

**Ministry of Education and Sports
Lao People's Democratic Republic**

**The Project for Improving Teaching and
Learning Mathematics for Primary
Education (Phase 2)**

Project Completion Report

April 2023

JAPAN INTERNATIONAL COOPERATION AGENCY

**PADECO Co., Ltd.
Tokyo Shoseki Co., Ltd.**

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Exchange rate: 1 KIP = ¥0.012940
(April, 2023)

Project Activity Photos (1st phase)



Pilot teacher's workshop (Savannakhet)



TTC curriculum writing (MOES)



Lesson Study workshop (Luangnamtha TTC)



Hand-made materials



Monitoring pilot school (Vientiane Capital)



Trainees (G1 TOT)



Textbook writing workshop (RIES)



Japan Training (G3 textbook writing)



G1 TOT (Thalat)



Micro teaching by PA (G1 TOT)



Developing Lesson Plan (School-level training)

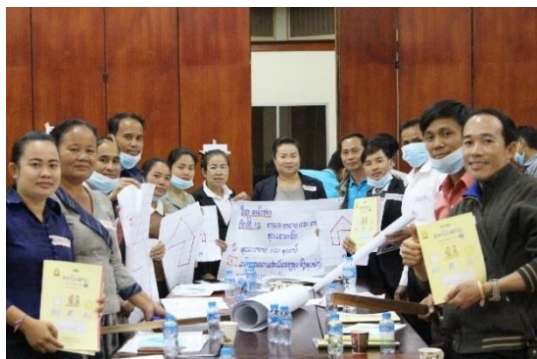


Surveyor training (National University of Laos)

Project Activity Photos (2nd phase)



G3 new textbook and students



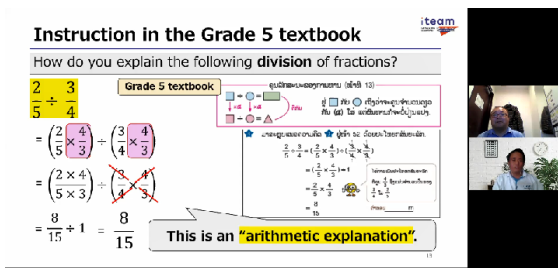
Grade 5 pilot teacher's workshop



Grade 4 students playing game at the introduction to
“Area” Chapter 17



Post-lesson discussion after demonstration lesson
(Bankeun TTC)



Teaching Math 2 training for TTC instructors (online)



Clocks donated by SEIKO



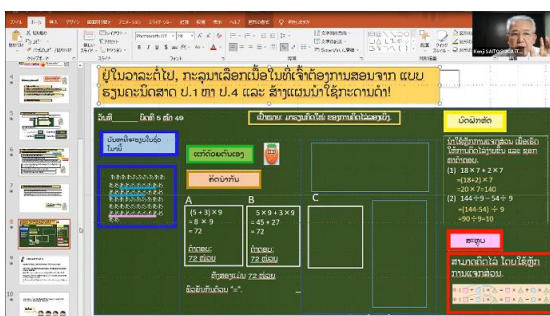
Discussion for finalizing textbook and teacher's guide after piloting (Japan training)



Piloting Math app "Math master" (Dongkhamxang TTC demonstration school)



Grade 1~5 new textbook



INSET follow-up training (blackboard planning)



Introduction to assessment training for TTC instructors and TTC demonstration school teachers



13th JCC and project completion workshop

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Abbreviations and Acronyms

ASLO	Assessment of Student Learning Outcomes
BEQUAL	Basic Education Quality and Access in Lao PDR
CACIM	Committee for Approval on Curriculum and Instructional Materials
CRO	Curriculum Roll-Out
DECE	Department of Early Childhood Education
DESB	District Education and Sports Bureau
DFAT	Department of Foreign Affairs and Trade
DGE	Department of General Education
DOF	Department of Finance
DPPE	Department of Pre-Primary and Primary Education
DTE	Department of Teacher Education
DTP	Desktop Publishing
GPE	Global Partnership for Education
ICT	Information and Communication Technology
IFEAD	Institute for Education Administration Development
INSET	In-Service Teacher Training
IPS	Internal Pedagogical Support
JCC	Joint Coordination Committee
JICA	Japan International Cooperation Agency
MOES	Ministry of Education and Sports
PA	Pedagogical Advisor
PDM	Project Design Matrix
PDN	Professional Development Network
PDP	Professional Development Program
PESS	Provincial Education and Sports Service
PRESET	Pre-Service Teacher Training
R/D	Record of Discussion
RIES	Research Institute for Educational Sciences
SCM	Steering Committee Meeting
SVA	Shanti Volunteer Association
TOT	Training of Trainers
TTC	Teacher Training College
UNICEF	United Nations Children's Fund

Overview of Project Activities and Achievement

This project provided comprehensive support for the revision of the math curriculum, textbooks, and teacher's guides, and the introduction and dissemination of the new curriculum in primary education in Laos. With the project purpose of "Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials," the following technical support was provided.

- Development of primary math curriculum, textbooks, and teacher's guides
- Revision of math curriculum at TTC
- Planning and implementation of INSET teacher training, including training to introduce the new math curriculum

Specific activities undertaken by the project were as follows.

1. Revision of Primary Mathematics Curriculum

The curriculum developed and approved by the Ministry of Education and Sports of Laos, outlines the objectives, scope, structure, and achievement levels of mathematics for the five primary grades, clarifying content relationships and sequences in four domains (Numbers and operations, Quantities and Measurements, Geometric figures, and Mathematics relations). It is academically oriented and adapted to the realities of the educational setting and the children's actual situation.

2. Development of Grade 1 to 5 Primary Mathematics Textbook and Teacher's Guide

Mathematic textbooks and teacher's guides were developed for the five primary grades that were consistent with the curriculum outline. At the end of the project, the textbooks had been distributed nationwide through the 5th grade and were being used in lessons through the 4th grade. The textbooks were developed to enable the development of 5 step lessons that are student-centered and focused on the improvement of problem-solving skills. The teacher's guide presents a structured sequence at the beginning of each chapter and a lesson process that encourages 5 step lessons.

3. Revision of TTC Mathematics Curriculum

In order to incorporate the content of the new curriculum into TTC programs, the project collaborated with BEQUAL, which provides comprehensive support for the TTC curricula, focusing on the content and teaching methods of the new curriculum, to develop course outlines and syllabi, lesson plans and exercises, for TTC programs. The new curriculum and math materials have already been introduced in Year 1 and Year 2 of the 12+2 TTC program in 8 TTCs nationwide.

4. Implementation of New Curriculum Induction Training for Teachers Nationwide

The project conducted induction training on the contents and teaching methods of the new curriculum in a cascade format; trained master trainers, TTC instructors, PESS technicians, and DESB PAs, developed training materials, and provided partial support for training on the dissemination of the new curriculum.

5. Implementation of INSET Follow-up Activities

After the completion of the induction training, the project promoted the dissemination of lessons using the new textbooks and INSET activities to teachers, TTC instructors, and teachers at TTC demonstration schools through follow-up training on how to develop 5 step lessons using the new textbook (how to teach 5 step lessons, Lesson Study, teaching and learning material development etc.), mainly at TTCs in the four pilot provinces.

In addition, the activities and the survey results conducted by the project suggest the following implications.

- While it is difficult to master the contents and teaching methods of the new curriculum with only a two-day induction training, continuous learning through INSET activities tends to increase understanding of teaching methods (4% to 13% improvement in this project¹).
- The level of understanding of how to use new textbooks properly improves after receiving INSET follow-up training (in this project, the highest number of teachers answered "very often" for 5 out of 8 questions).
- The quality of lessons (Level 1 achievement²) of teachers who have experienced INSET follow-up training and activities after the induction training improves (in this project, 8 out of 11 lessons (72.7%) in G1-4 achieved Level 1).
- There is a possibility that students' understanding of lessons will improve when teachers conduct lessons in accordance with the features of the textbooks (7% to 38% improvement in this project³).
- TTC students who studied under the new curriculum will be able to improve their understanding of basic math and teaching math skills (in this project, an average of 11.5% to 19.5% improvement before and after Basic Mathematics, and an average of 9.3% improvement before and after Teaching Math 2).

As described above, this project has made a significant contribution to improving mathematics education in primary education and TTC programs in Laos by improving educational content through curriculum revision and textbook development, and by cooperating with TTC programs and teachers.

¹ G3 teacher teaching methodology test results: average of G3 teachers who have not attended follow-up training 19%, average of G3 teachers who have attended follow-up training 23% (+4%), average of G1, G2, G4, G5 teachers who have attended follow-up training 31% (+13%)

² Level 1: 42.5 points, half of the total of 85 points on the lesson observation checklist

³ Chapter 5 of G4 "Calculation Rules" pre-test average 12%, post-test average 19% (+7%); "Area" pretest score 0, post-test average 38% (+38%)

Chapter 1 Project Overview

1.1 Background

Education in the Lao People's Democratic Republic (hereafter Laos) is underdeveloped compared to other Asian countries due to historical, political, geographical, population, and ethnic factors. After the end of the civil war in 1975, primary education increased significantly by the “One Village One School” policy. This policy contributed to increase the quantity, however, since the cost of school construction and administration was borne by residents, incomplete schools that could not be established up to fifth - grade were massively produced. Also, multi-grade classes increased due to the lack of pupils in each school. Furthermore, these types of schools were scattered in remote areas as most people did not migrate to urban areas thus the need for education in remote areas remains.

The Government of Laos aims to graduate from Least Developing Country (LDC) status by 2026 and identified ensuring access and improving quality of education as one of highest priorities for achieving poverty eradication. With continuous efforts, as a result, the primary net enrollment rate reached 99 percent according to the 2019-2020 school census⁴. However, the quality of education remains unsatisfactory. According to the Assessment of Students’ Learning Outcomes (ASLO) II implemented by Ministry of Education and Sports (MOES) in 2009, learning achievement was particularly low in mathematics⁵. In addition to an inappropriate curriculum, insufficient teaching time, lack of teachers and their subject knowledge, and lack of textbooks and learning materials, one of the main reasons behind the low learning achievement were issues with the contents of mathematics textbooks (teaching order, etc.). Although MOES had recognized the need of textbook revision, Research Institute for Educational Science (RIES), who is responsible for revision of curriculum, textbook and teacher’s guide, did not have specialized knowledge on how to develop/revise textbooks to enhance students’ learning outcomes, especially how to teach lessons which students can easily understand. Thus, the Government of Laos requested Japan International Cooperation Agency (JICA) for assistance on building human resources, and in 2013 a RIES-based key mathematics textbook writer attended a one-year technical training in Japan. Upon his return to RIES, to aid the Government’s primary textbook and teacher’s guide revision starting in 2016, MOES requested further technical assistance on mathematics subject to JICA.

Following these circumstances, JICA assessed the request from the Government of Laos and discussed the project contents and framework with the relevant ministries. On November 5th, 2015, the Record of Discussion (R/D) for this project was signed, and the project was launched on February 12, 2016, as a new technical cooperation project. Since then, JICA and Lao PDR held discussions as the work progressed, and on December 28, 2018, an R/D was signed to agree on a revised Project Design Matrix (PDM1), and on August 16, 2021, a one-year extension of the project until May 12, 2023, was agreed to, and on November 17, 2021, a revised evaluation indicator (PDM2) was agreed upon.

1.2 Framework of the Project

1.2.1 Project purpose

The "Project for Improving Mathematics Learning in Primary Education in Lao PDR" (hereinafter referred to as "the project") achieved the expected results and project objectives through the

⁴ World Bank Lao PDR Global Partnership for III: Learning and equity Acceleration Project (P173407) Project Information Document

<https://documents1.worldbank.org/curated/en/305851599702642485/pdf/Project-Information-Document-Lao-PDR-Global-Partnership-for-Education-III-Learning-and-Equity-Acceleration-Project-P173407.pdf>

⁵ 73% of 5th graders do not achieve sufficient learning achievement.

implementation of the work based on the technical cooperation project R/D for the project. Objectives of the Project are shown in the table below.

Table 1 Overall Goal and Project Purpose of the Project

Overall Goal	Students' learning outcome in mathematics at primary level is improved.
Project Purpose	Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.
Output	<ol style="list-style-type: none"> (1) Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed. (2) TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students. (3) The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET programs and materials promoting lessons in line with the new primary mathematics textbooks.

1.2.2 Implementing Organizations

This project is implemented by MOES, and its Vice-Minister is the Project Director (PD). The Joint Coordination Committee (JCC), which is called the Steering Committee (SC) in Laos, is the final decision-making body for the implementation of the project at the central level. The direct departments in the implementing organization are Research Institute for Educational Science (RIES), Department of Teacher Education (DTE), and Department of General Education (DGE). At the beginning of the project, Department of Pre-Primary and Primary Education (DPPE) was included instead of DGE, however DPPE was restructured into DGE (for primary and secondary education) and DECD (for pre-primary education) as part of ministerial organizational changes in 2018. The revision of the SC members was issued in the 6th JCC, and DGE was officially approved as part of the implementing organization.

1.2.3 Project Sites

The project target is primary-level education (Grades 1 - 5), which is based on the Lao definition, and direct beneficiaries of the project are primary schools and Teacher Training Colleges (TTCs) in the four pilot provinces, namely Luangnamtha province, Salavan province, Savannakhet province, and Vientiane Capital, where the population is about 2.36 million. At the beginning of the project, Savannakhet province was not included in the pilot provinces, however, was later added in the 2nd SCM because of the necessity to conform with the textbook piloting (validation) area in coordination with the Basic Education Quality and Access in Lao PDR (BEQUAL) Program commissioned by the Department of Foreign Affairs and Trade (DFAT).

1.2.4 Beneficiaries

The beneficiaries during the project period are approximately 2,600,000 primary school students⁶, 40,000 teachers (8,000 students per grade x 5 grades), and 1,300 students and 65 instructors from TTCs throughout Laos.

⁶ Primary school students nationwide who are expected to use the textbooks distributed during the project implementation period (200,000 textbooks per grade will be distributed and students are expected to use them every year from the time of introduction)

Grade 1: 1,000,000 (introduced in 2018)

Grade 2: 800,000 (introduced in 2019)

Grade 3: 600,000 (introduced in 2020)

Grade 4: 200,000 (introduced in 2021)

Total: 2,600,000 students

1.2.5 Scope of Work

The work was carried out within the framework of the "Project for Improving Mathematics Learning in Primary Education" to be implemented based on the R/D signed by JICA with MOES, Lao PDR on November 5, 2015, in order to achieve the "4. Purpose of the Work" stated in the task instructions, while taking into account the "6. Implementation Policy and Points to be Noted", "7. (7) Contents of Work" and prepared the reports and other documents shown in "8. Deliverables, etc.

1.2.6 Counterpart Organizations and Personnel

Table 2 Project Counterpart Organizations and Beneficiaries

Relevant Ministries	Ministry of Education and Sports (MOES)	
Counterpart Organizations	MOES relevant departments	Research Institute for Educational Sciences (RIES), Department of Teacher Education (DGE), Department of General Education (DGE)
	TTC	Eight Teacher Training Colleges (TTC)
	Local education office	Provincial Education and Sports Services (PESS), District Education and Sports Bureau (DESB)
Beneficiaries	Direct beneficiaries	35 Mathematics instructors at 4 TTCs (ability to conduct training, knowledge and skills) Primary school teachers from schools where textbook piloting and pilot Follow-up In-service Teacher Training (INSET) are conducted (knowledge and skills for teaching) 16 teachers and 234 ⁷ students at 13 pilot schools, 19 teachers from G1 to 5 at 4 pilot TTC demonstration schools which conduct INSET follow-up activities (Improvement in knowledge and skills in conducting lessons)
	Indirect beneficiaries	Approximately 2.6 million students in primary education, 1,256 TTC students in primary education programs

1.3 Transition of PDM

1.3.1 PDM Ver. 0

At the beginning of the project, work started based on the PDM agreed upon when the R/D was signed. The initial target areas and counterparts were as follows.

(1) Target Areas of the Project

Target Area

The project shall benefit the entire country, where the population is approximately 6.91 million, but the direct beneficiaries of the project would be primary school and TTC in the target areas (Luangnamtha, Salavan, and Vientiane Capital with a population of approximately 1.25 million).

Target Sub-sector

Primary education (Grades 1-5) as defined by Laos

⁷ Number of students in 13 pilot schools at the time of implementation of set 3 in G5 (set 4 could not be implemented in Vientiane capital due to COVID-19).

(2) Counterpart Organizations

MOES

- RIES
- DTE
- DPPE

(3) Project Purpose and Outputs

Project purpose, expected outputs and the indicators are shown in the table below.

**Table 3 Project Purpose, Expected Outputs and Indicators
(At the beginning of the project)**

Level	Goal	Indicator
Super Goal	Students' academic achievement in mathematics at primary level is improved.	Results of National Assessment in Primary mathematics
Overall Goal	Effective teaching and learning methods for primary mathematics are disseminated with the mathematics educational materials.	(1) Percentage of the textbook of primary mathematics distributed. (2) Percentage of improved lessons in line with textbook of primary mathematics implemented.
Project Purpose	Quality of primary mathematic lessons is enhanced in target area through mathematical educational materials.	Improvement in mathematic lessons using new math textbook in target area
Output	Output 1: Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.	Approval of the textbook and teaching/learning materials by MOES.
	Output 2: Mathematic subject knowledge of students at TTC in target areas is enhanced with revised contents of TTC curriculum and mathematics educational materials for primary education.	(1) Increment in score of mathematics of TTC students
	Output 3: INSET program with Professional Development Network (PDN) for primary mathematics in target areas is enhanced through development of mathematics educational materials.	(1) Increment in score of training evaluation, comparing between pre and post-test. (2) Number of teacher training activities conducted for target schools (indicators to be developed by the project).

1.3.2 PDM Ver. 1

The primary and teacher training curriculum conducted by the Lao Government and BEQUAL, supports six subjects other than mathematics. Under this situation, iTEAM project needed to cooperate closely with BEQUAL at the activity level. The outputs and activities were reviewed considering the situation of the Lao education sector and amended in PDM Ver. 1 based on the revision points below during the first phase of the project. PDM Ver. 1 was approved on December 28, 2018.

1. Added RIES, DTE, DGE to implementing organizations
2. Added Savannakhet province to target area in alliance with BEQUAL

3. Changed “Students’ academic achievement in mathematics at primary level is improved.” from Super Goal to Overall Goal
4. Identified ASLO as a possible indicator
5. Specified other activities

For this reason, the revision of the PDM was presented at the 6th JCC in September 2018 and the revisions were approved.

1.3.3 PDM Ver. 2

Based on the results of the G1 baseline survey conducted in 2018, the G1 end-line results in 2019 and monitoring conducted, the following points were revealed.

- Simply distributing new textbooks and conducting induction training will not lead to a short-term improvement in students' academic performance before and after the introduction of the new textbooks.
- The design of the impact survey conducted at the baseline and end-line makes it difficult to see changes in the "lesson" which is the project purpose set by the PDM to improve academic achievement.

Based on the results of the impact survey, the project discussed with the relevant organizations (JICA and counterparts) and came to the following conclusion.

- The project will shift its focus for the remainder of the project period to improving teachers' teaching methods and understanding the learning status of the students in their lessons, rather than to changes in students' academic performance as seen through the impact survey.
- The ability to conduct lessons that follow the features of the textbooks will improve the quality of lessons and ultimately the academic achievement of the students.
- The changes in pedagogy will be measured by teaching methodology test and lesson observations based on a checklist developed by the project.

Based on these discussions, PDM Ver. 2 was approved in November 2021, focusing on the following changes to the Overall Goal, Project Purpose, specific indicators of each output, and revisions to the activities.

1. Extended project period for one year
2. Specified the indicators for the Overall Goal, Project Purpose, and each output.
3. Deleted baseline and end-line comparison indicators
4. Changes in other activities

Table 4 shows an overview of this project based on the latest version of the PDM Ver. 2, November 2021.

Table 4 PDM Ver. 2

Item	Content	
Title	Project for Improving Teaching and Learning Mathematics for Primary Education (iTEAM)	
Implementing Agency	Research Institute for Educational Science (RIES) Department of Teacher Education (DTE) Department of General Education (DGE)	
Target Group	(Direct) Teacher Training College (TTC) trainers in pilot provinces and primary school teachers in pilot schools (Indirect) Primary school pupils	
Period	February 2016 – March 2022	
Target Area	Nationwide (Pilot provinces ¹ are: Luangnamtha Province, Vientiane Capital, Salavan Province, and Savannakhet Province)	
Level	Goal	Indicator
Overall Goal	Students' learning outcome in mathematics at primary level is improved.	Results of National Assessment in Primary mathematics
Project Purpose	Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.	Level of improved lessons in line with textbook of primary mathematics implemented in target area (indicators to be developed by the project).
Output	Output 1: Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.	Approval of the textbook and teaching/learning materials by MOES.
	Output 2: TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.	Increment TTC students' academic performance in mathematics subject (indicators to be developed by the project).
	Output 3: The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET activities.	(1) Increment in score of training evaluation, comparing between pre and post-test. (2) Number of teacher training activities conducted for target schools (indicators to be developed by the project).

1: Pilot Provinces: Provinces for piloting draft textbooks and teacher's guides and conducting Textbook Effectiveness Study, follow-up in-service teacher training activities and Base / End-line surveys

Details of changes in original PDM Ver. 0, Ver. 1, Ver. 2 can be found in Appendix 1.

