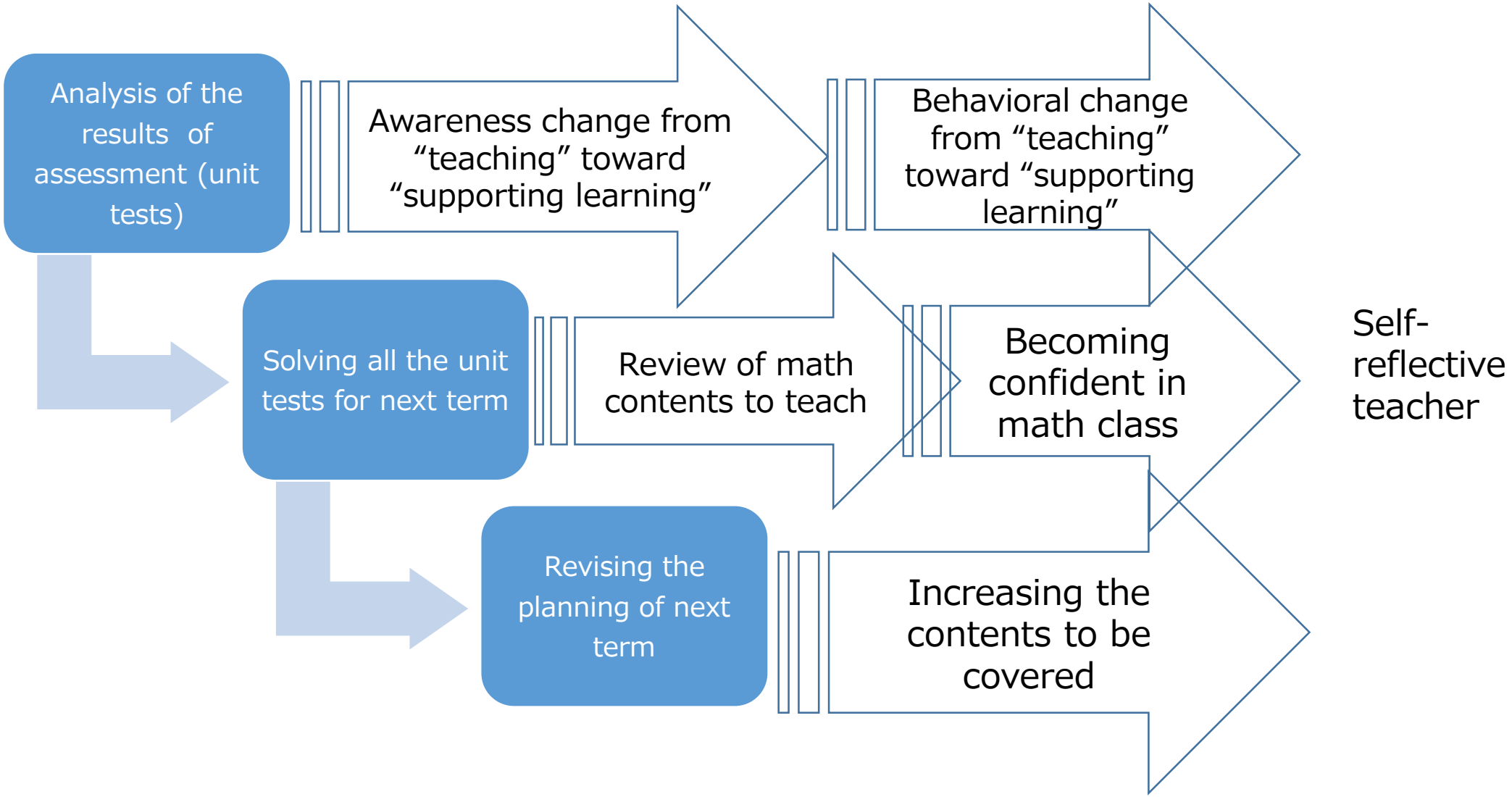
(3. Facilitate mutual learning among students)

- (Allocate time for mutual learning among students)

4. Practice again

- Ask students to try wrong answer again
- Assign homework

Support for student learning based on evaluation: Mutual review meeting of teachers



2.Overview of the Results of Randomized Controlled Trial (RCT)

Source: Maruyama, Takao and Takashi Kurosaki. “Developing Textbooks to Improve Student Math Learning: Empirical Evidence from El Salvador.” JICA Ogata Sadako Research Institute Working Paper, No.217, January 2021.