1.4 Overview of the Project

1.4.1 Project Team

The project team consisted of 11 members (7 from PADECO, Co., Ltd. and 4 from Tokyo Shoseki, Co., Ltd., including 1 university faculty member) in the first phase and 12 members (8 from PADECO, Co., Ltd. and 4 from Tokyo Shoseki, Co., Ltd., including 1 university faculty member) in the second phase with some members being replaced. The project team members for the first and second phases are listed in the table below.

Table 5 Project Team Members (1st phase)

Position	Name	Organization
1. Team Leader/Education Planning 1	Mr. Takashi Soma	PADECO
2. Deputy Team Leader/Education Planning 2	Mr. Tatsuya Nagumo	PADECO
3. Mathematics Education 1	Mr. Koji Takahashi	PADECO
4. Mathematics Education 2	Mr. Kenji Saito	PADECO
5. Education Administration/ Development Partner Coordination	Mr. Takashi Soma	PADECO
6. Teacher Education	Ms. Akiko Nakano	PADECO
7. Textbook Development 1 (Mathematics Editing)	Mr. Toshinari Ogasawara	Tokyo Shoseki
8. Textbook Development 2 (Textbook Editing)	Mr. Takaaki Takizawa	Tokyo Shoseki
9. Textbook Development 3 (Mathematics)	Dr. Hiroyuki Ninomiya	Tokyo Shoseki
10. Textbook Development 4 (Editing/Printing)	Mr. Hideo Takahashi	Tokyo Shoseki
11. Education Evaluation 1	Ms. Tomoko Masuda	PADECO
12. Education Evaluation 2	Ms. Kana Takahashi	PADECO
13. Project Coordinator/Training Planning	Ms. Kana Takahashi	PADECO

Table 6 Project Team Members (2nd phase)

Position	Name	Organization
1. Team Leader/Education Planning 1	Mr. Takashi Soma	PADECO
2. Deputy Team Leader/Education Planning 2	Ms. Akiko Nakano	PADECO
3. Mathematics Education 1	Mr. Koji Takahashi	PADECO
4. Mathematics Education 2	Mr. Kenji Saito	PADECO
5. Mathematics Education 3	Mr. Isamu Imahori	PADECO
6. Education Administration/ Development Partner Coordination	Mr. Takashi Soma	PADECO
7. Teacher Education	Ms. Akiko Nakano	PADECO
8. Textbook Development 1 (Mathematics Editing)	Mr. Toshinari Ogasawara	Tokyo Shoseki
9. Textbook Development 2 (Textbook Editing)	Mr. Shigeki Sasaki	Tokyo Shoseki
10. Textbook Development 3 (Mathematics)	Dr. Toshiakira Fujii	Tokyo Shoseki
11. Textbook Development 4 (Editing/Printing)	Mr. Ryo Nakamizu	Tokyo Shoseki
12. Education Evaluation 1	Ms. Kaori Tanaka	PADECO
13. Education Evaluation 2	Ms. Kana Takahashi	PADECO
14. Project Coordinator/Training Planning 1 (predecessor)	Ms. Kana Takahashi	PADECO
15. Project Coordinator/Training Planning 1 (successor)	Ms. Rio Nishihara	PADECO

1.4.2 Project Period

The project duration and contract were planned at the beginning of the project as follows.

- Phase 1: February 2016 to April 2019
- Phase 2: April 2019 to April 2022

The initial assumption was that MOES would complete the development of the new G5 textbooks during the project period, and that G5 implementation would be carried out independently by MOES. However, due to the situation of the spread of COVID-19 pandemic, schools were closed for a period of time between 2020 and 2021, making it difficult to continue project activities, and there were requests for follow-up until the introduction of G5 textbooks by MOES, and so the cooperation period was extended to April 2023 in the 2nd PDM revision.

- Phase 1: February 2016 to April 2019
- Phase 2: April 2019 to April 2023

Chapter 2 Input

2.1 Overview of Input

The following is the input by Laos and Japan. Both the Japanese and Lao sides implemented the project smoothly in accordance with the PDM and the implementation plan.

Table 7 Results of Inputs

Country	Input	Details
Japan	12 Experts ⁸ , 14 positions (81.14 PM)	Team Leader/Education Planning 1 Education Administration/Development Partner Coordination Deputy Team Leader/Education Planning 2 Teacher Education Mathematics Education 1 Mathematics Education 2 Mathematics Education 3 Textbook Development 1 (Mathematics writing) Textbook Development 2 (Textbook editing) Textbook Development 3 (Mathematics) Textbook Development 4 (Editing/printing) Education Evaluation 1 Education Evaluation 2 Project Coordinator/Training Planning 1
	Equipment JPY4,014,000	Laptop PC, projector, camera, copy machine etc.
	Local expense JPY194,769,000 ⁹	Local staff, interpreter/translator, budget for training, car rental, other expenses etc.
Laos	Counterpart (Project management)	DTE, DGE, RIES etc.
	Project office, facilities	Office, training venue
	Local cost	Rent, utility

2.2 Input by Japanese side

2.2.1 Assignment of Experts

Experts were assigned as shown in Table 5 and Table 6. The actual deployment of Japanese experts (for field and home-based assignments) is shown in Appendix 2.

2.2.2 Local Staff

The local staff contributed significantly to the smooth implementation of activities in this project. The following is a summary of the duties for each type of position.

- Secretary: Assisted the Japanese experts in managing the local staff's work record, accounting, procurement, general affairs, project office management, local staff management, finance, logistics related to activities, and external relations.
- Teacher Education Coordinator: Interpreted, translated, communicated between teacher education expert and her counterparts in charge of teacher education, and assisted in the implementation of the new curriculum induction and INSET follow-up training.

⁸ Both Kana Takahashi, the predecessor, and Rio Nishihara, the successor, are counted in the work coordination/training plan 1.

⁹ Local expenses are the estimated settlement amount at the time of writing the report (March 2023).

- Textbook Development Coordinator: Interpreted, translated, communicated between math education specialists and counterparts in charge of textbook development, and assisted in the implementation of the new curriculum induction and INSET follow-up training.
- Assistant: Assisted the Japanese experts in general affairs, logistics related to each training and activity, and field surveys.
- Driver: Drove and managed project vehicle.
- Japanese - Lao Interpreter: Interpreted and translated between the math education specialist and the counterpart in charge of textbook development.
- DeskTop Publishing (DTP) Operators: Provided guidance to counterparts and shared actual DTP work and designed and typeset textbooks in InDesign¹⁰.
- Illustrator: Created illustrations for textbooks.

Table 8 Local Staffs

Position	1 st phase	2 nd phase
Secretary	1	1
Teacher Education Coordinator	1	1
Textbook Development Coordinator	1	1
Assistant	0	1
Driver	1	1
Japanese – Lao interpreter	4	4
DTP operator	1	1
Illustrator	1	1
Total	10	11

2.2.3 Local Expenses

The table below shows the actual local operation costs for each phase of the project implementation period. The local expenses for the second period is the estimated amount at the time of writing the report (March 2023).

Table 9 Local Expenses

Phase	Local Expenses
1 st phase	JPY 97,672,000
	USD 716,917 ¹¹
2 nd phase	JPY 97,097,000
	USD 712,696
Total	JPY 194,769,000
	USD 1,429,613

2.2.4 Equipment

Equipment purchased by the project and those handed over are shown in Table 10.

¹⁰ Software widely used for DTP.

¹¹ Converted using the JICA rate for March 2023 (1USD=¥136.239, 1KIP=¥0.00816). All other columns are the same.

Table 10 Equipment List

No.	Equipment	Quantity		Total
		DTE	RIES	
1	Laptop PC	6	18	24
2	Air conditioner	2	-	2
3	Photocopy machine	-	1	1
4	Camera	1	1	2
5	Projector	1	1	2
6	Video camera	3	-	3
7	Scanner	1	-	1
8	Desktop PC (iMac)	-	2	2
9	InDesign	-	2	2
10	Car		1	1

*Equipment listed in the table are those which are over JPY 50,000.

2.2.5 Training in Japan

(1) Country-focused Training

During the project period, 12 training sessions (11 curriculum sessions¹² and 1 teacher education session) were conducted in Japan. The Japan training conducted and dispatched as part of this project are listed in Table 11.

The math team, which actually writes textbooks and teacher's guide, includes long-term and short-term returnee trainees who participated in the training program "Improvement of Textbooks and Teacher's Guide in Science and Mathematics" at Naruto University of Education until March 2016, and many of them were appointed to work with the project. On the other hand, TTC instructors and primary school principals, who were members of the same team, did not participate in this program, so it was necessary to reduce the gap in understanding between MOES and teachers and to seek a common understanding of the project. Therefore, in the first year of the first phase, training was first conducted in Japan to learn about the Japanese math textbook development process.

The second training was held for teacher trainers who are involved in TTC curriculum development and in strengthening the knowledge and skills of TTC students and primary school teachers to teach with the new math textbooks. After a lecture on problem-solving lessons in Japan, participants were able to experience the development of lesson plans and the actual practice of demonstration lessons at a primary school affiliated with Ryukyu University and were able to acquire basic knowledge of problem-solving style lessons.

The 3rd (3-1, 3-2, 3-3), 4th (4-1, 4-2, 4-3), and 5th (5-1, 5-2, 5-3, 5-4) trainings were conducted as an intensive writing camp for a small group of trainees, as the G3-G5 textbooks and teacher's guide were developed more independently by the math team from G3 and onwards, more guidance from Japanese experts was required. Trainings for G3 and G4, which were actually conducted in Japan, lasted one week and were for five trainees each. Whereas, the G5 training was conducted remotely by connecting JICA Laos office and JICA headquarters via videoconference room, and lasted from 10 days to 2 weeks, with no limit on the number of participants.

¹² The four training sessions in 2020 were conducted using the project's domestic budget, but because the trainees could not come to Japan due to the spread of the COVID-19 pandemic, the training was conducted as remote writing trainings by connecting JICA headquarters and the JICA Laos office via a TV conference room.

Table 11 Overview of Training in Japan

1st Training: Training in Japan for Textbook Editors and Writers	
1. Purpose of Training	To learn about: (i) theories and practices in textbook development in Japanese mathematics education; (ii) practices in each production process, such as typesetting, proofing, printing and binding; and (iii) primary school math lessons using a problem-solving approach.
2. Participants	13 participants from RIES, DTE, DPPE, TTC, and a primary school teacher in Vientiane
3. Period	June 26 – July 9, 2016
4. Sites Visited	Tokyo Shoseki, Co., Ltd. Tokyo Gakugei University and attached primary school Livretch Co., Ltd. and printing factory Fuchu No. 4 Primary School Japan Textbook Research Center "Experiencing Mathematics" Exhibition
5. Outcome	<ul style="list-style-type: none"> Through learning about the mathematics textbook development process in Japan, participants were able to deepen their understanding about textbook development which will be utilized in their work with iTEAM. Through lesson observation and participating in Lesson Study at Japanese primary schools, participants learned about problem-solving style math lessons in Japanese primary schools and have an improved understanding on the concepts being introduced by iTEAM experts in developing the new math textbooks.
2nd Training: Training in Japan for Teacher Education	
1. Purpose of Training	To deepen the participants' understanding on: (i) problem-solving style math lessons; (ii) teacher education and training in Japan (including Lesson Study and particular initiatives for remote and multi-grade schools); and (iii) Okinawa prefecture's initiatives for improving student learning achievement.
2. Participants	15 participants from DTE and TTCs
3. Period	June 17 – July 2, 2017
4. Sites Visited	University of the Ryukyus Faculty of Education and attached primary school Okinawa Board of Education, remote and multi-grade schools
5. Outcome	<ul style="list-style-type: none"> Through lesson plan development of a problem-solving style math lessons and teaching the lesson to Japanese primary school students, participants were able to deepen their understanding of Japanese problem-solving style math lessons which will help them to understand the contents of the new primary school mathematics curriculum, textbooks and teacher's guides, and how to teach TTC students to teach math to primary school students using the new textbooks. Through observing classes at the University of the Ryukyus Faculty of Education and discussions with the Okinawa Board of Education's initiatives to improve student learning achievement, participants were able to gain insight and ideas for the TTC mathematics curriculum revision.
3-1, 3-2, 3-3 Training in Japan for Textbook Editors and Writers	
1. Purpose of Training	(i) To complete G3 textbook draft (ii) To learn how to specify DTP typesetting (iii) To learn how to order illustrations
2. Participants	5 participants from the Math team each time
3. Period	1) April 2 - 6, 2018 2) September 17 - 21, 2018 3) December 10 - 14, 2018
4. Sites Visited	JICA Tokyo Tokyo Shoseki, Co., Ltd. PADECO, Co., Ltd.

5. Outcome	<ul style="list-style-type: none"> Participants were able to improve their textbook writing ability (understanding contents, components, making exercises). Participants were able to understand the way to specify DTP typesetting and order illustrations.
4-1, 4-2, 4-3 Training in Japan for Textbook Editors and Writers	
1. Purpose of Training	<ul style="list-style-type: none"> (i) To complete G4 textbook draft (ii) To learn how to specify DTP typesetting (iii) To learn how to order illustrations
2. Participants	5 participants from the Math team each time
3. Period	<ul style="list-style-type: none"> 1) June 2 - 8, 2019 2) September 8 - 14, 2019 3) December 8 - 14, 2019
4. Sites Visited	JICA Tokyo Tokyo Shoseki, Co., Ltd. PADECO, Co., Ltd.
5. Outcome	<ul style="list-style-type: none"> Participants were able to improve their textbook writing ability (understanding contents, components, making exercises). Participants were able to understand the way to specify DTP typesetting and order illustrations.
5-1, 5-2, 5-3, 5-4 Training in Japan for Textbook Editors and Writers (Online)	
1. Purpose of Training	(i) To complete G5 textbook draft
2. Participants	Math team
3. Period	<ul style="list-style-type: none"> 1) June 16 - July 1, 2020 2) July 28 - August 7, 2020 3) December 14 - 23, 2020 4) February 5 - 15, 2021
4. Sites Visited	JICA Tokyo JICA Laos office
5. Outcome	<ul style="list-style-type: none"> Participants were able to improve their textbook writing ability (understanding contents, components, making exercises).
6. Remarks	<ul style="list-style-type: none"> Since the spread of the COVID-19 pandemic made it impossible for math team to come to Japan, remote training was provided by connecting JICA headquarters and the JICA Laos office via a video conference room.

(2) Area-focused Training of "Improvement of Quality of Education through Lesson Study"

iTEAM has been supporting TTC's Lesson Study activities, in order to strengthen teaching and learning at TTCs, demonstration schools, and network schools. Through these activities, TTCs were able to learn from each other as well as from the perspectives of Japanese university professors and foreign participants, and the knowledge and experience gained can be used for improving implementation of Lesson Study at their TTCs, demonstration schools, and network schools.

On September 23 - 29 2017, iTEAM supported implementing the Complementary Training of "Improvement of the Quality of Education through Lesson Study" at Savannakhet TTC and Pakse TTC. The instructors from each TTC participated in the Complementary Training, and they were able to share best practices and lessons learned of Lesson Study at their TTCs with other TTCs, Japanese university professors and overseas trainees. They also learned about new perspectives in teaching math by conducting class observations, demonstration lessons, and post-lesson discussions with the students at the TTC primary demonstration school. Afterwards, participants conducted and disseminated Lesson Study in their TTCs and to nearby schools' teachers through INSET Follow-up activities and the Professional Development Program (PDP) of BEQUAL.

2.3 Input by Lao Side

2.3.1 Deployment of Counterparts

The table below shows the assignment by Lao side who worked on the development of textbooks and teacher's guide, curriculum development for TTC, and INSET training.

Table 12 Input by Lao side

Output	Task	Personnel in charge
Textbook and teacher's guide development	Textbook writing	13 people from RIES math team and DTE
	Piloting textbook and teacher's guide	13 pilot schools in pilot 4 provinces
TTC curriculum development	Mathematics	TTC instructors, RIES math team, DTE officers, Institute for Education Administration Development (IFEAD)
INSET training	New curriculum induction training, INSET activities	DTE, PESS technicians, TTC instructors, TTC demonstration schools, neighboring schools, DESB Pedagogical Advisor (PA)

2.3.2 Budgetary Expenses Born by the Lao Government

The new curriculum was introduced by MOES based on the textbooks developed by the project and implemented in school education activities. The main costs for this were the printing and delivery of textbooks, teacher's guide, and induction training, as well as the cost of induction training. Total was about LAK 19,239,651,000 (about JPY 156 million at the March 2023 rate) was spent on printing and training costs for the introduction of the new G1 to G5 curriculum.

Table 13 Estimated Expenditure Born by the Lao Government¹³

Item	2017-2018	2018-2019	2019-2020	2021-2022	2022-2023
G1 textbook	1,787,909,600				
G1 teacher's guide	116,480,000				
G1 TOT	359,563,000				
G1 school level training	2,866,194,000				
G2 textbook	-	1,982,247,600			
G2 teacher's guide		126,880,000			
G2 TOT	-	378,378,000			
G2 school level training	-	2,800,000,000			
G3 TOT	-		115,000,000		
G3 school level training	-		2,892,000,000		
G4 school level training	-			2,700,000,000	
G5 TOT	-				115,000,000
G5 school level training	-				30,000,000,000
Subtotal	5,130,146,000	5,287,505,000	3,007,000,000	2,700,000,000	3,115,000,000
Total					LAK 19,239,651,000

2.3.3 Coordination with Other Donors on Budget Allocation Using External Funding

As mentioned earlier, the project normally shares the cost of its activities with the Lao government. However, due to COVID-19, it was feared that the project's activities and students' learning would be affected due to the difficulty in securing government funding.

Table 14 Estimated Expenditure Using External Funding

UNICEF	GPE COVID-19 Fund	G3 textbook and teacher's guide	LAK 2,176,585,000
		G4 textbook and teacher's guide	LAK 2,487,526,000
		G5 textbook and teacher's guide	LAK 2,759,599,600
	Government of Japan	G5 TOT materials printing	LAK 95,680,000
		INSET follow-up training for 3 batches	LAK 408,841,000

¹³ This is an estimate of the allocated budget, not the actual total expenditures. Amounts under 1,000 kip are rounded down.

Chapter 3 Activities

3.1.1 Overview of the Project Activities

For Output 1, the original plan was to spend one year to develop G1 materials locally through technical transfer by Japanese experts to their counterparts. However, after the project commenced in February 2016, it was found that the Lao government planned to start piloting the G1 textbooks and teacher's guides from September that year in the four pilot provinces, and therefore the draft textbooks needed to be developed by the end of August 2016. In order to meet the deadline, some of the tasks such as drafting texts, typesetting and developing illustrations were done through Japanese experts' home assignments or by a publishing company in Japan. As a result, many person-months were spent on G1 textbook and teacher's guide development. However, by completing the G1 textbook and teacher's guide development during the first year as planned, the project gained the trust of the Lao government and was able to put the textbook and teacher's guide development activities on track. The development work was then gradually moved to the Lao side, and the textbook for one grade was divided into four parts, and the cycle of manuscript writing, trial, content review, and finalization was repeated four times over the course of a year. Finally, the final draft was approved by the Committee for Approval on Curriculum and Instructional Materials (CACIM). Similarly, for illustrations and desktop publishing, work was gradually moved to the Lao side.

The G3 textbook and teacher's guide were being written smoothly after the start of the second phase, but at that time the development pattern was a combination of one workshop in Laos and three training sessions in Japan, which took one year to complete. However, the G3 textbooks and teacher's guide, which were to be printed and delivered under the 2020 government budget, were subject to government-wide budget cuts due to strains on Lao government finances on account of COVID-19. As a result, MOES decided to utilize funds from the Global Partnership for Education (GPE) COVID-19 Grant, with United Nation's Children's Fund (UNICEF) as the grant agent, and subsequently G4 and G5 were also printed using GPE funds. However, due to the time required for coordination between UNICEF and MOES, which is responsible for managing GPE funds, the printing of G4 textbooks and teacher's guides were delayed beyond expectations, and delivery could not be made in time for the new school year in September 2021, so MOES decided to postpone the use of these materials by one year, starting in September 2022. As a result, G4 students who had studied with the new math textbooks until G3 were to use the old textbooks again from G4 onward, and issues remained, such as whether the primary school completion examination would be administered according to the new or the old curriculum.

At the end of the project (March 2023), G5 textbook induction training has been completed in all districts, so it is likely that delivery of the new G5 textbooks has been completed except for a few schools that were unable to attend the training. There are some primary schools that started using the new textbooks in the middle of the school year after attending the training.

For Output 2, BEQUAL also took the overall lead in the TTC curriculum revision process. As the previous TTC curriculum was developed separately from the primary curriculum and the content of the textbooks were not connected, the new TTC curriculum was developed to be aligned with the new primary school textbooks. The TTC curriculum writing workshops were held regularly and the project coordinated workshop schedules with MOES and BEQUAL so that Japanese experts could participate and strengthened the capacity of the writing team by holding additional workshops. After the introduction of the new TTC curriculum, training was conducted for TTC instructors on each module (Basic Mathematics, Teaching Math 1 and 2), and the results of the TTC student assessments were used to identify issues with the lessons in order to provide additional instruction.

For Output 3, support was provided for implementing trainings for the introduction of the new math textbooks and INSET follow-up training and activities mainly for TTC instructors and demonstration school teachers.

In this way through coordinating and adjusting tasks, the activities particularly for Output 2 and 3 were clarified, and after the 5th SCM in March 2018, discussions were held with representatives of concerned departments. Details of the changes in the revised PDM can be found in “Details of Amendment” in the R/D for revising the PDM (see Appendix 1).

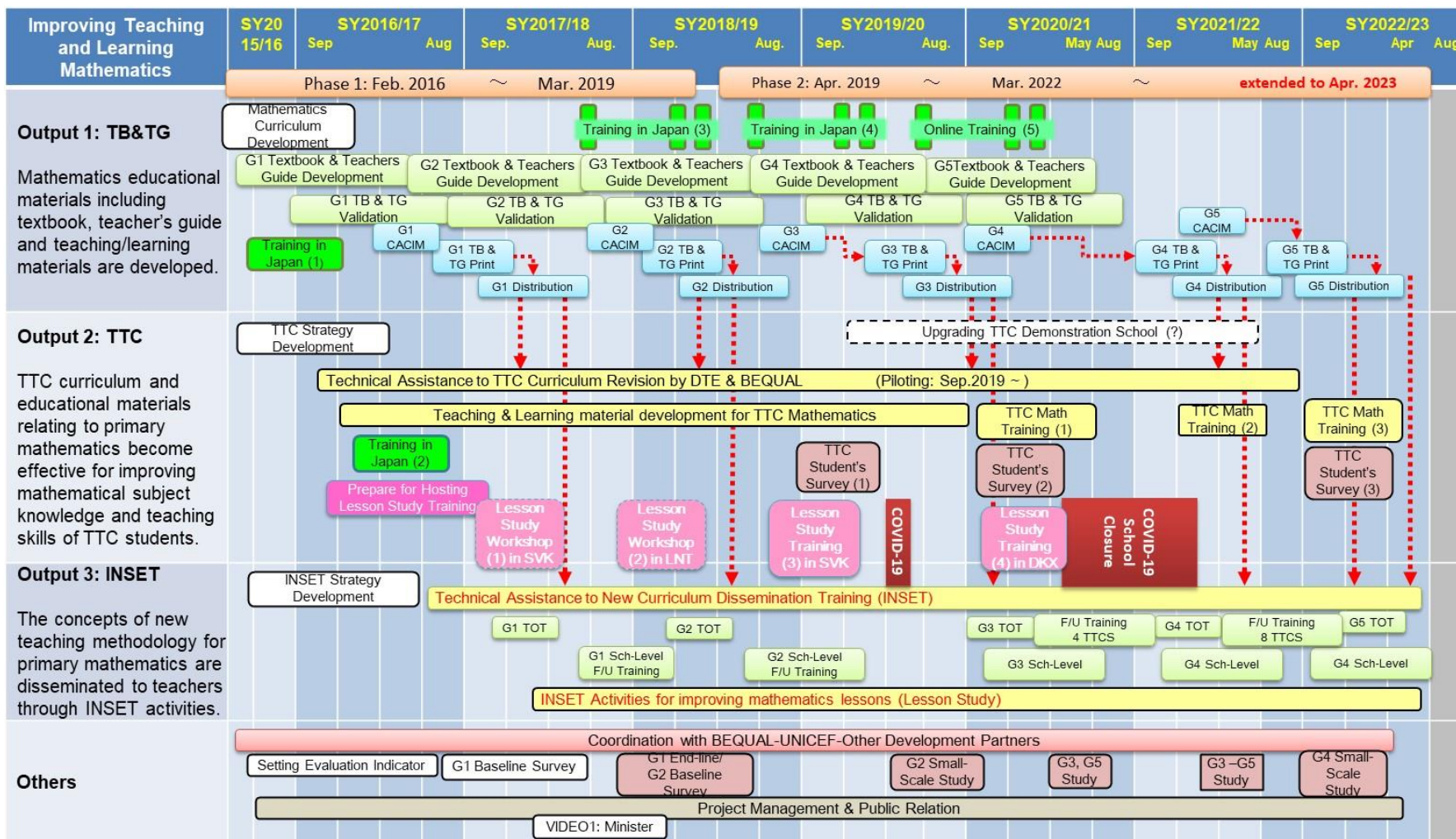


Figure 1 Overview of the Project Activities

3.1.2 Activities of Textbook and Teacher's Guide Component

In regards with the textbook and teacher's guide development component the following deliverables in primary mathematics for five years were completed during the project period.

- new curriculum
- new textbooks
- new teacher's guide

In this process, training, supervision in Laos and training in Japan were carried out to deepen understanding of the curriculum and to strengthen capacity in textbook and teacher's guide development. In particular, G3 and G4 have focused on technical support for writing textbook manuscripts, including three training sessions in Japan and one writing instruction session in Laos per year. Technical support was also provided to improve the quality of printing of new textbooks¹⁴. During the project period, the new curriculum, new textbooks and new teacher's guide up to G5 were approved, and new textbooks and new teacher's guide up to G4 were introduced in public primary schools nationwide.

3.1.3 Activities of Teacher Education Component: Increment in Mathematic Subject Knowledge of TTC Students

Activities to improve the math subject knowledge of teacher training college students in the teacher education component included support for the revision of the TTC curriculum and training support for TTC instructors in conjunction with the revision. During the project period, experts provided guidance to TTC instructors, DTE, and RIES in writing syllabi (lesson plans and exercises) and completed the implementation of Basic Mathematics and Teaching Math 1 and 2 after trials in 8 TTC schools. The following deliverables were completed during the project period.

- New TTC math curriculum (course outline and syllabi)
 - Basic Mathematics
 - Teaching Math 1
 - Teaching Math 2

3.1.4 Activities of Teacher Education Component:

Activities related to INSET training consisted mainly of conducting training for the induction of the new curriculum¹⁵, conducting INSET follow-up training, and supporting INSET follow-up activities.

The following deliverables were completed during the project period.

- G1-5 new curriculum induction training materials

3.2 Output 1 Curriculum and Textbook Component

3.2.1 Support of Developing Curriculum

The Japanese experts assisted in developing the content of the math curriculum through showing a curriculum sample from Japan and sharing the viewpoints on mathematics education from an academic perspective, as well as aligning the curriculum with the actual conditions of children

¹⁴ Since COVID-19 prevented training in Japan and travel to the site, the G5 manuscript was written remotely via a video conference room at JICA headquarters and JICA's Laos office.

¹⁵ The project supported training for the introduction of the new curriculum in G1 and G2 only in the four pilot provinces, while the remaining 14 provinces and G3 and beyond were all funded by the Ministry of Education by DTE.

and education in schools. Also, the project created a scope and sequence to clarify the relationship between each content, which is attached as Appendix 3. As a result, the new primary mathematics curriculum for G1 to G5 was approved by CACIM on June 22, 2016 (see Appendix 4).

3.2.2 Develop Draft Textbook and Teacher’s Guide

Between the beginning of the first phase of the project and the second phase in March 2021, all pilot textbooks and teacher’s guide from G1 to G5 were developed and piloted. Initially, G1 was to be distributed in 2018, G2 in 2019, G3 in 2020, G4 in 2021, and G5 in 2022 under the agreement with the government¹⁶, but the introduction of G3 to G5 was delayed due to COVID-19. However, there was no particular impact on the writing of manuscripts for the development of textbooks and teacher’s guide, which was originally planned, or on the pilot schools themselves, so there was no particular change from the plan, which was calculated backward from the start of use. The textbooks and teacher’s guide were developed in four separate sets for each grade level (commonly referred to as Sets 1-4), and the pilot was conducted throughout the school year. The development procedure and the pilot schools of the project are as follows.

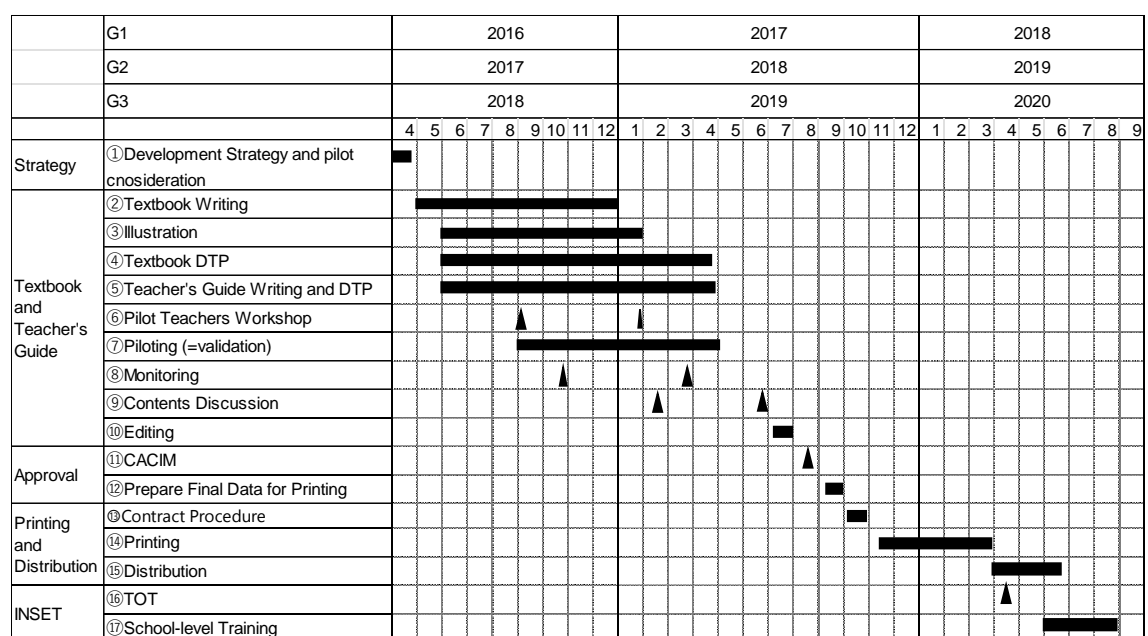


Figure 2 Flow of G1-3 Textbook and Teacher’s Guide Development

¹⁶ Academic year starts from September.

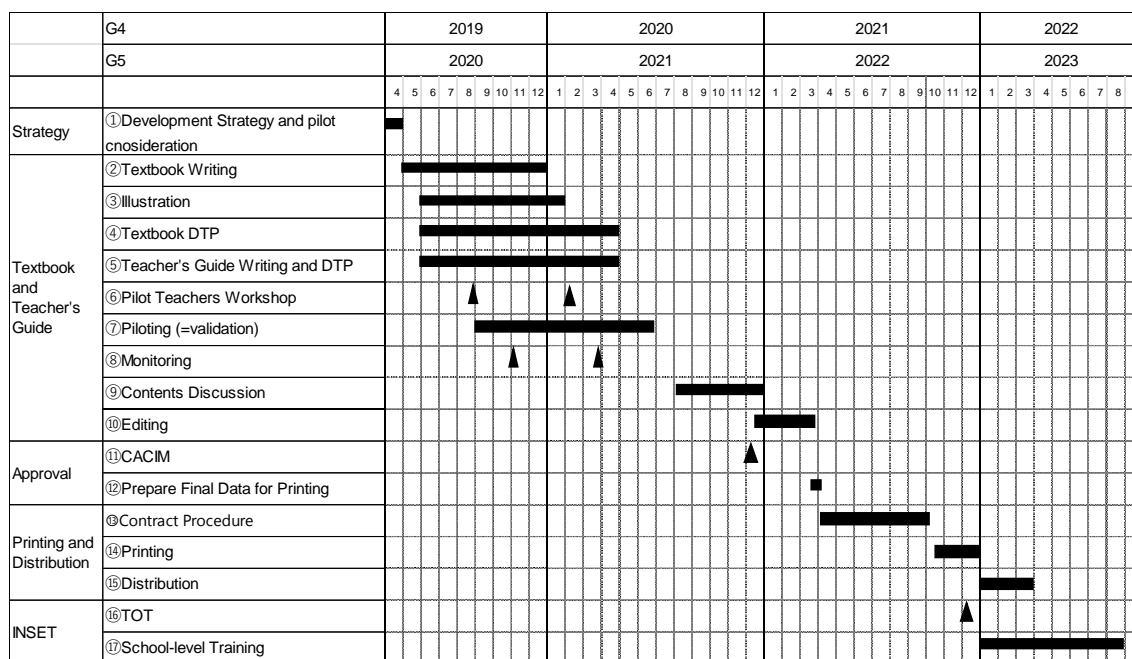


Figure 3 Flow of G4-5 Textbook and Teacher's Guide Development

In the first phase, a total of 11 members from RIES, DTE, DPPE¹⁷, Vientiane capital primary School, and TTC were assigned as textbook writing members (hereinafter referred to as "math team") as follows. Dr. Thongkhao SENGSOULICHAN, who was on leave to pursue his doctoral degree at Khon Kaen University in Thailand but returned to work during the second phase, and Mr. Petsamone CHANTHAVONG joined the math team as members of the textbook development team. The list of the math team in the first and second phases is shown in the table below.

Table 15 Math Team

No.	Full name	Job title
1	Mr. Outhit THIPMANY	Director of Teaching-Learning Material Development Center, RIES
2	Mr. Vilaleuth SAPHANGTHONG	Deputy Head of Supplemental Materials Center, RIES
3	Mr. Boualy Keovongsa	Deputy Head of Mathematics and ICT Section, RIES
4	Mr. Donbandith BIENTHANONG	Technical Staff, Mathematics Section, RIES
5	Mr. Khoupakone PHETSAVONG	Technical Staff, Mathematics Section, RIES
6	Ms. Soutdaphone KEOBOUASAMAI	Technical Staff, Teaching-Learning Material Development Center, RIES
7	Mr. Valor BOUALONGXAIFASAO	Mathematics Staff, DTE
8	Ms. Phonevilay NAMMAVONG	Mathematics Staff, IFEAD
9	Mr. Keooudone ONGSAVANGTHONG	Mathematics Staff, DECE
10	Ms. Souchitta PATSAPHANH	Head of Sciences Section, Dongkhamxang TTC
11	Ms. Bounnao SIHALATH	Principal, Thaphalanxai Primary School
12	Dr. Thongkhao SENGSOULICHAN	Technical Staff, Mathematics Section, RIES
13	Mr. Petsamone CHANTHAVONG	Technical Staff, Mathematics Section, RIES

¹⁷ When the DPPE was reorganized into the DGE and the Department of Early Childhood Education (DECE), Keooudone Ongsavangthong, originally a DPPE employee, was assigned to DECE.

Editing and Revision Policy

Based on the analysis of the old Lao mathematics textbooks in the beginning of the 1st phase, the following five points were raised as issues:

- There were some parts that did not meet students' developmental stages¹⁸.
- The pages are too short for one chapter, thus it takes only a short time to introduce a specific example, introduce a concept, learn related skills, and use it to solve problems.
- There are few problems and activities to deepen the understanding of the concept such as solving problems by combination of learned items, discovering mathematical facts through activities, and applying learned concepts to real life problems.
- The order of instruction is also an issue¹⁹, and students are required to memorize them rather than understand.
- There is no logical explanation using figures when introducing formulas and students must memorize them.

Through discussions between the math team and Japanese experts, it was decided to revise the textbooks and teacher's guide in Laos based on the concept of "problem-solving" in Japanese textbooks and teacher's guides, in a manner that conforms to global standards for math education, including the introduction of teaching methods appropriate to developmental stages, the establishment of logically valid teaching sequences, the introduction of problems that foster thinking skills, and the effective use of charts and semi-concrete objects.

The division of roles in the development of textbooks and teacher's guide, from writing to DTP, is shown in the table below.

Table 16 Major Division of Work between the Japanese and Lao Sides in the Development of Textbooks and Teacher's Guide

Grade	G1	G2	G3	G4	G5
Writing manuscripts	Japan	Japan	Japan • Laos	Japan • Laos	Japan • Laos
Illustration	Japan	Japan	Laos	Laos	Laos
DTP	Japan	Japan	Laos	Laos	Laos
Writing manuscripts and DTP of teacher's guide	Japan	Japan	Laos	Japan • Laos ²⁰	Japan • Laos

1) Textbook Draft Writing

In the G1 textbook writing, due to the Math team's limited writing skills and the time until the piloting began was short, Japanese experts created a sample manuscript referring to Japanese

¹⁸ For example, even the G1 students who haven't sufficiently grasped the number concept yet are asked to make replacements such as "10 white circles are one black circle and 10 black circles are one red circle" in the textbook pages 131-132. There should be a consideration such as representing 1 by a small square and representing 10 by a rectangle of 10 pieces.

¹⁹ For example, instruction is given in the order of "area of rectangle" → "area of triangle" → "area of parallelogram" in the G5 textbook pages 92-99. However, in order to explain that the area can be determined by "base×height÷2" even for obtuse triangles, it is necessary to explain "half of the area of a parallelogram is made by combining two identical obtuse triangles". This explanation cannot be made because the instruction of the parallelogram area comes after the triangle.

²⁰ The Lao side basically developed the teacher's guide for G4 and G5, but due to the advanced content, the Japanese side was asked to assist in writing the manuscripts. Due to the limited number of person-months, RIES selected particularly difficult chapters, and Mr. Imahori partially wrote Chapters 15 to 18 in G4 and Mr. Sasaki partially wrote Chapters 13 to 15 in G5.

textbooks and teacher's guides, translated them into Lao language, composed Desktop Publishing (DTP) in Japan, and the Math team revised them. After translation and DTP, since the data was handed to the Math team, the time taken for correction and editing by the math team was short, and problems such as difficulty in checking with the original draft in Japanese arose. However, in the translation stage, the local translation team (4-5 people) and the Math team repeatedly held discussions on appropriate Lao language of educational and mathematic terms, and Lao side and Japanese side closely communicated and coordinated with each other on the activities.

From G2, Japanese experts proposed chapter arrangements and page allocation to the Math team, and the Math team developed the contents through discussions with Japanese experts. The Math team experienced writing one chapter in each set, referring to the English version of the math textbook made by Tokyo Shoseki.

From G3 onward, the math team wrote all pages based on the draft prepared by the Japanese experts, using the original manuscript, and the Japanese experts provided advice as needed. In the writing process, a Japanese expert from a textbook company drafted a manuscript in advance based on the content of the Japanese textbooks in accordance with the new Lao primary math curriculum. The math team writes the draft in the Lao context during the Japan training program, referring to the draft written by the Japanese experts and the English version of the Tokyo Shoseki textbook. In this way, the math team did not "develop the manuscript from scratch," but they "learned about the new textbook from the draft written by the Japanese experts and revised it according to the current situation in Laos. Ideally, in the future, each member of the math team should be able to write a draft from scratch, but during the project, it was very difficult for the inexperienced math team to write and edit the textbooks entirely by themselves, so the project decided to continue the next revision based on the assumption that the textbooks and teacher's guides will be revised based on the ones developed this time. The G3 and G4 textbooks were written three-fourths of the time during the Japan training, and the remaining one-fourth was done through a workshop in Laos, while the G5 textbooks were written all the way from set 1 to set 4 remotely by connecting JICA headquarters and the JICA Laos office (for details, see Section 2.2.5 "Training in Japan").

2) Making Illustrations

Illustrations for especially lower-grade textbooks are very important for students because they have a great impact on children, encouraging them to imagine the setting of a scene and improving their motivation to learn. However, because the deadline before the pilot began was short, illustrations for G1 and G2 were made in Japan. In order to draw illustrations (animals and fruits) matching the actual conditions of Laos, Japanese experts confirmed the actual items in the local market and home, and the Math team and project staff took photos and collected photos taken by Japan Overseas Cooperation Volunteers (JOCV) at TTCs.

From G3, the Math team employed a local illustrator. The Math team (RIES staffs) placed orders for each set, and once the illustrations were delivered to RIES, the Math team confirmed the quality. If it was necessary to re-draw, the Math team ordered from the illustrator again. After the complete version was delivered to RIES, the illustrations were sent to the DTP operator.

3) Textbook Typesetting (DTP)

As stated in 2), most of the DTP typesetting for G1-G2 were done in Japan. Due to the short delivery time, the need to pay close attention to the typesetting of textbooks used by children, and the complexity of design, it was technically difficult for the Math team to compose textbooks at that time. As for equipment, two Apple desktop PCs with DTP software (InDesign) were placed in the RIES math unit in November 2016. In terms of human resource development, Japanese DTP specialists were sent as lecturers, and short-term training on how to use InDesign, set up a basic format, and manage data, was implemented twice for the Math team. For G3, the textbook typesetting work was carried out in Laos by hiring a local DTP operator, and the Math team checked and corrected the work as editors.

In the second phase, Mr. Nakamizu, a member of Livrettech who has extensive experience in textbook DTP, was dispatched to the site and continued to provide short-term training on basic InDesign usage and basic formatting to the math team once in May 2019, at the beginning of the second phase. However, in light of the fact that COVID-19 prevented travel, a 4-day online DTP training was conducted for the math team in February 2022 during the finalization of the G5 textbook and teacher's guide. Since the textbook and teacher's guide were in the process of being finalized, the math team shared with Mr. Nakamizu in advance any questions or problems they had with DTP of the textbooks and teacher's guide, and Mr. Nakamizu prepared and implemented a training curriculum based on these questions. During the training, the iMac screen that the RIES math team uses daily was shared, and the difficulties and inefficiencies in the work the math team had felt were reproduced and explained, with solutions provided by Mr. Nakamizu. Although the training was not systematic due to the limited number of days, it was very practical in the sense that it focused on the questions and challenges that the RIES math team encountered when editing textbooks and teacher's guide. The skills gained from the training were put to use in the finalization of the G5 textbooks and teacher's guide from after CACIM in January through the end of February.