Experimentation design

Group	2018	2019
Control	W/O Intervention	Intervention
Treatment	Intervention	Intervention

Targeted grade of students

- 2nd grade (primary)
- Follow up same students in 2019

Evaluate Y1 impact

Evaluate accumulated impact of Y1 intervention

- Sampling frame: 369 basic education public schools in departments of Cabañas, La Union, San Miguel and San Vicente

- Control group: 125 schools (1,846 students at the baseline survey)
- Treatment group: 125 schools (1,939 students at the baseline survey)

Math test items

- Content of test items
  Baseline : Content of 1st grade, 20 including problems posed in text
  End-line : Content of 2nd grade, 20 including problems posed in text
  Follow-up: Content of 2nd and 3rd grade, 25 including problems posed in text

- Test items: written test

- Duration: 45 minutes

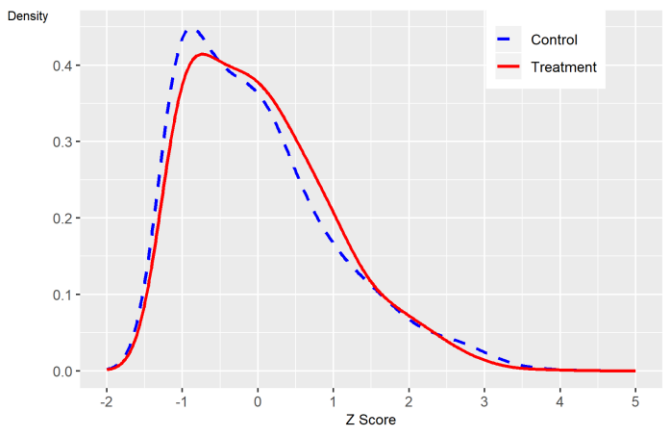
- Test is organized by surveyors. (Without presence of teacher). All the data are collected by Koei Research & Consulting Inc. (KRC) under the contract with JICA, in collaboration with the Ministry of Education, El Salvador.

The impacts of ESMATE program on math learning

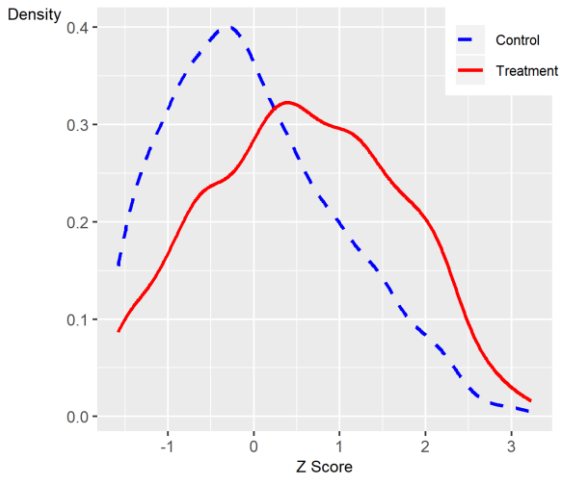
- Average one-year impact of the ESMATE program on math learning of primary 2nd grade is estimated at 0.48 standard deviations of test scores.