4) Teacher's Guide Writing and DTP

Development of teacher's guide for G1 was carried out in the same manner as in the textbook. From G2, the Japanese teacher's guide was translated into Lao, and the math team developed the manuscript and typeset it, using the Japanese teacher's guide as reference. However, it was difficult for the math team to write everything based on the Japanese teacher's guide because the content became more advanced for upper grades, and the content of the Japanese textbooks and the newly developed Lao textbooks were different. Therefore, the Japanese experts were able to provide partial support for the writing of some of the G4 and G5 chapters that the math team found particularly difficult.

3.2.3 Pilot Draft Textbook and Teacher's Guide

From the first year, the development of textbooks and guides and piloting had been carried out in coordination with BEQUAL, which supports the development of textbooks and guides for subjects other than Math. The pilot area was Vientiane capital, Luangnamtha, Savannakhet, and Salavan provinces, and this was implemented through the collaboration of Math team and the Japanese experts (this project originally planned to conduct piloting in three provinces but expanded to four provinces to align activities with BEQUAL). Since the piloting of G1 and G2 were led by BEQUAL, BEQUAL provided budget and coordination services and iTEAM covered per-diem and accommodation allowance for the Math team allowing the pilot to be done on a large scale with minimum budget.

On the other hand, decisions of the piloting method and pilot schools were made by BEQUAL. This resulted in having to adjust the timing of Japanese experts' inputs in the field, scheduling of dates, contents, compiling hand-outs as well as coordinating on financial aspects such as setting the daily allowance and accommodation, venue rental rates for workshops and monitoring conducted jointly with BEQUAL. After G2, the project basically followed the above process, but due to the recommendations of BEQUAL's Mid-Term Review in 2017, it was decided that the development of BEQUAL-supported textbooks and teacher's guide would be postponed for one year in May 2018 and monitoring was also suspended. Therefore, monitoring after G3 was conducted solely by the project and the number of pilot schools was reduced from 26 to 13. The reasons were 1) to keep the scale of implementation within the project budget, and 2) based on the experience of G1-G2, it was more efficient to focus on schools with cooperative teachers and schools where the situation of learning of Lao students could be grasped, and the math team could focus its efforts on reflecting on the feedback. The pilot schools from G1 to G5 are listed in the table below.

Table 17 26 Pilot Schools for G1 and G2

No.	Province/District		School Name
1	Vientiane Capital	Sisattanak	Sokpaluang school
2			Thoungkang school
3		Hadsayfong	Dongkhamxang TTC Sathit school
4		Xaythany	Phonexay school
5			Danexang school
6	Savannakhet Province	Kaisone	Savannakhet TTC Sathit school
7			Phonesavanh school
8		Sepon	Nahounanam school
9			Nalouang school
10			Oudomsouk school
11			Kadap school
12			Kengkham school
13	Salavan Province	Salavan	Nadon school (Sathit)
14			Sengvannoy school
15			Boungsui school
16			Khokmai school
17			Naxaynoy school
18			Nalek school
19			Lak 2 school
20	Luangnamtha Province	Namtha	Luangnamtha TTC Sathit school
21			Nammatmai school
22			Khuasong school
23			Lakkhamkao school
24			Oudomsin school

No.	Province/District	School Name
25		Nadaeng school
26		Soptout school

Table 18 13 Pilot Schools for G3 - G5

No	Province/District	School Name
1	Vientiane Capital	Sisattanak
2		Hadsayfong
3		Xaythany
4	Savannakhet Province	Kaisone
5		Phonesavanh school
6		Sepon
7		Kengkham school
8	Salavan Province	Salavan
9		Nadon school (Sathit)
10		Sengvannoy school
11	Luangnamtha Province	Namtha
12		Boungsui school
13		Luangnamtha TTC Sathit school
		Soptout school
		Khuasong school

For Sets 2 and 4, textbook and teacher's guide were distributed during the pilot school visits in October and March, respectively, and the math team involved in textbook development explained only the main points of the textbooks. However, as the content of the textbooks became more advanced in the upper grades, it took more time to teach the teachers in the pilot schools. After Set 4 of G4, 1-day pilot teacher workshops in each pilot province during monitoring was conducted for Sets 2 and 4, and a 3-day workshop was conducted in Vientiane for set 1 and 3.

The flow of the pilot teacher workshops and pilots is as follows.

Table 19 Flow of Piloting Textbook and Teacher's Guide

Time	Item	Purpose (Contents)
G1: September 2016 G2: September 2017 G3: September 2018 G4: August 2019 G5: August 2020	Pilot Teachers' Workshop 1 (RIES)	Set 1 Distribute textbook and teacher's guide (Lecture about set 1, mock lesson)
G1: October 2016 G2: October 2017 G3: October 2018 G4: October 2019 G5: October 2020	Central Monitoring Visit 1 (Pilot schools)	Set 1 monitoring, Distribute Set 2 textbook and teacher's guide (Lesson observation, interview with principals and teachers, collect comments of teachers, simple test to grasp children's level of understanding)
G1: January 2017 G2: January 2018 G3: January 2019 G4: January 2020 G5: January 2021	Pilot Teachers' Workshop 2 (RIES)	Set 2 collect monitoring comments, Distribute Set 3 textbook and teacher's guide. (Lecture about set 3, mock lesson)
G1: March 2017 G2: March 2018 G3: March 2019 G4: June 2020 ²¹ G5: March 2021	Central Monitoring Visit 2 (Pilot schools)	Set 3 monitoring, Distribute Set 4 textbook and teacher's guide (Lesson observation, interview with principals and teachers, collect comments of teachers, simple test to grasp children's level of understanding)

²¹ The piloting of set 4 was delayed because the school was closed from March to May 2020 due to COVID-19.

Time	Item	Purpose (Contents)
G1: May 2017 G2: May 2018 G3: May 2019 G4: June 2020 G5: June 2021 ²²	Central Monitoring Visit 3 (Pilot schools)	Set 4 collect monitoring comments (Lesson observation, interview with principals and teachers, collect comments of teachers, simple test to grasp children’s level of understanding)

The above flow has basically been followed in the second and third years of the project. However, from the recommendations of BEQUAL's Mid-Term Review in 2017, the development of textbooks and teacher’s guides supported by BEQUAL was postponed for one year, and monitoring was also suspended in May 2018. Therefore, G3 monitoring was implemented by the project alone, and the number of pilot schools was reduced from 26 to 13. The reasons were: 1) to minimize the costs, and 2) based on the piloting experience of G1 and G2, it was found to be effective to collect feedback through reducing the number of pilot schools to schools with cooperative teachers and in which the situation of learning of students from various backgrounds can be grasped, and the Math team could focus their time and attention on analyzing and reflecting the feedback from the piloting.

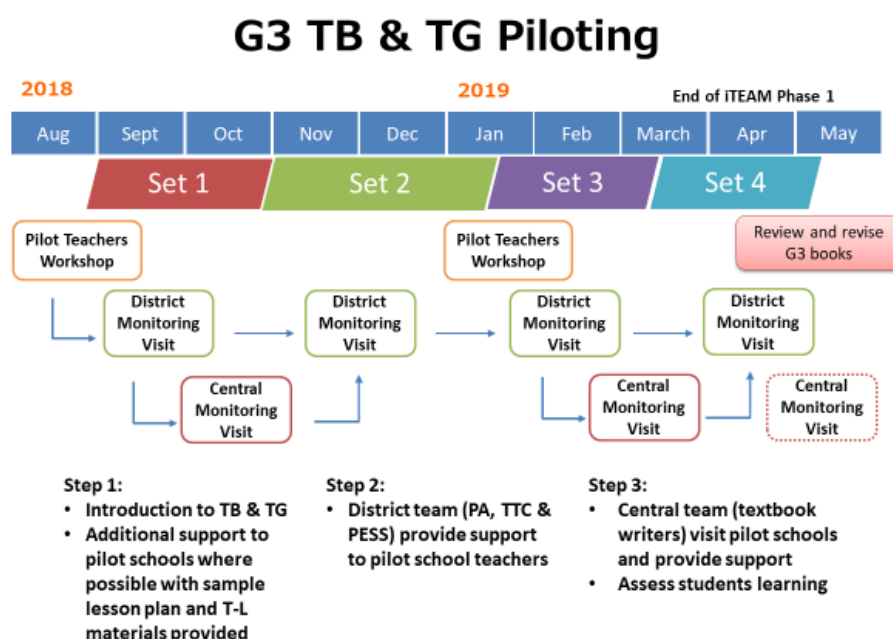


Figure 4 Flow of Textbook and Teacher’s Guide Piloting (G3 as example)

Pilot Teachers’ Workshop

The Pilot Teachers Workshop is a 3-day program for the teachers and principals and teachers of pilot schools (G1 – 25 schools, G2 – 26 schools, G3-G5 – 13 schools) and PESS, DESB (Pedagogical Advisor: PA), TTCs (total 50 people) held twice a year at the beginning of each semester at RIES. Based on the advice of Japanese experts, Math team discussed the contents of Set 1 and Set 3, demonstrated mock lessons using sample lesson plans, and then the participants conducted micro-teaching (developing a lesson plan in groups and conducting part of the lesson followed by discussion). In addition, as mentioned earlier, set 4 of G4, Set 2 of G5, and Set 4 of G5 each conducted workshops in each pilot province in a one-day program.

²² Since cross-province travel was not possible due to the lockdown caused by the spread of COVID-19, PESS and TTCs in each pilot province were asked to monitor and collect comments. Results were mailed to Vientiane.

Monitoring

Math team and Japanese experts divided into teams for four provinces and went on field visits for three to five days, and visited 13 pilot schools with PESS, PA and TTC teachers in each province and district two or three times a year. The activities conducted are: lesson observation, interviews with principals and teachers, comment collection of teachers, simple test to grasp the children's level of understanding in Set 1 and Set 3, and comment collection of teachers in Set 2 and Set 4.

3.2.4 Workshop for Finalization after the Piloting

Based on the analysis of the monitoring results, a workshop for reviewing content and revision of the pilot textbooks and teacher's guide were conducted with the support of a Japanese expert to the math team. The team analyzed the test results of the monitoring of each grade level and set and made revisions to make the textbooks easier and clearer for the students to understand. Revisions ranged from simple rewording to changing numerical values to simplifying calculations and replacing page-by-page drafts, and the revisions were discussed one by one with the math team. In addition, taking into consideration the possibility that teachers might miss important information even if it was written in the teacher's guide, text balloons of characters were used to include particularly important points, which was a way devised to communicate directly with students in light of the current situation in Laos.

3.2.5 CACIM Approval and Final Draft

The textbook and teacher's guide are to be approved by CACIM with some comments, and the final version of textbook and teacher's guide are submitted to the Department of Finance (DOF) for printing.

- G1: CACIM approved in July 2017, final data submission to DOF in August 2017
- G2: CACIM approved in July 2018, final data submission to DOF in October 2018
- G3: CACIM approved in September 2019, final data submission to DOF in February 2020
- G4: CACIM approved in December 2020, final data submission to DOF in May 2021
- G5: CACIM approved in January 2022, final data submission to DOF in February 2022

G1 and G2 textbooks and teacher's guide began to be used throughout Laos in September of the scheduled introduction year, while G3 and later were printed and distributed using GPE's COVID-19 emergency fund due to the difficulty in securing a budget for printing and distribution from the MOES due to the impact of COVID-19. Even so, the budget allocation was significantly delayed due to coordination with the MOES and various procedures, and G4 textbooks were printed and distributed around March to April 2022, and G5 textbooks around December 2022 to January 2023. Therefore, students who had only studied with the new textbooks from G1 to G3 had to study with the old textbooks for G4, and after moving up to G5, they either continued to study in the old textbooks or switched to the new textbooks after the distribution of the new textbooks²³. The COVID-19 pandemic had the greatest impact on the students during this school year.

²³ Although MOES advocated that students learn with the old textbooks, the actual situation in each school is not certain, as the project found that they were already using the new G5 textbooks when they interviewed TTC instructors in eight provinces in January 2023.

3.2.6 Features of New Textbook and Teacher's Guide

The new textbooks and teacher's guide thus completed were very different from the old ones. First, a structured sequence was developed in accordance with the revised curriculum, and the content was taught in a manner appropriate to the student's stage of development. The content and numerical values of the exercises have been set so that students can gradually move up from easy to difficult problems. In addition, a structured diagram of related chapters studied in the previous and following grades was included in the introduction of each chapter so that teachers can check what the related chapters are.

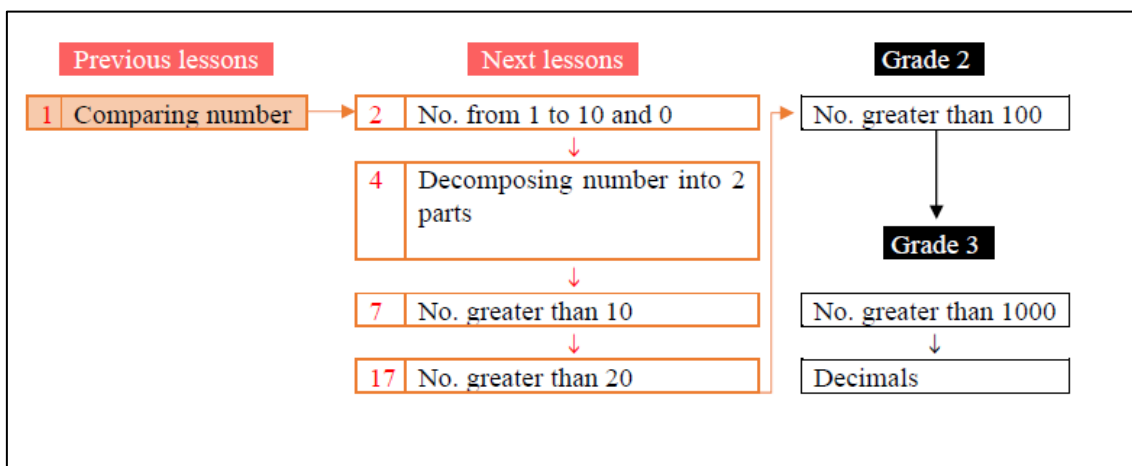


Figure 5 Structure Sequence in Teacher's Guide²⁴

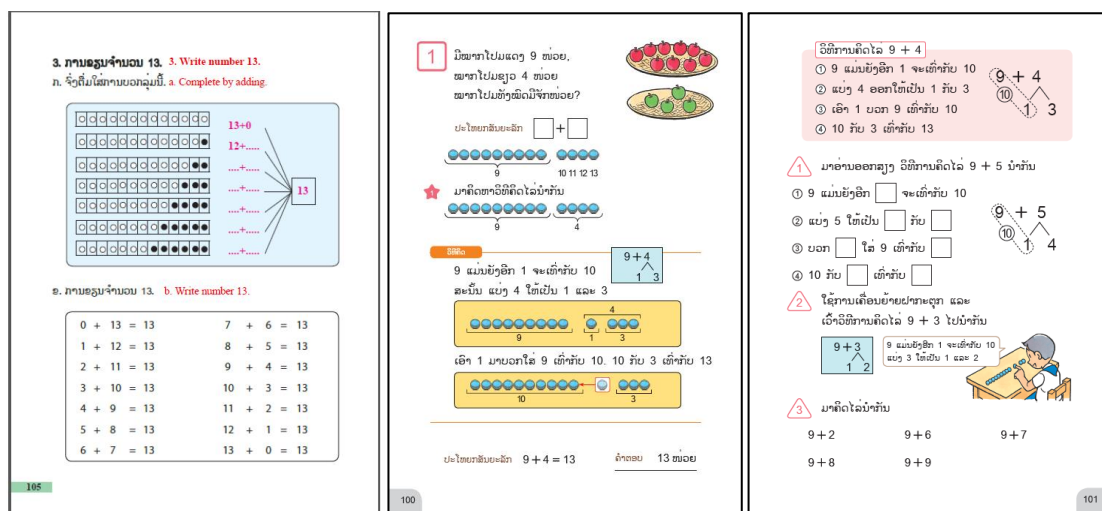


Figure 6 Comparison of "Decomposition of Numbers and Addition" (Left: Old, Center and Right: New)

The new textbooks are designed to be "problem-solving" style, in which students think independently, solve problems they have not studied yet by combining previously studied contents, and discover new findings through their activities. Specifically, Step 1: Understanding the problem (identification of the problem/issue of the day), Step 2: Individual Solving (students work on the problem individually), Step 3: Comparison of students' ideas and discussion (student-led

²⁴ The Figure 6 is an image of unofficially translated teacher's guide by the project.

discussion in the first half, teacher-led guidance in the second half), Step 4: Doing exercises, Step 5: Conclusion.

While the old textbooks focused on memorizing formulas and teacher-centered lessons in which students were passive, the new textbooks are designed to enable students to enjoy learning mathematics through self-directed learning and to acquire the ability to think through mathematic lessons and to tackle problems they have not yet learned.

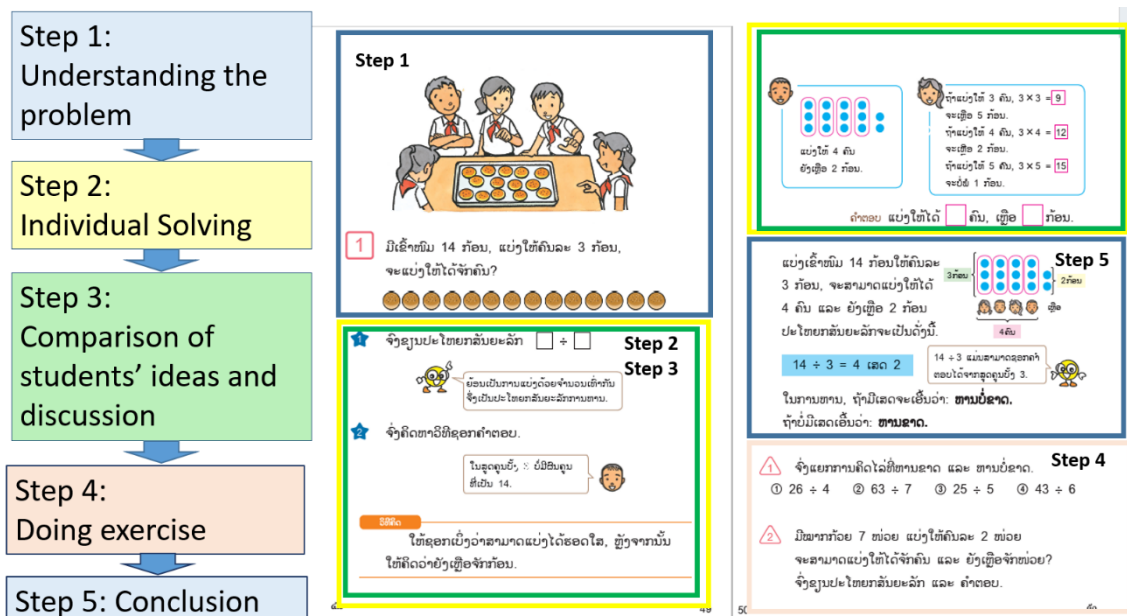


Figure 7 Textbook Layout for Enabling a 5 step Problem-solving Style Structured Lesson

3.3 Output 2 Teacher Education Component: Enhancing Mathematical Subject Knowledge and Teaching Skill of TTC Students

3.3.1 TTC Curriculum Syllabus Revision

In parallel to the primary textbook and teacher’s guide development, BEQUAL is leading the TTC curriculum revision. A total of eight people from the TTC instructors, RIES, and IFEAD were assigned to the TTC math curriculum writing team, as follows.

Table 20 TTC Mathematics Curriculum Writing Team

No.	Full name	Job title
1	Mr. Phailath SITHONG	Head of Academic Office, Savannakhet TTC/PhD Candidate Khon Kaen University, Thailand
2	Ms. Souchitta PATSAPHANH	Head of Sciences Section, Dongkhamxang TTC
3	Mr. Senhak BOUNYMY	Deputy Head of Kindergarten and Primary Office/Teacher, Salavan TTC
4	Ms. Litthida GNOTTHIVONGSA	Assistant Teacher, Luangnamtha TTC
5	Mr. Sisamay DOUANGMANY	Head of Natural Science Department, Champasack University Faculty of Education
6	Mr. Boualy KEOVONGSA	Deputy Head of Mathematics and ICT Section, RIES
7	Mr. Khouphe Kone PHETSAVONG	Technical Staff, Mathematics Section, RIES
8	Ms. Phonevilay NAMMAVONG	Mathematics Staff, IFEAD

TTC curriculum writing workshops were held on a regular basis, coordinating with MOES and BEQUAL on workshop dates and content, adjusting travel schedules so that Japanese experts could participate, and additional workshops were held on the project to strengthen the writing team's capacity.

In the new TTC Curriculum Framework, a two-year core program for each course (9+3, 12+2, 12+4) will be established and the structure was changed so that common contents would be studied.

Table 21 New TTC Curriculum Structure

	Bridging year	Core 1	Core 2	Advanced 1	Advanced 2
9+3	Year 1	Year 2	Year 3		
12+2		Year 1	Year 2		
12+4		Year 1	Year 2	Year 3	Year 4

Source: Draft Curriculum Framework Document for Pre-service Primary Teacher Education in Lao PDR (July 2018)

Since students in 9+3 are lower secondary school graduates, the 1st year (Bridging Program) will be used to learn the contents of the upper secondary education, and then they will study the same contents as the 12+2 and 12+4 students in the two-year core program. 12+4 students will further their studies in a two year “advanced course” after the core program, and have more classes on teaching methods, School Experience, Practicum, and Action Research/Lesson Study. The subjects and allocated hours for the new TTC curriculum are shown in Appendix 4. Math classes and allocated hours in the current curriculum and new curriculum are shown in the table below.

Table 22 Math Classes and Allocated Hours in the Current Curriculum

Course	Hours	Basic math 1	Basic math 2	Math teaching methodology 1	Math teaching methodology 2	Total Hours
12 + 4	Semester*	1	2	5	6	306 hours
	Hours/week	3 hours/week	4 hours/week	6 hours/week	6 hours/week	
	Total hours	48 hours	64 hours	96 hours	96 hours	
12 + 2	Semester	1	-	1	2	160 hours
	Hours/week	4 hours/week		2 hours/week	4 hours/week	
	Total hours	64 hours		32 hours	64 hours	
9 + 3	Semester	1	2	2	3	224 hours
	Hours/week	4 hours/week	4 hours/week	3 hours/week	3 hours/week	
	Total hours	64 hours	64 hours	48 hours	48 hours	

*1 semester is half a year.

Table 23 Math Classes and Allocated Hours in the New Curriculum

Course	Hours	Basic Math	Teaching Math 1	Teaching Math 2	Total Hours
Semester		1	2	3	
12 + 4	Hours/week	5 hours/ week/ x	4 hours/ week/ x	4 hours/ week/x 16 weeks	192 hours
	Total hours				
12 + 2	Hours/week	16 weeks	16 weeks	48 hours	
	Total hours				
9 + 3	Hours/week	80 hours	48 hours	48 hours	
	Total hours				

In the new curriculum, the number of hours for math classes is 32 hours more for 12+2 than in the current curriculum. As of March 2023, the curriculum revision schedule for the 12+4 third and fourth year classes by DTE has not yet been determined, and TTC instructors are continuously teaching Teaching Math 3 and 4 under the old curriculum. The second phase of BEQUAL's action plan considers support for TTC development of materials for teacher upgrading programs, but support for TTC curriculum revision in the third and fourth years is not planned. However, support for TTC curriculum revision in the third and fourth years is not planned.

During the project period, supervision of the writing of course outlines and syllabi (including lesson plans and exercises) was provided by the project for the three math subject modules for the two years of the core program. The old TTC curriculum had only course outlines, and the details of the course content were not clear. In addition, each TTC instructor prepared their own lesson plans and teaching materials, so the content of the lessons was not standardized. In the new TTC curriculum, lesson plans include lesson objectives, time allocation, student evaluation methods, activities, and exercise questions and answers, which clarifies the content taught in each course and lesson and unifies lesson content at all TTCs.

Table 24 Overview of Mathematics Module

Year/Semester	Module	Contents
Year (Y1)/1 st semester	Basic Mathematics	<ul style="list-style-type: none"> • Primary mathematics concepts • Reinforcement of calculation skills and problem-solving skills through practice exercises
Y1/2 nd semester	Teaching Math 1	<ul style="list-style-type: none"> • Primary mathematics curriculum • Lesson planning • Lesson observation, feedback • Assessment • Lesson Study
Year (Y2)/3 rd semester	Teaching Math 2	<ul style="list-style-type: none"> • Primary Mathematics pedagogy • Teaching material development • Mock lesson, teaching practice

In order for teachers to check students' understanding and provide guidance during lessons, teachers themselves need to solve problems quickly and accurately. 52 hours out of 80 hours (65%) of the class time was devoted to exercises to strengthen TTC students' calculation skills and problem-solving abilities.

Table 25 Breakdown of Lesson Hours

Content domain	Topic	Lesson		Total teaching hours
		Lecture-based	Exercise-based	
1. Numbers and operations (26 hours)	1.1 Numbers	1	2	3
	1.2 Basic calculations and operations	3	6	9
	1.3 Decimals	1	2	3
	1.4 Fractions	2	4	6
	1.5 Currency	1	1	2
	1.6 Logic thinking	1	2	3
2. Quantities and measurement 1	2.1 Length, weight	1	2	3
	2.2 Time	2	2	4
	2.3 Average and speed	1	3	4
	2.4 Angles	1	1	2
3. Geometric figures	3.1 Plane figures	3	3	6
	3.2 Solid figures	2	2	4
4. Quantities and measurement-2	4.1 Area of plane figures	2	2	4
	4.2 Volume of solid figures	2	2	4
5. Mathematical relations	5.1 Ratio, proportion and percent	1	2	3
	5.2 Direct and inverse proportion	2	3	5
	5.3 Data collection and arrangement	2	3	5
6. Problem solving	6.1 Review exercises and exercises as preparation for exams	0	10	10
Total		28	52	80

In the old curriculum, time for lectures and exercises were not set apart, and the large number of items made it difficult for most TTC instructors to complete the entire course. With this revision, the items were carefully examined in order to acquire the mathematical knowledge and skills necessary to teach at primary schools, and after learning theory in lectures, practice problems were given in the exercise classes.

ກິດຈະກຳທີ 3: ການຄູນ (10 ນາທີ)

- ບຸກຄົນສຶກສາຊຸດໃນການຈຳເປັນກຽມຂຽນ ພວກເຂົາຕ້ອງໄດ້ເອົາໃຈໃສ່ໃນຈຸດດຽວກັນກັບ ການບວກ ແລະ ການລົບ ແລະ ຈຸດເປັນອີກເຊັ່ນ:
 - ຈຳເປັນການບຸກຄູນສູນຊຸດອັນດຽວກັນຂອງຕົວຕຽນ, ອາກກັບເລືອນໄປສູ່ກາລິຕິພົບ, ສູນຊຸດ ຍັດຊຸດ, ... ຂອງຕົວຕຽນ.
 - "ຂຽນຈຳເປັນຕາມຈຳແໜ່ງກອງຕັ້ງ ເປັນລະບຽບດີ" ແມ່ນມີຄວາມສຳຄັນຫຼາຍໃນ ການຄູນ.
- ຄູນບົດເລິກສູງລຸ່ມນີ້ສຳຄັນຫຼາຍ.

(1)	(2)	(3)
1 4	4 5	2 8
x 3 6	x 2 7	x 3 8 9
- ຈຳເປັນການຄູນ (1) ບຳກັບອັນດຽວກັນໂດຍເອົາໃຈໃສ່ໃນຈຸດຕ່າງໆດັ່ງນີ້.

1. ຈຳເປັນ $14 \times 6 = 84$.

2. ຈຳເປັນ $14 \times 30 = 420$.

3. ຈຳເປັນ $8 \times 2 = 10$.
- ໃຫ້ບັນທຶກສູນຊຸດຈຳເປັນການຄູນ (2) ແລະ (3) ເປັນລະບຽບດີ. ຈຳເປັນຕ້ອງຕັ້ງສູນຊຸດ ເພື່ອກວດວ່າບັນທຶກສູນຊຸດເປັນຕາມສຳເລັດບຸກຄູນ.

ສຳຄັນ: (2) 1215, (3) 10892

ສະຫຼຸບ ແລະ ປະເມີນ (10 ນາທີ)

- ໃຫ້ບັນທຶກສູນຊຸດບຸກຄູນທີ່ເປັນອັນດຽວກັນຂອງຕົວຕຽນ, ແລະ ຖາມເບິ່ງວ່າອັນດຽວກັນໃນບົດຄູນນີ້ທີ່ເຂົາເຈົ້າຈຳເປັນ ເອົາໃຈໃສ່ແຈ້ງ.
- ຊື່ໃຫ້ເອົາຈຸດສິດພາດ ແລະ ເອັດສິດເລືອກໃນບົດຄູນນີ້, ແລະ ໃຫ້ອະທິບາຍເພື່ອເຕີມກ່ຽວກັບ ສິດພາດດັ່ງກ່າວ.
- ສົງຄາມການສຶກສາກວດກາຄູນນັກຄູນ, ການສຶກສາກ່ອນ, ສຳຄັນ, ແລະ ສິນຄູ, ກວດວ່າ:
 - ມັກສຶກສາຄູນກັບສິດພາດໃນແຕ່ລະວິທີຕ່າງໆ.
 - ມັກສຶກສາຄູນກັບສິດພາດທີ່ຈຳເປັນຫຼາຍທີ່ສຸດ ແລະ ການເອັດສິດໃຫ້ເຊື່ອໝັ້ນທີ່ສຸດ, ແລະ
 - ມັກສຶກສາຄູນກັບສາມາດຈຳເປັນການຄິດໄລ່ບຸກຄູນ, ການເອັດ, ແລະ ການຄູນໄວ້ກ່ຽວ ຕ່າງໆ.
- ຢາກເອົາບັນທຶກບັນ. (ສຳຄັນແມ່ນຈະຢາກໃນຊຸດໂບດກູນນີ້)

ວຽກບ້ານ

1. ຄິດໄລ່ການບວກດຽວກັນ

(1) $12 + 34$	(2) $46 + 50$	(3) $30 + 40$
(4) $\begin{array}{r} 28 \\ + 56 \\ \hline \end{array}$	(5) $\begin{array}{r} 65 \\ + 29 \\ \hline \end{array}$	(6) $\begin{array}{r} 43 \\ + 37 \\ \hline \end{array}$
(7) $\begin{array}{r} 83 \\ + 75 \\ \hline \end{array}$	(8) $\begin{array}{r} 59 \\ + 64 \\ \hline \end{array}$	(9) $\begin{array}{r} 73 \\ + 67 \\ \hline \end{array}$
(10) $\begin{array}{r} 56 \\ + 44 \\ \hline \end{array}$	(11) $\begin{array}{r} 49 \\ + 58 \\ \hline \end{array}$	

2. ຄິດໄລ່ການລົບດຽວກັນ

(1) $68 - 32$	(2) $59 - 40$	(3) $71 - 21$
(4) $\begin{array}{r} 83 \\ - 18 \\ \hline \end{array}$	(5) $\begin{array}{r} 50 \\ - 23 \\ \hline \end{array}$	(6) $\begin{array}{r} 64 \\ - 57 \\ \hline \end{array}$
(7) $\begin{array}{r} 80 \\ - 73 \\ \hline \end{array}$	(8) $\begin{array}{r} 145 \\ - 32 \\ \hline \end{array}$	(9) $\begin{array}{r} 112 \\ - 41 \\ \hline \end{array}$
(10) $\begin{array}{r} 173 \\ - 58 \\ \hline \end{array}$	(11) $\begin{array}{r} 160 \\ - 23 \\ \hline \end{array}$	(12) $\begin{array}{r} 127 \\ - 49 \\ \hline \end{array}$
(13) $\begin{array}{r} 150 \\ - 64 \\ \hline \end{array}$	(14) $\begin{array}{r} 102 \\ - 37 \\ \hline \end{array}$	(15) $\begin{array}{r} 104 \\ - 9 \\ \hline \end{array}$

3. ຄູນ $>$ ຫຼື $=$ ຫຼື $<$ ໃຫ້ບອນຫວ່າງດຽວກັນ.

(1) $45 + 38$ <input type="checkbox"/> $29 + 57$	(2) $26 + 49$ <input type="checkbox"/> $16 + 54$
(3) $76 - 19$ <input type="checkbox"/> $94 - 36$	(4) $81 - 28$ <input type="checkbox"/> $14 + 39$

4. ຄິດໄລ່ການຄູນດຽວກັນ

(1) 12×4	(2) 3×13	(3) 11×8	(4) 4×12
(5) 5×17	(6) 6×14	(7) 13×7	(8) 3×18
(9) 7×14	(10) 15×6	(11) 10×7	(12) 6×10

5. ຕື່ມອ່ານທີ່ເຫມາະໃຫ້ບອນຫວ່າງດຽວກັນ:

(1) $4 \times 9 = 4 \times 8 +$ <input type="checkbox"/>	(2) $8 \times 7 = 8 \times 6 +$ <input type="checkbox"/>
(3) $7 \times 6 = 7 \times 7 -$ <input type="checkbox"/>	(4) $5 \times 6 = 5 \times 7 -$ <input type="checkbox"/>
(5) $3 \times 12 = 3 \times 10 + 3 \times$ <input type="checkbox"/>	(6) $7 \times 15 = 7 \times 10 + 7 \times$ <input type="checkbox"/>
(7) $14 \times 5 = 10 \times 5 +$ <input type="checkbox"/> $\times 5$	(8) $18 \times 6 = 10 \times 6 +$ <input type="checkbox"/> $\times 6$

Figure 8 Basic Mathematics Syllabi, Exercises (Excerpts)

The old curriculum for Teaching Math 1 consisted of general instructional content from the teacher's perspective and limited time to practice teaching methods. The new TTC curriculum focuses on student learning and has been changed to include content on how students learn math in primary school (connections within and outside each domain of math concepts, learning through each grade level), learning math according to primary school student's developmental stages, and understanding problem-solving lessons in math. Teaching Math 2 also includes the old curriculum items, the new curriculum selected content from the new primary school math curriculum and textbooks that are difficult for teachers to teach, allowing TTC students time to study the textbooks and practice teaching methods through mock lessons and teaching practice.

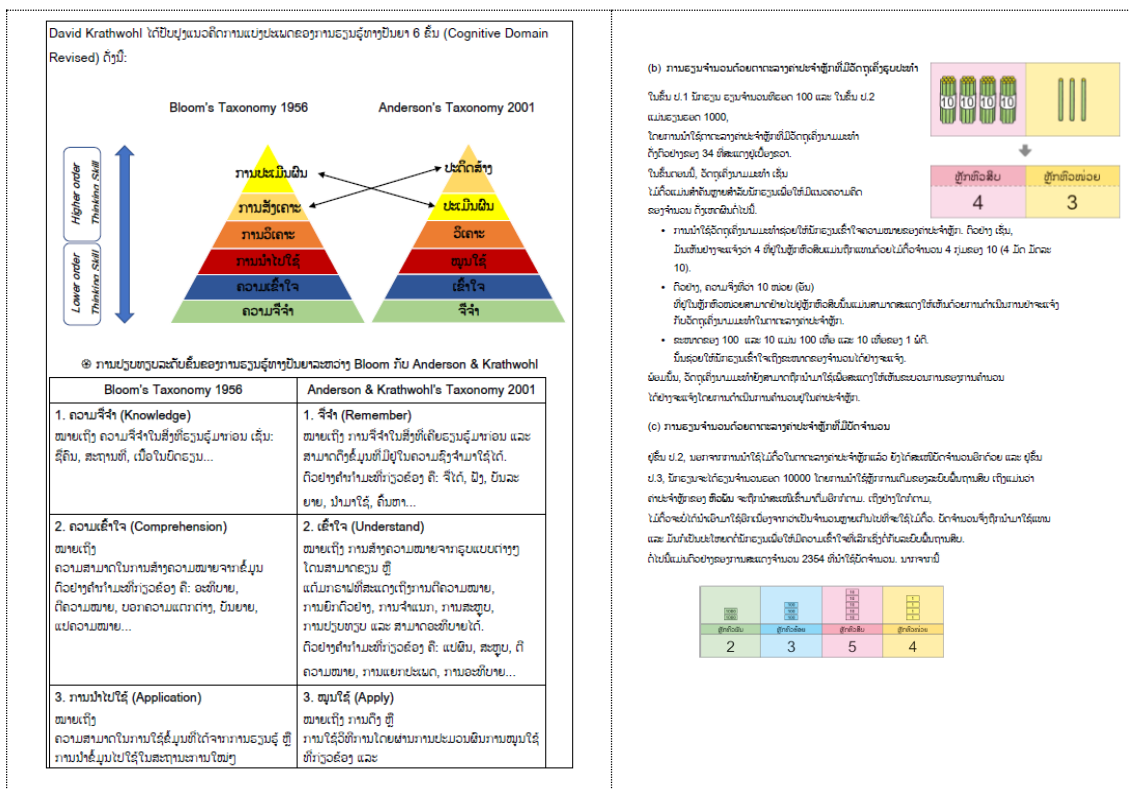


Figure 9 Figure 8 Teaching Math Syllabi (Excerpts)

Left: Teaching Math 1 (5.3 Bloom's Taxonomy),
 Right: Teaching Math 2 (2.1 Introduction the concept of place value)

3.3.2 Support for Introduction of New TTC Curriculum

Introduction and follow-up training was conducted for each module for TTC instructors at 8 TTCs to support the implementation of the new TTC curriculum.

**Table 26 Overview of Training on Introduction and Follow-up of
New TTC Curriculum**

Date	Content	Venue
October 10 - 12, 2020	Module 1: Basic Mathematics Training <ul style="list-style-type: none"> • Sharing the results of the TTC Student Math Assessment • Identifying challenges in teaching Basic Mathematics and providing guidance on those challenges • Creating an action plan to improve the teaching of Basic Mathematics 	Lecturer: Koji Takahashi/Mathematic Education 1/Online Participants: JICA Laos office
March 1 - 5, 2021	Module 1: Basic Mathematics Follow-up Training <ul style="list-style-type: none"> • Identifying issues in teaching Basic Mathematics and providing guidance on those issues Module 2: Teaching Math 1 Training <ul style="list-style-type: none"> • Explanation of the content of each chapter • Issues in teaching Teaching Math 1 • Developing an action plan to improve the teaching of Teaching Math 1 	Basic Mathematics Lecturer: Koji Takahashi/Mathematics Education 1 Teaching Math 1 Lecturer: Isamu Imahori/Mathematics Education 3/Online Participants: JICA Laos office
March 22 - 24, 2022	Module 3: Teaching Math 2 Training <ul style="list-style-type: none"> • Sharing the results of the TTC Student Math Survey • Explanation of the content of multiplication and division of fractions, area, and proportional and inverse proportion, and instruction on the challenges of teaching 	Lecturer: Koji Takahashi/Mathematic Education 1/Online Participants: JICA Laos office
March 15 - 17, 2023	Assessment <ul style="list-style-type: none"> • Introduction to Formative and Summative Assessment • Practice developing test questions for the TTC math curriculum 	RIES Lecturer: Koji Takahashi/Mathematics Education 1

Through the initial Basic Mathematics training, problems emerged in the TTC instructors' lack of subject knowledge, especially in the area of conceptual understanding, and their inability to observe TTC students and organize issues through this observation. Therefore, in each training session, the results of the TTC students' academic achievement survey and the challenges that the TTC instructors faced in teaching their classes were shared. In addition to this, the training lecturer explained the content of the issues that had been identified and shared their efforts to strengthen the TTC instructors' subject knowledge, including their understanding of concepts, and their awareness of the issues that TTC students face in their learning.

3.3.3 Assessment for TTC Students

A series of surveys of TTC students' basic math skills and understanding of teaching methods conducted during the project period are shown in Table 27.

Table 27 Overview of Surveys of TTC Student's Basic Math Skills and Understanding of Teaching Methods

Survey 1

Objectives	(i) Examine the academic improvement of Y2 through Year 4 (Y4) students under the old curriculum (ii) Compare the effect with the new curriculum
Period	Baseline: October 2017 End-line: October 2019
Target	(i) 2016 cohort in 8 TTC (old curriculum, Y2, Y4) (ii) 2016 cohort in 8 TTC (old curriculum, Y2, Y4) 2019 cohort in 5 TTCs (Luangnamtha, Pakse, Savannakhet, Dongkhamxang) (new curriculum, Y1)
Sample	(i) 352 (ii) 178
Survey tool	Test (91 questions, test A to F)
Findings	(i) Examine the academic growth of Y2 to Y4 students under the old curriculum. There was a slight but dominant improvement in computation and problem-solving skills between Y2 and Y4, but the computation and problem-solving skills of Y4 students are still at the level of G2 to G3. (ii) Comparing with the effects of the new curriculum The 2019 cohort's pre-test (before learning Basic Mathematics) results were lower than the 2016 cohort's Y2 test results, but the post-test (after learning Basic Mathematics) results were significantly higher than the Y4 test results.
Reference	Appendix 6 Comparative Analysis on the Results of Math Assessment Test for TTC Students (2016 and 2019 cohorts)

Survey 2

Objective	Examine the improvement in basic math skills under the new curriculum (Basic Mathematics)
Period	Pre-test: October 2019 Post-test: February 2020
Target	12+2 at 5 TTC (Luangnamtha, Pakse, Savannakhet, Dongkhamxang), 12+4 Y1 at Dongkhamxang
Sample	178
Survey tool	Test (91 questions, test A to F)
Findings	<ul style="list-style-type: none"> Calculation and problem-solving skills before and after taking Basic Mathematics increased significantly from a pre-test average of 42.8% to a post-test average of 54.4% (+11.5%) for 12+2 and from a pre-test average of 42.9% to a post-test average of 62.4% (+19.5%) for 12+4, which is a significant improvement, but calculation skills are still likely to be at the G3 level, and about 10% of students' calculation skills are likely to be lower than those of G2. Even on the post-test, 1 out of 10 students may have skipped certain chapters that they could answer without problems; more than 75% of students did not even attempt to answer some of the questions.
Reference	Appendix 6 Comparative Analysis on the Results of Math Assessment Test for TTC Students (2016 and 2019 cohorts)

Survey 3

Objective	Examine the improvement in understanding of teaching methods under the new curriculum (Teaching Math 2)
Period	Pre-survey: January 2021 (After lessons of 2019 cohort) Pre-test: November 2022 Post-test: January 2023
Target	12+2 Y2 at 7 TTC (Luangprabang, Khangkhay, Pakse, Savannakhet, Salavan, Dongkhamxang, Bankeun)
Sample	114
Survey tool	Test (16 multiple choices of examining understanding of new primary math curriculum, teaching methods)
Findings	There was a 9.3% increase in the average of the six schools in the post-test, but the overall average is still low (only three schools averaged 50%).
Reference	Appendix 7 Comparative Analysis on the Results of Math Assessment Test for TTC Students 2023 (2021 cohort)

3.4 Output 3 Teacher Education Component: INSET Training

3.4.1 New Curriculum Induction Training

(1) Overview

In order to implement the new curriculum, textbooks, and teacher’s guide in primary schools nationwide, it is necessary that not only primary school teachers, but also DESB Pedagogical Advisors (PAs), PESS technicians, TTC instructors, and other educational personnel who supervise and guide teachers, all have a basic understanding of the new curriculum. To this end, a two-tiered cascade of G1-5 textbook dissemination training was conducted during the project period. First, a Training of Trainers (TOT) for TTC teachers, PESS technicians, and DESB PAs, and a school-level training for teachers at each grade level were organized. These trainings were implemented at each grade level beginning in the 2018 school year, when the new G1 curriculum was introduced, and were completed for five grades during the project period. The project supported planning and materials development, and with some exceptions, TOT was basically funded by the MOES (RIES), while all school-level trainings were funded by the MOES (DTE), except for four pilot provinces in G1 and G2.