- Average accumulated impact of the first-year intervention in the following year is estimated at 0.12 standard deviations of test scores. <u>The ESMATE program improved math learning, and the impact persisted even after schools of the control group also received the package of interventions in the following year.</u>

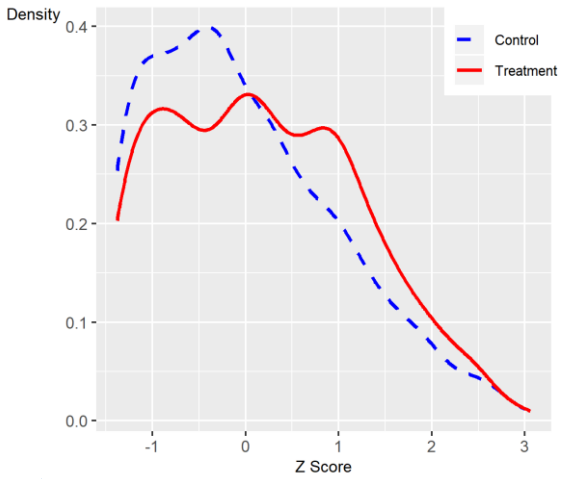
Baseline



End-line



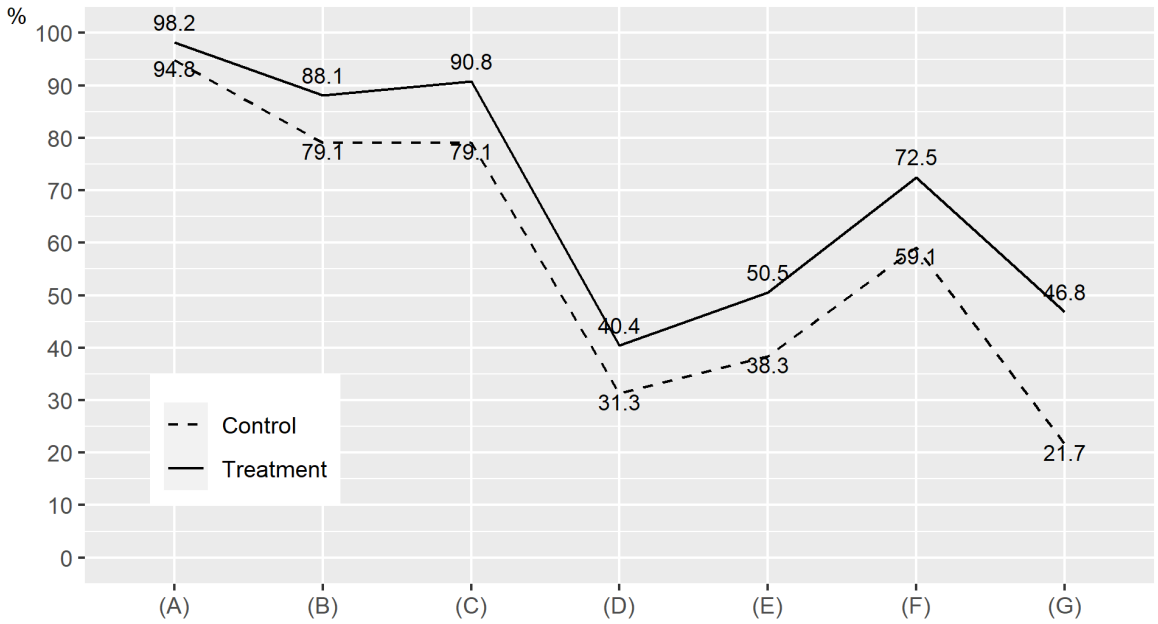
Follow-up



Year 0 → Year 1 → Year 2

The impacts of ESMATE program on math teaching

Year 1

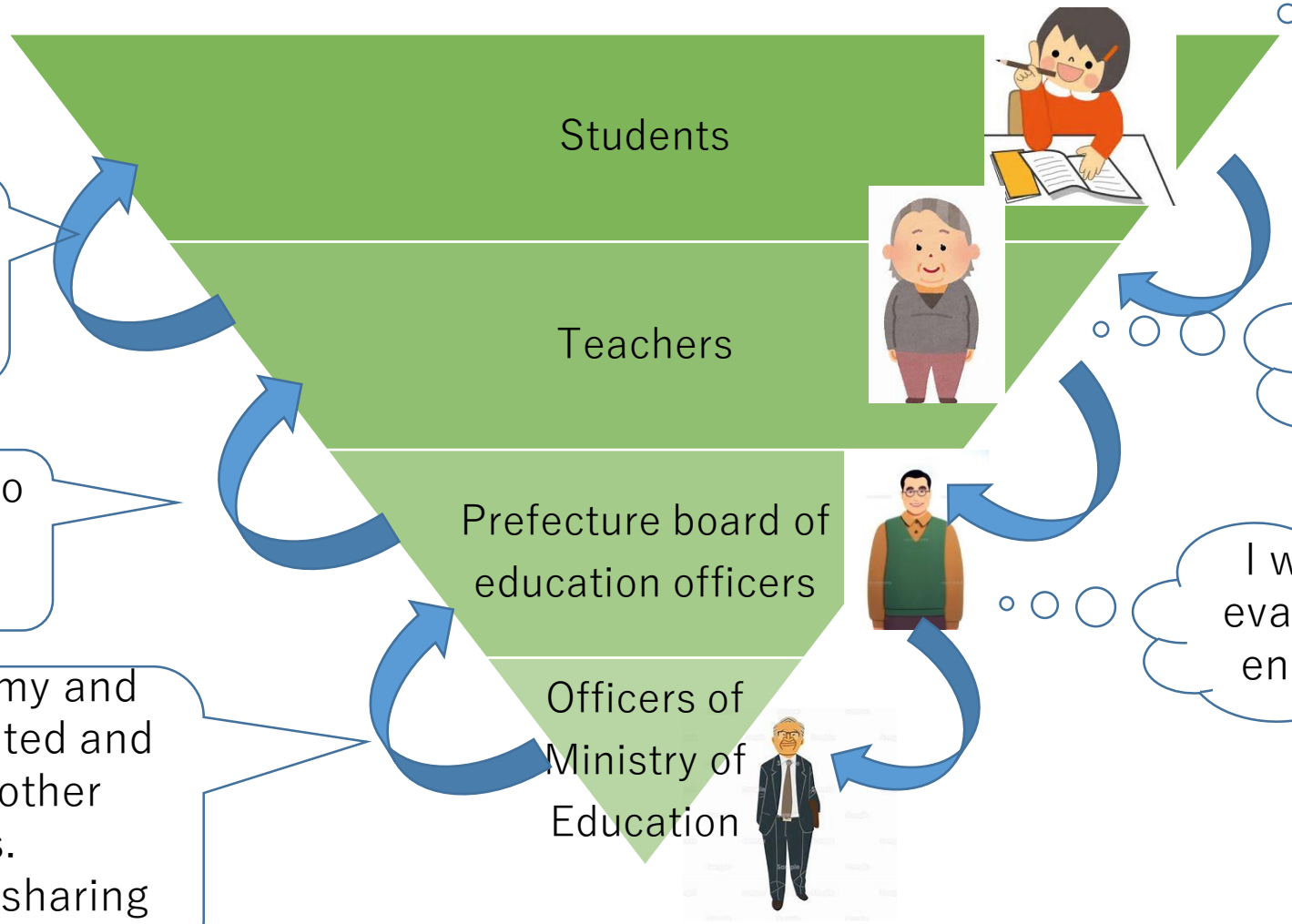


N.Treatment: 109, N. Control: 115
(A) Give exercise; (B) Check note book; (c) Walk in class to check notebook;
(D) Advise students to consult with each other; (E) Tell students to check answer;
(F) Instruct students to try again the same problem for wrong answer; (G) Give H/W.

In year 1, the ESMATE program increased the percentage of teachers who walked around in a classroom to check student notebook, and assign homework in the treatment group.

3. Behavioral change of all the stakeholders to ensure sustainability

So that all stakeholders can be motivated, how should be the relation among them?



I want to be evaluated and encouraged.

I want to be evaluated and encouraged.

I want to be evaluated and encouraged.

Providing a place to be evaluated (e.g.; Check and acceptance)

Providing a place to be evaluated (Mutual learning)

Providing autonomy and place to be evaluated and encouraged by other prefectures. (e.g.; Experience sharing seminar)

Thank you very much for your attention