The cascade training implementation method is shown in the figure below.

Cascade Training for New Math Curriculum (Grade 1)

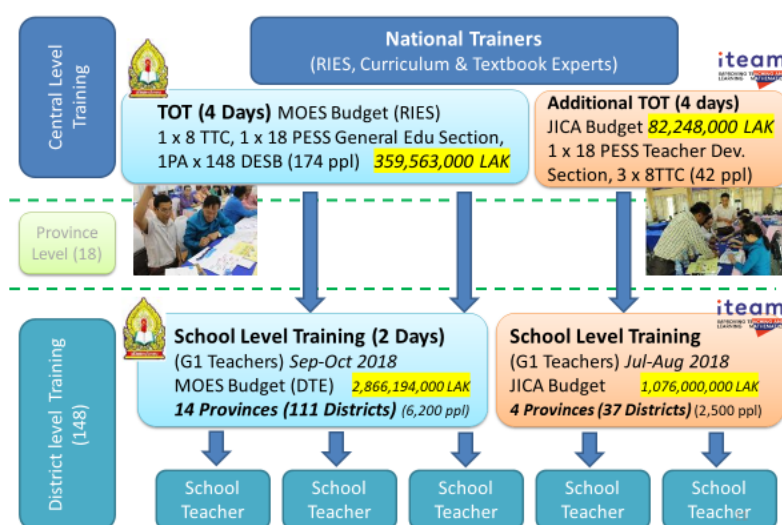


Figure 10 G1-2 Cascade Style Dissemination Training

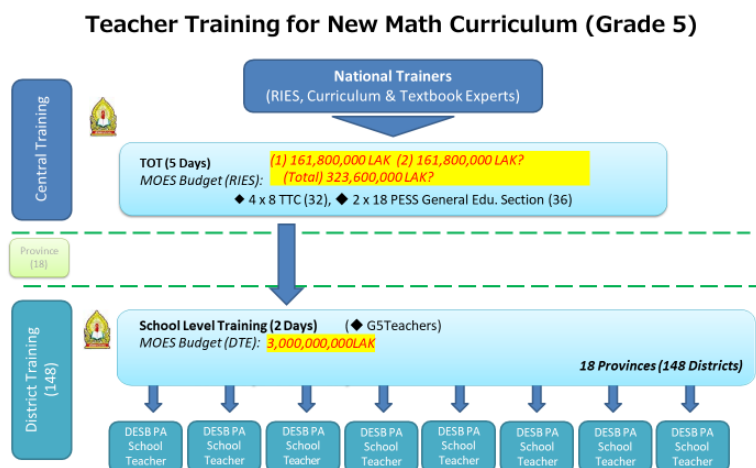


Figure 11 G3-5 Cascade Style Dissemination Training

(2) New Curriculum Induction Training: Implementation of TOT

The TOT was designed to facilitate the smooth implementation of the new curriculum in each province and district by promoting understanding of the new curriculum, and to identify the contents and implementation methods of school-level training for teachers and prepare them for implementation as planned. The project developed the training plan, developed training materials, trained trainers, and partially supported the implementation of the training, while MOES (RIES) was in charge of the implementation and management of the training; TOT for G1-G3 and G5 was funded by the RIES budget, and TOT for G4 was conducted online with the project budget in light of budget disbursement delays and travel restrictions due to COVID-19.

Since the induction training had to be completed by August, the period between the printing of the new textbooks and teacher's guides at CACIM and the start of the new school year, first the G1 and G2 TOTs were conducted with the budget of the MOES (RIES)²⁵ for PAs in each DESB (148 districts), PESS technicians in 18 provinces, and TTC instructors from 8 TTCs. G1 was the first TOT, so an additional TOT was conducted in May 2018 for math instructors (3 each) from 8 TTCs nationwide with a training budget contributed by the project (see Attachment 5 for participants). Although in the G3 and G5 TOT, the participants had to be limited to PESS technicians and TTC instructors as the full budget could not be secured and there were considerable delays in the allocation of funds due to COVID-19, the implementation from G1 to G5 was successfully completed during the project period. However, in 2021, when the G4 TOT was conducted, it was difficult to predict when the TOT could be conducted face to face due to the prolonged spread of COVID-19 and the extremely tight budget allocation. Therefore, the project rented a venue for online delivery of the TOT to TTC instructors, PESS technicians, and DESB PAs (see 3.7.1 for details).

The duration of the training varied from 2 to 5 days, depending on the grade, but for G5, the final year, the training was conducted for 5 days due to requests for a longer training period. Although the number of days varied, the first half of the training period for all grades was planned as trainees could learn the contents of textbooks and teacher's guides and how to use the materials through lectures and exercises, and the second half was planned to be used for microteaching (practice and discussion of a part of a lesson plan created by the group). See Attachment 5 for a list of TOT participants (TTC, PESS, DESB).

²⁵ In 2019, when the G2 TOT was implemented, the project partially paid for the DESB PAs because the full budget could not be secured.

Table 28 G1 Overview of TOT

Grade	G1	G2	G3	G4	G5
Period	April 2018	April 2019	July 2020	October 2021	1 st batch: 5 th -9 th December 2022 2 nd batch: 26 th - 30 th December 2022
Duration	4 days	4 days	4 days	2 days	5 days each
Participants	PESS technicians, TTC instructors, DESB PAs	PESS technicians, TTC instructors, DESB PAs	PESS technicians, TTC instructors	PESS technicians, TTC instructors, DESB PAs	PESS technicians, TTC instructors
Number of Participants ²⁶	PESS 18 TTC 8 DESB 148 Total: 174	PESS 18 TTC 37 DESB 148 Total: 203	DTE 8 DGE 4 RIES 19 PESS 36 TTC 32 Total: 99	DTE 1 RIES 2 PESS 36 TTC 33 DESB 23 Total: 95	1 st batch PESS 6 TTC 12 2 nd batch PESS 8 TTC 16 Total: 42
Remarks	Additional TOT was implemented from 8 th to 11 th May 2018 by the project budget for 24 TTC instructors (3 x 8 TTC)	Costs for DESB PAs were supported by the project	-	Implemented online due to COVID-19	Implemented for 2 batches due to the allocation timing of the budget
Contents	<ul style="list-style-type: none"> • Opening remarks • Introduction of new curriculum • Instruction of new textbook and teacher's guide (Numbers and operation, Quantities and measurements, Geometry, Mathematical relations) • Microteaching • Closing remarks 				



Figure 12 G5 TOT Microteaching

²⁶ Since the G4 TOT was conducted online, the number of participants = the number of people who responded to the questionnaire, and the actual number may be larger.

(3) New Curriculum Induction Training: Implementation of School-level Training

The TTC instructors, PESS technicians, and DESB PAs who participated in the TOT then conducted school-level training in their respective districts for teachers of their grade levels nationwide. The school-level training was conducted annually to familiarize teachers with the features of the new primary curriculum, the content structure of textbooks, and the use of teacher's guides, so that they can begin teaching with the new textbooks in the new school year. Since primary teachers in Laos are in charge of a fixed grade, with the exception of a few schools, the school-level training covered teachers in charge of each grade in approximately 8,000 public primary schools. Japanese experts and project staff accompanied the participants to the training sessions in the four pilot provinces, paid daily allowances and accommodation expenses, observed the progress of the training, the teachers' level of understanding, and the appropriateness of teaching materials, and provided advice as necessary. In addition, a TTC instructor trainer was assigned to each team as much as possible, and the TTC instructor provided support to the other trainers (PESS technicians and PAs). In the other 14 provinces and 111 districts, the MOES budget allocation to the DTE was delayed, which also pushed back the implementation period, but the DTE took the lead in completing the implementation of the 2-day MOES training program on its own.

The school-level training program was shortened from the TOT program to two days, while emphasizing time for practice as in the TOT. The standard program for school-level training was as follows.

Table 29 Two day School-level Training Program (G1 as example)

Day	AM	PM
Day-1	<ul style="list-style-type: none"> • Opening remarks • Introduction of new curriculum • Instruction of new textbook and teacher's guide • (1) Numbers and operations 	<ul style="list-style-type: none"> • Instruction of new textbook (1) Numbers and operations (cont.), (2) Quantities and measurements, (3) Geometry • Teaching methods • Preparation for microteaching (developing lesson plans)
Day-2	Microteaching (Lesson, discussion)	<ul style="list-style-type: none"> • Microteaching (cont.) • Evaluation, closing remarks

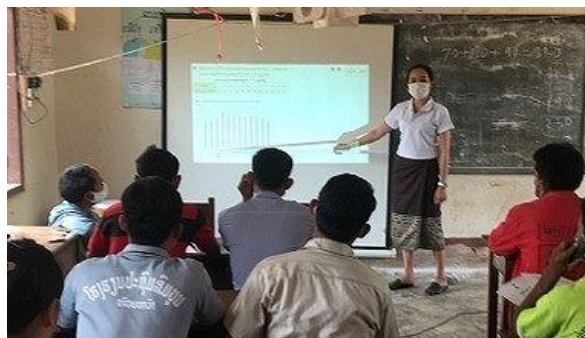


Figure 13 School-level Training

Japanese experts could not join G3 and G5 school-level training as the G3 school-level training in 2020 was held during COVID-19, and the G5 school-level training after January 2023 was held near the end of the project, and the training in an easily accessible district overlapped with another

training organized by the project. For the G4 school-level training, a Japanese member of the team accompanied the team to the training in Kaisone district in Savannakhet Province.

As a result of the monitoring, it was found that although the program emphasized the time for practice, the content became more advanced for upper grades, and in reality, most of the training time was spent just explaining the contents of the textbooks. In addition, at the G4 training textbooks and teacher's guides had not been printed in time for the training, and the rainy season often caused power outages in the rural areas, making it impossible to project the PowerPoint presentation. In light of this situation, for the G5 training, TOT materials in booklet were printed and distributed so that training participants could take notes and bring them home for repeated study (see 0 for details).

3.4.2 INSET Follow-up Activities after the School Level Training

(1) G1, G2 INSET Follow-up Activities

The school-level training for the introduction of the new curriculum was ad hoc and only for two days, making it difficult for the trainers to cover all contents about the new curriculum during the training and for the participants to understand everything. Therefore, it is important to establish a system to follow up with teachers after the induction training. During the project period, the effectiveness and necessity of an ongoing support system was verified through INSET pilot activities and follow-up training. First, after the introduction of the G1 and G2 curricula, pilot follow-up INSET activities were conducted in the four pilot provinces according to the following procedure.

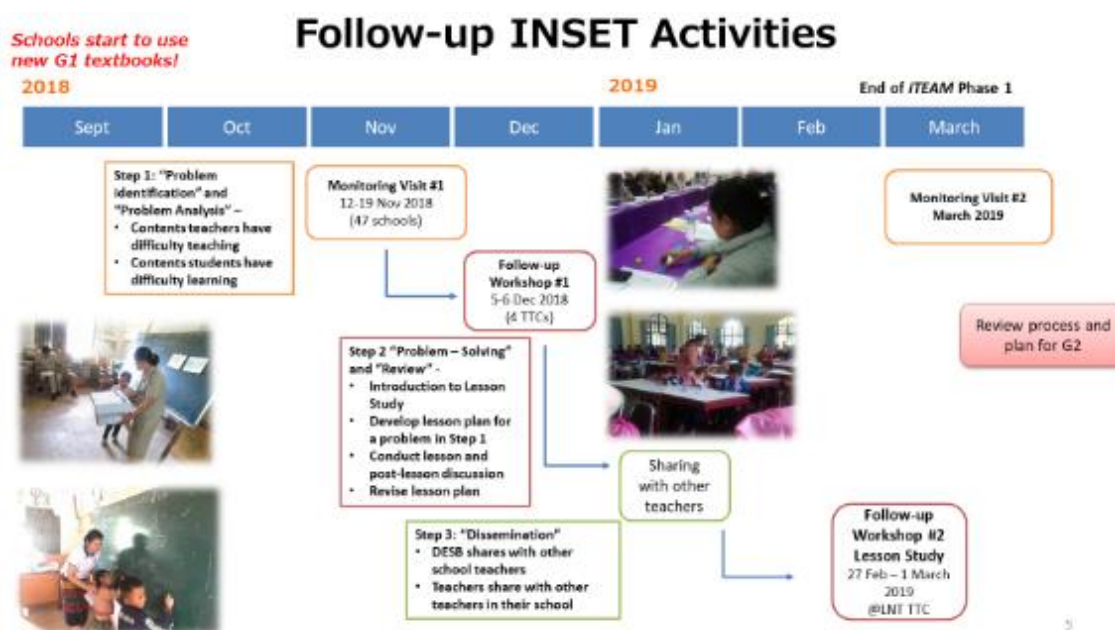


Figure 14 Flow of INSET Activities for G1, G2

“Step 1: Problem Identification and Analysis”: G1 monitored classes in one or two schools in each of the four provinces (47 schools in total) from November 12-19, 2018, and in G2 monitored classes in the core schools of the school cluster where the Cabinet Office was piloting school cluster²⁷ activities in the four provinces from November to December 2019, by the Math Team

²⁷ While the Cabinet Office was piloting the school cluster activity for 40 districts nationwide, the target districts within the four pilot provinces of the project were Vientiane Capital (Santhong District), Luangnamtha Province (Long

and school level training trainers (TTC instructors, PESS, DESB) and G2 were conducted jointly with G2 teachers in the school cluster. A simple test was administered to the students, and through lesson observations and interviews with teachers, meetings were held to discuss any problems in teaching.

In the monitoring, it was found that some teachers were working very hard to prepare teaching-learning materials and utilizing methods which they learned in the school-level training in their lessons. Whereas, issues such as the overall, teaching-learning materials for semi-concrete object manipulation such as bottle caps or straws were mostly used by teachers with little time for students, not enough instruction on how students should use their notebooks, and textbooks weren't being distributed to all students were also identified.

“Step 2: Problem-Solving”: A follow-up workshop was conducted at the 4 TTCs on December 5 - 6, 2018 for the G1 teachers, principals, and PAs from the schools visited in November. Findings from the monitoring (students' test results, lesson observation, and interviews) were reported, teaching methods for lessons on composition of numbers, addition and subtraction (G1 textbook Chapters 4 – 6) were reviewed, and Lesson Study was introduced as well as practiced (lesson plan development, conducting a demonstration lesson for G1 TTC demonstration school students, and a post-lesson discussion).

Table 30 G1 Follow-up Workshop Program

Date	AM	PM
1	<ul style="list-style-type: none"> Opening Ceremony Report on Monitoring Review of new textbook and teacher's guide (Chapters 4-6) 	<ul style="list-style-type: none"> Introduction to Lesson Study Development of lesson plan, discussion
2	<ul style="list-style-type: none"> Conducting demonstration lesson Post-lesson discussion 	<ul style="list-style-type: none"> Developing a plan for Lesson Study Training Evaluation, Closing Ceremony

G2 follow-up workshop was carried out in January and February 2020 at TTC's in the four provinces for one representative from each of the school clusters monitored above, G2 teachers, and PAs. The G2 workshop content was planned by the TTCs in the four provinces and reviewed the content of the new G1 and G2 textbooks.

Table 31 G2 Follow-up Workshop Program

Date	AM	PM
1	<ul style="list-style-type: none"> Report on school cluster activities Review of G1 contents 	<ul style="list-style-type: none"> Review of G2 contents Instruction on how to observe lessons
2	<ul style="list-style-type: none"> Lesson observation TTC demonstration school G2 Post-lesson discussion 	<ul style="list-style-type: none"> Developing action plan on the future school cluster activities

“Step 3: Dissemination”: During the above workshop, participants developed a plan for conducting Lesson Study at their schools to review teaching and learning methods as well as share what they learned in the workshop with other teachers in their school and network schools. In Savannakhet TTC and Salavan TTC, TTC instructors mainly shared their learning with neighboring cluster schools through Lesson Study. In April 2023, the project interviewed DESB and found out that schools in each cluster meet once each semester in Salavan district in Salavan

District), Savannakhet Province (Sepon, Nong, Ping, Xonbouly, and Phalanxay districts), and Salavan Province (Taoy, Laongam, and Lakongpheng districts).

province and Kaisone district in Savannakhet province, and once or twice each semester in Namtha district in Luangnamtha province, and that activities related to Lesson Study for math are conducted.

Additionally, from February 27 - March 1, 2019, the 2nd Follow-up Workshop and Lesson Study was conducted at Luangnamtha TTC. In total 150 participants consisting of DTE DG (Director General), DDG (Deputy Director General), RIES DDG, RIES Math team members, 4 TTC instructors from each TTC, 1 representative from each PESS, G1 TTC demonstration school teachers, teachers from surrounding schools, and TTC JOCVs attended. In addition, TTC science education JOCV member and the counterpart TTC instructors took the lead in conducting an introductory session on Lesson Study for TTC instructors and demonstration school teachers who were new to Lesson Study among the training participants, followed by a science Lesson Study session which was conducted in parallel with math.

Table 32 Follow-up Workshop and Lesson Study Program

Date	AM	PM
1	<ul style="list-style-type: none"> • Opening Ceremony • Reporting on Lesson Study activities (by each TTC), Introductory Course on Lesson Study 	<ul style="list-style-type: none"> • Continuation of Lesson Study activities (each TTC)/ Introductory Course on Lesson Study Activities • Lecture “Outcomes and issues of Lesson Study”, Prof. Hiroshi Ishii, Associate Professor, Hokkaido University of Education
2	<ul style="list-style-type: none"> • Observation of lesson at TTC primary demonstration school • Discussion • Development of lesson plans 	<ul style="list-style-type: none"> • Development of lesson plans, discussion • Micro-teaching
3	<ul style="list-style-type: none"> • Report on 2018 “Improvement of Quality of Education through Lesson Study” • Demonstration – lesson presentation • Post-Lesson Discussion 	<ul style="list-style-type: none"> • Continuation of Post-Lesson Discussion • Development of plan for Lesson Study • Training evaluation, Closing Ceremony

When making groups for the lesson plan development, participants from the same TTC were put into different groups, and experienced TTC instructors who are trainers were asked to facilitate, and G1 teachers who are actually using the new textbooks were put into each group. Since RIES math team members also participated, lesson plans were discussed from the viewpoint of “textbook makers” and “textbook users”.

On March 2 - 4, 2020, a Lesson Study workshop was held at Dongkhamxang TTC for all 8 TTC instructors and demonstration G1 and G2 teachers. On the first day of the workshop, Professor Maitree of Khon Kaen University, Thailand, gave a lecture on lesson study in Thailand and the Open Approach, which is similar to the problem-solving method of teaching. In addition, Savannakhet TTC instructor, and a doctoral student at Khon Kaen University, conducted a problem-solving lesson for G4 students at Dongkhamxang primary school, and participants deepened their understanding of problem-solving lessons through lesson observation. On the second day, the teacher in charge of G1 at Luangnamtha TTC demonstration school gave a lesson to G1 students at Dongkhamxang TTC demonstration school, and the teacher in charge of G2 at Dongkhamxang TTC demonstration school gave a lesson to G2 students at the same school. Participants observed each class and discussed ways to change the class to a problem-solving class based on their observations.

(2) INSET Follow-up Activities for TTC Instructors and TTC Demonstration School Teachers

Until around the beginning of 2020, training and workshops like follow-up training for the introduction of the new curriculum were conducted based on the monitoring activities described in (1) above, but at the same time, based on the results of surveys and on-site monitoring conducted in the latter half of the first phase and the beginning of the second phase, it was found that change in textbook alone does not directly lead to a short-term improvement in students' learning achievement. The logic was that being able to develop lessons in line with the features of the textbooks, as described in 3.2.6, would improve the quality of lessons and ultimately lead to an improvement in students' learning achievement.

Therefore, a training program was planned for teachers to be able to develop "student-centered" and "5 step lessons" using the new textbooks and teacher's guides at TTC demonstration schools and surrounding schools starting in 2021 and the training program was conducted 9 times from March 2021 to March 2023. The project supported the entire activity, from training planning to implementation and development of teaching materials. The first part of the training focused on the introduction and basics of the 5 step lessons for TTC instructors in the four provinces, and from 2022 onward, the training program was developed based on the problems that many teachers face in developing 5 step lessons, which were identified through video, mock lessons, and experimental lesson surveys (see 3.5 for details). Specifically, the training program was designed to combine theory and practice in order to implement the new 5 step lesson flow, including the class time allocation, textbook and teacher's guide page structure, how to present the problem of the day, the importance of achieving the objectives, the role of the teacher during self-solving, how students present during class, and how to plan and take notes on the board. In addition, each training session included time for micro-teaching and discussions to provide more technical input. In order to prevent gaps in the level of understanding among TTC, and because the project was able to utilize the International Agencies Grant for the training budget, the target participants were expanded to TTCs in 8 provinces from around October 2022, and teachers of demonstration schools were also included in the training.

Follow-up training conducted by the experts during the project period is shown in the table below.

Table 33 INSET Follow-up Training Conducted during the Project

No.	Period	Contents	Lecturer	Trainees	Venue
1	March 2021	- 5 step lesson - Lesson observation check list	Kenji Saito	TTC instructors at 4 provinces	Online
2	October 2021	- 5 step lesson - Time allocation of 45 minutes lesson	Kenji Saito	TTC instructors at 4 provinces	Online
3	February 2022	- 1 st half: Mock lesson on particularly difficult contents in G4 & G5 - 2 nd half: Lesson observation of G1-3 and mock lessons	Toshiakira Fujii	1 st half: RIES math team, TTC instructors at 8 provinces 2 nd half: TTC demonstration school at 8 provinces, National University of Laos G1-5 teachers	Online
4	March 2022	- How to present the problem of the day - Presentation in class - Blackboard planning	Kenji Saito	TTC instructors at 4 provinces	Online

No.	Period	Contents	Lecturer	Trainees	Venue
5	October 2022	- Introduction to 5 step lesson	Kenji Saito	Non-pilot TTC instructors	Online
6	October 2022	- Note-taking - Developing lesson plans - Mock lesson	Kenji Saito	TTC instructors at 8 provinces, TTC demonstration school G1~5 teachers	Dongkhamxang TTC
7	January 2023	- Mock lesson on particularly difficult contents in G4 & G5 - Lesson study	Toshiakira Fujii	TTC instructors at 8 provinces, TTC demonstration school teachers, National University of Laos G4 & G5 teachers	Don Chan Palace Hotel
8	February 2023	- Demonstration lesson from G1-5 - Post-lesson discussion	Toshiakira Fujii	TTC instructors at 8 provinces, G1 to 5 teachers at TTC demonstration school and National University of Laos	Bankeun TTC
9	March 2023	- Presentation board - Mock lesson	Kenji Saito	TTC instructors at 8 provinces, G1 to 5 teachers at 4 TTC	RIES

2-1. What is “Problem solving style lesson with five steps”

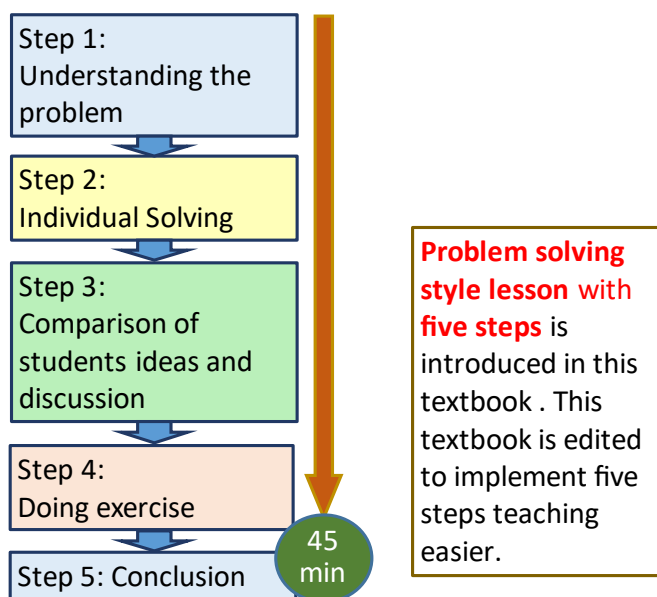


Figure 15 Flow of 5 Step Lesson

In developing the 5 step lesson, teachers as well as students need to change their attitude toward learning in lesson. The training also included content for creating teaching materials to change the mindset of both teachers and students. For example, in the past, there were many teacher-centered situations in which students listened to the teacher and copied what was written on the board, and when presenting their answers on the blackboard, they explained their answers to the teacher and not to the whole class, and the teacher explained his/her answers to the students. In order for students to take the lead in comparing and contrasting their own ideas, it is necessary to improve the basic attitude of the students, such as facing forward and presenting in a voice that can be heard by the entire class. The TTC instructors and teachers from the demonstration schools mastered the use of the pointer through the training, and whenever they play the role of a student

in a mock lesson, they always use the pointer to present their ideas at a volume that can be heard by the whole class.

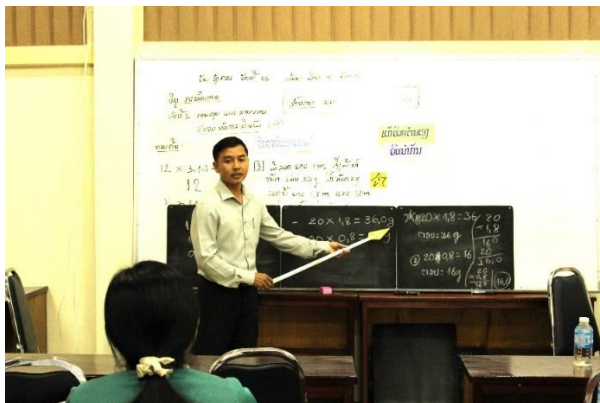


Figure 16 Trainees Using a Hand-made Pointer at Mock Lesson

The training emphasized not only the technical input from the instructors, but also the post-lesson discussion among TTCs after the mock lessons, which were facilitated by highly competent TTC instructors to encourage lively discussions. In particular, the fact that common issues faced by different TTCs were shared at the training session and how to improve them were discussed was very meaningful for the Lao counterparts to continue their activities on their own initiative. For example, while it is basically important to have the students summarize the conclusions of this session, the TTC instructors and demonstration school teachers who participated in the training had concerns that it might be difficult for Lao students in the current situation. It was discussed to put the ideas in order from the most predictable and general to the most desirable would facilitate student understanding at the summary stage.

The training participants were very satisfied with the content of the training, as they were able to deepen their understanding of the 5 step lesson flow, receive specific guidance on how to ask questions and use teaching materials in the lectures, and output during the training through the practice of mock lessons.

Each TTC instructor who participated in the training made an action plan on how to implement what they learned in the training, and then went on to conduct workshops and INSET activities at TTC demonstration schools and surrounding schools.

(3) INSET Follow-up Activities after the Training

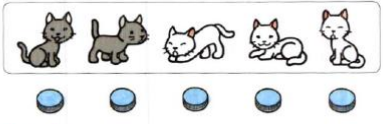
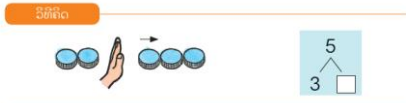
TTC instructors who participated in the INSET follow-up training planned and conducted workshops and lesson observations to disseminate the 5 step lesson mainly in the attached schools plus surrounding schools. Since the project focused on TTC demonstration schools and surrounding schools with the intention of continuing INSET activities in the surrounding schools, within the school cluster, even after the project finishes, the project did not provide financial support for travel and other activities, and instead focused on conducting consultations with the TTCs in the four pilot provinces from time to time to check the progress of activities and provide advice. The table below outlines the INSET activities conducted by the four pilot provinces during the project period.

Table 34 Overview of INSET Activities in Pilot 4 TTC

TTC	Activity	Challenges ²⁸
Salavan	Workshop on the implementation of 5 step lessons (target: TTC demonstration schools and surrounding schools) Day 1: Introduction of 5 step lessons, observation of lesson videos, lesson plan preparation Day 2: Lesson practice and discussion for G3 students of the TTC demonstration school Observation and review of lessons by TTC instructors at the demonstration school Training on 5 step lessons for TTC students (12+2, 12+4) in their final year of study before teaching practice.	Difficulty for the <u>teacher to compare and contrast ideas that come from students in self-solving²⁹</u> , or for the teacher to explain a student's idea (how he or she came up with the math sentence or answer) to other students
Savannakhet	Workshop on the implementation of 5 step lessons (target: TTC demonstration schools, surrounding schools, principals, and PAs) Introduction of the 5 step lesson, lesson observation, review meeting, group lesson plan preparation, and writing board plan Creation of WhatsApp group including teachers and TTC instructors Use as a communication tool for sharing lesson plans, comments, etc.	<u>Blackboard planning</u> <u>How to instruct on taking notes</u> Teachers are not fully implementing what they have learned in training in their lessons, and there is still a strong tendency to “teach.”
Luangnamtha	Developed a lesson plan for lesson improvement based on observation and analysis of students' challenges during the lesson. Lesson practice and review meeting TTC instructors and the principal of the demonstration school observed a lesson of G1. After discussing issues and ways to improve, the lesson plan was revised, and the lesson was conducted again for discussion.	Misusage of teaching materials Example 1: In a lesson on subtraction, the teacher presented a picture from the textbook, divided it into two pieces of paper, one black cat and one white cat, and put them on the blackboard. As a result, some students mistook it for addition instead of subtraction.

²⁸ The issues for which the project conducted training after collecting information from TTCs are underlined.

²⁹ While the original goal of the problem-solving lesson is to have one student write on the blackboard a solution and have another student think about it and explain it, a process called "reading the math sentence," it is still difficult to develop a student-centered class in Lao classrooms, where students are not yet familiar with the problem-solving class. The TTC members have voiced their concerns about the need for teacher intervention and guidance to some extent.

TTC	Activity	Challenges ²⁸
		<p>3 ມີແມວ 5 ໂຕ there are 5 cats ມີແມວຂາວ 3 ໂຕ there are 3 white cats ແມວດຳ ມີຈັກໂຕ how many are black cats ?</p>  <p>Example 2: Bottle caps are not prepared and used.</p>  <p>ປະໂຫຍກສັນຍະລັກ $5 - 3 = \square$ ຄຳຕອບ \square ໂຕ</p> <p>Resulted in TTC instructors supporting revising lesson plans and material development.</p>
Dongkhamxang	<p>Workshop on the practice of 5 step lessons (for teachers of demonstration schools) Day 1: Introduction of Lesson Study, issues in G3 lessons, introduction of new mathematics and teacher's guide, introduction of 5 step lessons Day 2: Practice, observation, and discussion of G1-G3 lessons Observation of a lesson at TTC demonstration school, JOCV provided advice on the development of the 5 step lesson (time allocation), and guidance on the preparation of teaching materials Guidance on preparation of teaching materials Observation and review of lessons at network schools in Bolikhamxay Province</p>	<p>Teachers' understanding of the <u>5 step lesson</u> is limited. Many teachers find it difficult to make students think and realize by themselves at the stage of <u>presenting a problem</u>. Many teachers concentrate on teaching the answers.</p>

The TTC instructors and teachers from demonstration schools who participated in the training have deepened their understanding of the 5 step lesson flow, and their behavior during the lesson has certainly changed compared to what it was before the training. On the other hand, there were still some common problems for both teachers and students in implementing the 5 step problem-solving class. For example, students don't know what to do during the self-solving time and did not attempt to work on the topics they had not studied yet, while teachers ignore the wrong answers given in the comparison and immediately teaches the correct answers. In order to enable students to reach the objective of the lesson, it is necessary for them to establish their skills through continuous activities. In order to implement a 5 step lesson in a 45-minute class period, it will be necessary to improve basic calculation skills and review previously learned material outside of the lesson.

To see how the lessons at the demonstration schools have changed as a result of the above-mentioned training and INSET activities, Chapter 4 and Appendix 8, "Result of Lesson Video Analysis" shall be referred.

3.5 Surveys

The initial plan for this project was to measure the effectiveness of the new math textbooks before and after the introduction (i.e., the level of achievement of students learning from the old textbooks and the new textbooks), but the end-line results of G1 showed that simply distributing the new textbooks and conducting induction training did not lead to short-term improvements in student achievement before and after the introduction of the new textbooks. In addition, the conventional method using the impact evaluation method required a survey of 1,000 students, and it was difficult to maintain a constant sample size considering the students' level of understanding and the teachers' backgrounds (e.g., multi-grade teachers, native language, etc.). Therefore, through discussions with JICA on December 11, 2020, the project decided to shift the focus of the survey from a design that emphasizes measuring the effects of textbooks on student achievement through a comparison of old and new textbooks to one that focuses on improving teachers' teaching methods and students' learning status in their lessons, which are the indicators of the project purpose, in line with the existing PDM. The results of the survey are presented in Chapter 4, see Appendix 9 for the results of Table 36 Student Survey.

Table 35 Teacher Survey

Survey 1

Objective	To assess the status of teachers' lessons using the new math textbooks.
Schedule	June 2021, without follow-up INSET training or activities February 2023, with follow-up INSET training or activities
Target	June 2021, without follow-up INSET training or activities 96 G3 teachers in pilot schools in 4 target provinces and surrounding schools near TTC February 2023, with follow-up INSET training or activities 64 G1-G5 teachers at 8 TTC
Survey item/tool	<ul style="list-style-type: none"> • Status of using textbook: questionnaire • Teaching skills: Teaching methodology test • Discussion about lessons: questionnaire
Reference	Result of teaching methodology test and questionnaire

Survey 2

Objective	To identify changes in the teaching methods of new math textbook lessons.
Schedule	November 2019 to March 2021, without follow-up INSET training or activities December 2022 to February 2023, with follow-up INSET training or activities
Target	November 2019 to March 2021, without follow-up INSET training or activities 8 G1 to G3 teachers in 4 pilot provinces December 2022 to February 2023, with follow-up INSET training or activities 11 G1-G4 TTC demonstration school teachers
Survey item/tool	Implementation of 5 step lessons using the new textbooks: lesson observation check list
Reference	Appendix 8 Result of Lesson Video Analysis

Table 36 Student Survey

Objective	To assess student understanding of lessons aligned with the new math textbook.
Schedule	September to October 2022
Target	G4 students at 3 pilot schools in Vientiane Capital Pre-test: 138 Post-test for Chapter 5: 222 Post-test for Chapter 7: 250
Survey item/tool	Test Chapter 5: 15 questions Chapter 17: 7 questions
Reference	Appendix 9 Results from G4 Experimental Study

A summary of the survey of TTC students' basic math skills and understanding of teaching methods for Output 2 is provided in 3.3.3.

3.6 Trial of Math Study App

The JICA math learning app “Math Master” was piloted from February 14-28, 2022, with 33 G3 students from Dongkhamxang TTC demonstration school in Vientiane capital. An orientation and baseline survey was conducted on the first day, the 14th, and an end-line survey on the 28th. Since schools in Vientiane had just reopened in early February after a 10-month break, students had forgotten what they had learned in G1 and G2, not to mention what they had learned in G3, and often struggled with addition and multiplication problems when the baseline survey was conducted. Whether or not students were taking online classes during the school break and whether or not they were reviewing what they had already learned at home could be one of the factors contributing to the disparity in student learning. In considering full-scale implementation, the main challenges are also the hardware aspects, such as maintenance and management of equipment and securing a budget for communication costs.

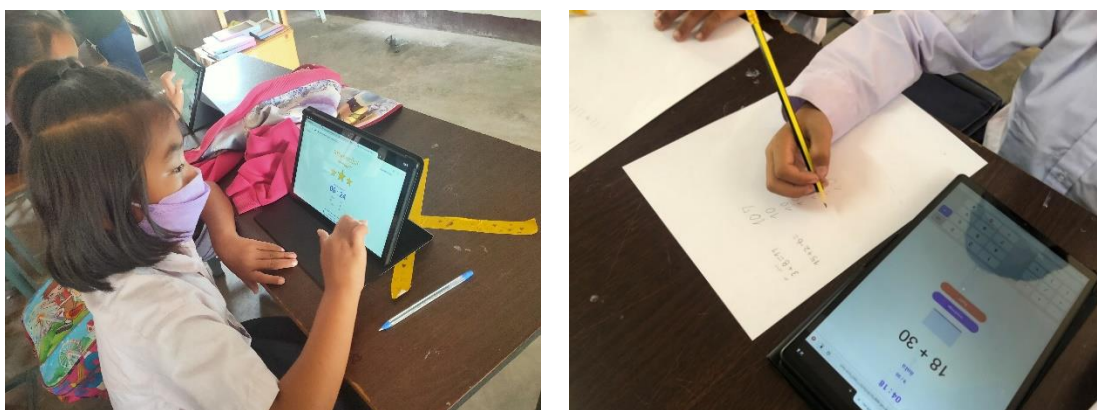


Figure 17 G3 Students at Dongkhamxang Primary school Using Math Study App

The tablet devices purchased for this activity were collected at the end of the trial, and the PDF data of the textbooks and teacher's guides for G1 to G5 were downloaded to all the devices so that they could be used when conducting the training for the project. Participants who did not have the paper textbooks/training manuals at hand were able to view the data.

At the end of the project, of the 43 tablets purchased, 11 were handed over to MOES (4 each to DTE and RIES, and 3 to DGE) and 4 each to TTC in 8 provinces, for a total of 32. The tablets will be used for recording and monitoring lesson videos, and for reviewing training materials and

videos posted on Khang Panya Lao, a digital online learning platform developed by UNICEF with the MOES.

3.7 Responses to the spread of COVID-19

3.7.1 Overview of COVID-19 Impacts and Countermeasures by the Project in Laos

The impact of COVID-19 in Laos was relatively short in the first half of 2020, with only a small number of new cases and a relatively short school closure period from late March to early May due to the lockdown compared to other countries that had severe travel restrictions due to the global spread of the disease. However, after COVID-19 infection was confirmed in the city in mid-April 2021 during the Pimai (Lao New Year holiday), the infection spread rapidly, and most schools were closed for nine months from that month to around January 2022. In February 2022, travel restrictions were eased and schools reopened, and international border measures were also eased. As of March 2023, life has almost returned to pre-COVID-19.

At the direction of JICA, all project experts switched to remote operations from March 2020. Japanese team members were unable to travel to the field until January 2021, and everything from meetings with counterparts and staff to textbook development work and training was conducted remotely using online tools (teams, zoom, etc.) and JICA's videoconferencing system. In addition, in 2021, the Lao government had imposed restrictions on travel between provinces, so online training was conducted by connecting experts in Japan with TTCs in the four provinces.

Additional activities conducted under COVID-19 and a summary of project operations in response to COVID-19 are listed below.

(1) Implementation of G4 TOT Online and Dissemination of Training Videos

The G4 TOT was conducted online on October 26 - 27, 2021 for TTC instructors and provincial PESS technicians in the four pilot provinces. The TOT had been basically funded by RIES, and the implementation of G3 in 2020 was postponed until the situation of the spread of COVID-19 was improved and the budget was allocated. At the introduction of G4, the project respected MOES's desire to finish the TOT and school-level training before the start of the new school year and conducted the training online, with the project bearing the cost of the budget, without waiting for budget allocations or improvement in the infection situation. However, since the new textbooks and teacher's guides had not yet been printed for schools, the latest PDF data were shared with TOT participants, and textbooks that had become available for purchase at the printing house were purchased by the project and distributed to each province. Since this was the first attempt to conduct the TOT online, concerns were raised mainly about the communication environment and equipment, so a venue was rented that was suitable for online training. As a result, the TOT was conducted over two days, and the participants were just as active as in the face-to-face sessions, asking many questions. Unlike training sessions that are held at large venues, online training, in which participants use their own devices, had some advantages unique to online training, such as it was easy-to-read whiteboard text and easy-to-hear lecturers' voices.



Figure 18 Online G4 TOT

After the TOT was conducted, the project edited the recordings of the online training into sections for each chapter and uploaded them to YouTube so that participants could review the training content repeatedly and teachers in each primary school could view them as training videos before the school-level training was conducted. The TTC/PESS in each province shared the YouTube links with primary school teachers via WhatsApp and also shared the YouTube link as a training video for review during the school-level training implementation. Some of the videos have been viewed more than 2,800 times as of March 2023 and are being used as training videos even after the TOT. Although this was the first attempt during COVID-19, it was helpful as a method of developing and disseminating educational materials for teachers in Laos, where videos of training contents were recorded as educational materials for teachers, uploaded to YouTube for viewing on smartphones, and disseminated via WhatsApp.

Table 37 Number of Views of G4 TOT Videos (As of 24 March 2023)

Title	Uploaded date	Number of views
Lesson 1: Numbers Greater than 10000	2021/11/26	2,880
Lesson 2: Approximate Numbers	2021/11/26	1,073
Lesson 3: How Quantities Change in Graphs – Broken Line Graphs	2021/11/26	659
Lesson 4: Division Algorithm ①	2021/11/26	545
Lesson 4: Division Algorithm ②	2021/11/26	218
Lesson 5: Rule of Calculation	2021/11/26	540
Lesson 6: Size of Angles	2021/11/26	412
Lesson 7: Decimal Numbers	2021/11/26	398
Lesson 8: Division	2021/11/26	411
Lesson 9: Perpendicular, Parallel and Parallelogram	2021/11/26	341
Lesson 10: Whole/Decimal Numbers and Fraction	2021/11/26	317
Lesson 11: How to Organize Data	2021/11/26	306
Lesson 12: Properties of Angles of Figures	2021/11/28	298
Lesson 13: Multiples and Factors	2021/11/29	489
Lesson 14: Properties, Addition and Subtraction of Fraction	2021/11/29	521
Lesson 15: Letters and Math Sentences	2021/11/29	508
Lesson 16: Investigating Changes	2021/11/29	501
Lesson 17: How to Measure and Express Area	2021/11/29	677
Lesson 18: Cubes and Cuboids	2021/11/29	304
Grade 4 New Textbook and Teacher guide	2021/11/29	242
Problem Solving Style Lesson with Five Steps	2021/11/29	300
Q & A No.1 “Division $349 \div 28$ ”	2021/12/09	105
Q & A No.2 “The angle of the triangle”	2021/12/09	224

3.7.2 Implementation of Activities Under COVID-19

In order to keep operations running while preventing infection in offices where large numbers of counterparts and staff work, the following measures were taken.

(1) Prevention on Infection

Since March 2020, the following infection prevention measures were taken to prevent infection among counterparts and staff.

- a) Project offices: Installation of disinfectant solutions in offices, regular ventilation
- b) Personal infection control support: distribution of non-woven masks
- c) Exceptional measures for time and attendance management: introduction of telecommuting

(2) Implementation of Remote Textbook Writing

In this project, the manuscript writing for the four sets of pilot textbooks was divided into one trip by Japanese experts to Laos and three training sessions in Japan until 2019. The G5 pilot textbook writing was also planned to be conducted in three sessions from June to December 2020, but the Japanese training for textbook writing was postponed and a method of conducting the training without travel to Japan was considered. As a result, the training was conducted online, through connecting JICA headquarters and JICA's Laos office via video conference room, from June to December of the same year. At the beginning of each chapter, Mr. Ogasawara gave advice on points to keep in mind when writing the manuscript and explained the contents according to the table of contents for each chapter. On the day of the videoconference with the Japanese experts, the trainees scanned the manuscript and shared it with the Japanese side as PDF data. The Japanese side verbally communicated revisions while looking at the printed document and checking the document as well. The checked manuscript was also shared with the Lao side as scanned PDF data, and the trainees worked on the revisions. The JICA Laos office prepared a workroom for the trainees so that the instructor could instruct one trainee who was in charge of writing the manuscript while the other trainees could concentrate on revising the manuscript based on the feedback. The trainees were able to come back to the videoconference room immediately if they had any questions and solve them on the spot, resulting in high satisfaction among the trainees that the training environment was as close to the Japanese training environment as possible, even at a distance. As a result, each trainee was able to write his/her assigned manuscript during the planned schedule, although with some inefficiencies compared to the face-to-face training.

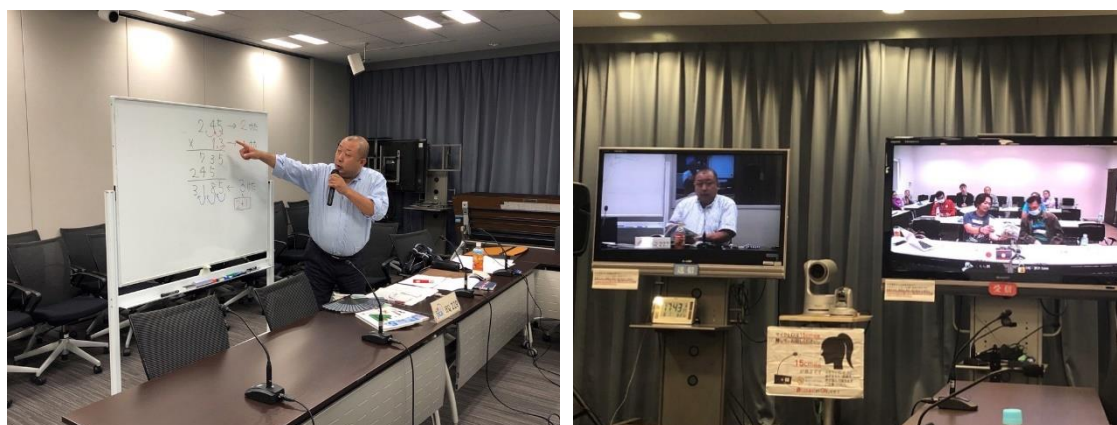


Figure 19 Remote Textbook Writing Workshop

3.8 Management of the Project

3.8.1 JCC

The decision-making body of the project is the Joint Coordination Committee (JCC) which is called the Steering Committee (SC), in the context of Laos, and is chaired by the Vice Minister of MOES. This SC Meeting (SCM) was held 13 times, and has discussed and confirmed the project's progress, revised workplan, findings from monitoring, and other important and relevant issues, such as budget for printing mathematics textbook and teacher's guide, delivery mechanism for textbooks and teacher's guide, teacher training on new curriculum, influence of COVID-19 on learning, and other issues. The summary of the SCM is shown in Table 39 below. This committee has also been working as a coordination body not only for the Mathematics subject but other parties as well, since curriculum issues together with teacher training are cross-cutting issues involving different departments under MOES.

Table 38 SC Executive Committee Members

Executive Committee (Based on MOES on August 27, 2018)		
1.	H.E. Dr. Sisouk Vongvichith, Vice Minister of MOES	Chairman
2.	Dr. Onekeo Nuannavong, DG of RIES	Vice Chairman
3.	Ms. Khampaseuth Kitignavong, DG of Department of General Education	Member
4.	Mr. Keth Phanhlack, DG of Department of Teacher Education	Member
5.	Dr. Bounpanh Xaymounry, DG of Department of Planning	Member
6.	Ms. Dala Phakonekham, DG of Department of Finance	Member
7.	Ms. Silinthone Saklokham, DG of External Relations	Member
8.	Mr. Toshio Nagase, Chief Representative of JICA Laos Office	Member

*Executive Committee members listed are as of the date of report submission in April 2023.

Table 39 Summary of JCC/SC

Date	Event (Venue)	Summary
June 9, 2016	Launching Ceremony (RIES)	Co-chaired by: H.E. Associate Professor Dr. Kongsy Sengmany, Vice Minister, MOES Mr. Yusuke Murakami, Chief Representative, JICA 1) Opening Ceremony 2) Presentation about JICA Mathematics Project 3) Issues from JICA Mathematics Project Team 4) Closing Ceremony
August 19, 2016	Steering Committee 1 (RIES)	Co-chaired by: H.E. Lytou Bouapao, Vice Minister, MOES Mr. Yusuke Murakami, Chief Representative, JICA 1) Opening Ceremony 2) Progress of JICA Mathematics Project 3) Approval of the Project Work Plan (Revised) 4) Project Abbreviation: iTEAM: Improving Teaching and Learning Mathematics for Primary Education 5) Amendment of Steering Committee Membership 6) Mathematics Textbook/Teacher's Guide printing & Delivery 7) Closing Ceremony
October 17, 2016	Steering Committee 2	Co-chaired by: H.E. Lytou Bouapao, Vice Minister, MOES

Date	Event (Venue)	Summary
	(RIES)	Ms. Saeda Makimoto, Senior Representative, JICA 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan (Revised) 4) Mathematics Textbook/Teacher's Guide Development Process 5) Mathematics Textbook/Teacher's Guide Printing & Delivery 6) Closing Ceremony
February 2, 2017	Steering Committee 3 (RIES)	Co-chaired by: H.E. Associate Professor Dr. Khamphay Sisavanh, Vice Minister, MOES Ms. Saeda Makimoto, Senior Representative, JICA 1) Opening Ceremony 2) Progress of iTEAM Mathematics Project 3) Approval of the Project Work Plan (Revised) 4) Mathematics Textbook/Teacher's Guide Printing & Delivery 5) Closing Ceremony
September 29, 2017	Steering Committee 4 (RIES)	Co-chaired by: H.E. Associate Professor Dr. Khamphay Sisavanh, Vice Minister, MOES Mr. Yoshiharu Yoneyama, Chief Representative, JICA 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan (Revised) 4) Mathematics Textbook/Teacher's Guide Printing & Delivery 5) Closing Ceremony
March 5, 2018	Steering Committee 5 (RIES)	Co-chaired by: H.E. Associate Professor Dr. Khamphay Sisavanh, Vice Minister, MOES Mr. Shunsuke Sakudo, Senior Representative, JICA 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Mathematics Textbook/ Teacher's Guide Printing & Delivery 5) Closing Ceremony
September 21, 2018	Steering Committee 6 (RIES)	Co-chaired by: H.E. Associate Professor Dr. Khamphay Sisavanh, Vice Minister, MOES Mr. Yoshiharu Yoneyama, Chief Representative, JICA 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Mathematics Textbook/ Teacher's Guide Printing & Delivery 5) Follow-up INSET 6) Closing Ceremony
February 18, 2019	Steering Committee 7 (RIES)	Co-chaired by: H.E. Associate Professor Dr. Khamphay Sisavanh, Vice Minister, MOES Mr. Yoshiharu Yoneyama, Chief Representative, JICA Dr. Keiko Mizuno, Education Advisor, JICA 1) Opening Ceremony 2) Progress of iTEAM Project

Date	Event (Venue)	Summary
		3) Approval of the Project Work Plan 4) Mathematics Textbook/ Teacher's Guide Printing & Delivery 5) Budget of G2~G5 Mathematics textbook 6) Closing Ceremony
November 22, 2019	Steering Committee 8 (RIES)	Co-Chaired by: H.E. Associate Professor Dr. Phout Simmalavong, Vice Minister Ms. Sanada, JICA Senior Representative, and Dr. Mizuno, JICA Specialist 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Mathematics Textbook/ Teacher's Guide Printing & Delivery 5) Budget of G3~G5 Mathematics textbook 6) Discussion on indicators for revised PDM 7) Discussion on induction training for new G3
March 10, 2021	Steering Committee 9 (Laos: MOES, Japan: Online)	Co-Chaired by: H.E. Associate Professor Dr. Phout Simmalavong, Vice Minister Ms. Sanada, JICA Senior Representative 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Budget of G4~G5 Mathematics textbook 5) Discussion on induction training for new G4~5 6) Discussion on indicators for revised PDM
October 20, 2021	Steering Committee 10 (Laos: RIES, Japan: Online)	Co-Chaired by: H.E. Dr. Sisouk Vongvichith, Vice Minister Mr. Nagase, JICA Chief Representative 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Budget of G4~G5 Mathematics textbook 5) Discussion on induction training for new G4~G5 6) Discussion on extension of the project
May 11, 2022	Steering Committee 11 (Laos: RIES, Japan: Online)	Co-Chaired by: H.E. Dr. Sisouk Vongvichith, Vice Minister Mr. Nagase, JICA Chief Representative 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Budget of G4~G5 Mathematics textbook 5) Discussion on induction training for new G4~G5 6) Introduction of new G5 textbook from the new school year
October 4, 2022	Steering Committee 12 (RIES)	Co-Chaired by: H.E. Dr. Sisouk Vongvichith, Vice Minister Mr. Nagase, JICA Chief Representative 1) Opening Ceremony 2) Progress of iTEAM Project 3) Approval of the Project Work Plan 4) Remaining tasks towards the end of the project 5) Discussion on follow-up for G5 students 6) Discussion on follow-up for teachers

Date	Event (Venue)	Summary
March 21, 2023	Steering Committee 13 (Don Chan Palace Hotel)	Co-Chaired by: H.E. Dr. Sisouk Vongvichith, Vice Minister Mr. Nagase, JICA Chief Representative 1) Opening Ceremony 2) Achievement of the project purpose 3) Output, challenges and recommendations from the project

3.8.2 Donor Coordination

MOES is supported by DFAT (BEQUAL), UNICEF, GPE and JICA (this project) to improve the quality of primary education. While this project supports the field of mathematics education, BEQUAL supports other subjects than mathematics, and UNICEF supports in the field of assessment, as well as the operational unit of GPE's COVID-19 emergency fund and the operational unit of International Agencies Fund. In order to align the progress of the development of teaching materials and the specifications of the results, the three parties or two parties discussed and coordinated their efforts. The areas and groups of activities coordinated are as follows.

Table 40 Coordinating Activities

BEQUAL	Textbook and Teacher's Guide Development	<ul style="list-style-type: none"> Curriculum Material distribution: BEQUAL is planning to provide materials needed for the major subjects (mini-blackboard and Lao language poster) to all primary schools when the new textbooks are distributed. Coordinated with BEQUAL to include math materials (number cards and large triangle ruler for teacher) in the list.
	INSET	<ul style="list-style-type: none"> School-level training in mathematics was preceded, hence information sharing on training budgets, implementation methods, and follow-up training was carried out.
	PRESET	<ul style="list-style-type: none"> TTC Curriculum Revision: iTEAM is providing technical support to TTC math curriculum writers by providing feedback on outputs from workshops organized by BEQUAL and DTE and will also conduct additional workshops for the math curriculum writers during iTEAM's mathematics expert's field assignments. TTC math teacher's capacity development: iTEAM has been providing technical support to BEQUAL and DTE for the TTC PDP Key Trainer's Workshops by presenting with RIES math team on the new mathematics curriculum and textbooks and also facilitated a session on Lesson Study with Savannakhet TTC instructors.
UNICEF	Assessment and textbook distribution	<ul style="list-style-type: none"> Participated in meetings organized by UNICEF and RIES to share ideas on assessment. iTEAM and JICA Education Policy Advisor have consulted with UNICEF on textbook management and distribution to learn from their past experience.
	Khang Panya Lao	<ul style="list-style-type: none"> The textbooks and teacher's guides for G1-5 developed by the project, as well as from TOT training materials, are posted on the digital learning platform "Khang Panya Lao (warehouse of knowledge)" jointly developed by the MOES and UNICEF. The platform is accessible at any time to counterparts, school teachers and students so that they can repeatedly learn the contents.

	GPE COVID-19 Emergency Fund	<ul style="list-style-type: none"> On behalf of the MOES, which had difficulty securing and distributing a budget for the printing and distribution of textbooks and teacher's guides for G3-G5 due to the COVID-19, the math textbooks were printed and distributed to each DESB for introduction in public primary schools nationwide.
	International Agencies Grant	<ul style="list-style-type: none"> To further enhance the learning effects of the training, G5 TOT training materials were made into booklets and 8,000 copies were printed for G5 teachers nationwide and distributed to each G5 teacher during the school-level training. Three INSET follow-up trainings for this project were conducted with the help of the grant. Each training included a session on how to use Khang Panya Lao on the last day, and the participants of the INSET follow-up trainings (mainly RIES, TTC teachers, teachers from TTC demonstration schools, etc.) learned how to develop lessons using digital teaching materials.

3.8.3 Public Relations

In order to introduce the new curriculum and textbook, it is necessary for a wide range of people and stakeholders to understand the meaning and purpose of the activities. Therefore, iTEAM has been implementing public relations activities during this project period. iTEAM started a Facebook page in July 2017 and posted news for sharing project news.

Table 41 Public Relations Activities

	Target	Component	Means	Place	Time
1	Nationwide	Inform about the distribution of textbooks and beginning of use	RIES TV, Newspaper (Vientiane Times)		Distribution time G1: September 2018 "Education and Sports TV" "New Education (Seuksa Mai)", International Day of Mathematics (14 th March)
2	Teachers, Education officers, TTC instructors	Sharing experiences of using new textbooks (lesson experience stories, photos from lessons, school visits etc.)	Facebook	Facebook page	All year round
3	Teachers, Education officers, TTC instructors	Raise awareness to education stakeholders in order to introduce new textbooks and gain an understanding of the project activities	Bag, Polo-Shirt, Sticker		During new textbook induction training
4	Laos people, Japanese people, Others	Photos and reports about the project (in Lao language, English, Japanese)	Facebook	Facebook page (JICA Laos Office, iTEAM)	All year round
5	Japanese people, Japanese teachers	Progress and results of the project activities	Web	JICA homepage, Tokyo Shoseki webpage	All year round



Bag



Polo-shirt



New G1 Textbook Promotion Video



And new revised Mathematics textbook and teacher's guide

Articles of Introducing Project Activities on Vientiane Times



"Online Training on Problem-solving Style Lessons Using New Mathematics Textbook by JICA ITEAM"

Since 2016, "The Project for Teaching and Learning Mathematics (ITEAM)" by JICA has been working with the Ministry of Education and Sports to develop a new primary mathematics curriculum, textbooks and teacher's guides, and to provide primary school teachers with training. The new primary mathematics curriculum is designed to be student-centered where each student can think independently and develop problem-solving skills through mathematics. JICA has been supporting the development of such "problem-solving style lessons" in other countries.

JICA ITEAM conducted an online training for developing problem-solving style lessons using the new math textbook at Crowne Plaza Hotel in Vientiane from 17th to 23rd February 2022 with participants from the Ministry of Education and Sports, Teacher Training College (TTC) trainers and demonstration school teachers from all 8 TTCs, and National University of Laos Faculty of Education demonstration school teachers.

The training lecturer, Professor Emeritus Toshikazu Fujii at Tokyo Gakugei University, participated online from Japan and gave a lecture on problem-solving style mathematics lessons. Using lesson videos, he pointed out some common problems that can be found in conventional teacher-centered math lessons at primary schools in Laos and discussed ways to improve the lessons with the participants. Additionally, participants had the opportunity to practice teaching skills used in problem-solving style math lessons, such as how to pose questions, praise students, and have students present their ideas. Professor Fujii emphasized to the participants that students are the main actors in problem-solving style lessons and that the teacher's role is to assist the students to think and discover key ideas on their own. The training participants exchanged opinions with teachers from other provinces with whom they have had less contact with since the spread of COVID-19 and learned about the philosophy of the new textbooks and how to develop problem-solving style mathematics lessons through the training.

JICA ITEAM will continue to support teacher trainings for TTC instructors and primary school teachers in Laos until the end of the project in April 2023.



Japan supports Lao primary schools to mark International Day of Mathematics

Education Day in Laos. The new textbooks are quite similar to those used in other countries, and it is easier to adapt to the curriculum. The new textbooks are quite similar to those used in other countries, and it is easier to adapt to the curriculum. The new textbooks are quite similar to those used in other countries, and it is easier to adapt to the curriculum.

Figure 20 Examples of PR Activities

Facebook Page: <https://www.facebook.com/jicalaoiteam>

Articles have been posted on the G1 Textbook Hand-Over Ceremony by the Minister of Education and JICA Laos Office Chief Representative, G1 School Level Training, and Baseline Survey.



Figure 21 iTEAM Facebook Page

Chapter 4 Achievement of the Project

4.1 Achievement of PDM

As explained in 1.2.3, indicators for the Project Purpose were set taking into consideration results from the G1 End-line Survey and monitoring activities during phase 2. Achievement status of each indicator specified in PDM2 are presented in the table below.

4.1.1 Achievement of Overall Goal

The status of achievement of the indicator at the end of the project is as follows. Due to the COVID-19 pandemic, ASLO was not conducted during the project period and therefore the indicator could not be measured, however it is expected the indicator can be achieved in the future.

Indicator	Status of Achievement
Results of Grade 3 ASLO are higher than previous Grade 3 ASLO.	As ASLO was postponed until around May 2023, this indicator could not be measured during the project period. One major reason for this was the restrictions of project activities due to the COVID-19 pandemic that began in March 2020, but an even greater constraint was the lack of normal classes at schools. The distribution of textbooks is not the end of the project. If teachers and students can become more familiar with the new learning methods in math through continuous support, although achieving the indicator in the upcoming ASLO in 2023 may be difficult, it is expected that the effects of the project will be seen in the next ASLO in 2025. Follow-up activities after the project completion will be extremely crucial during the next two years.

4.1.2 Achievement of Project Purpose

Status of achievement of the Project Purpose is shown in the table below.

Project Purpose	Indicator	Status of Achievement
Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.	(1) Status of proper use of textbooks by teachers	Achieved
	(2) 10% point improvement on average score in Teaching Methodology Test	Partially achieved
	(3) 50% of Grade 1 - Grade 4 TTC demonstration school teachers in pilot provinces achieve Level 1 (half of Lesson Observation Checklist criteria)	Achieved

Regarding the first indicator, teachers who had not received follow-up training after the introduction of the new textbooks responded "Seldom" or "Sometimes" to 5 out of 8 items, while the latter responded "Very often" to 5 out of 8 items. In the item "Giving students time to read the textbook during class", 35% of the teachers chose "seldom", while 33% and 34% of the teachers chose "sometimes" for the items "giving students time to solve all the exercises during class" and "giving students homework", respectively.

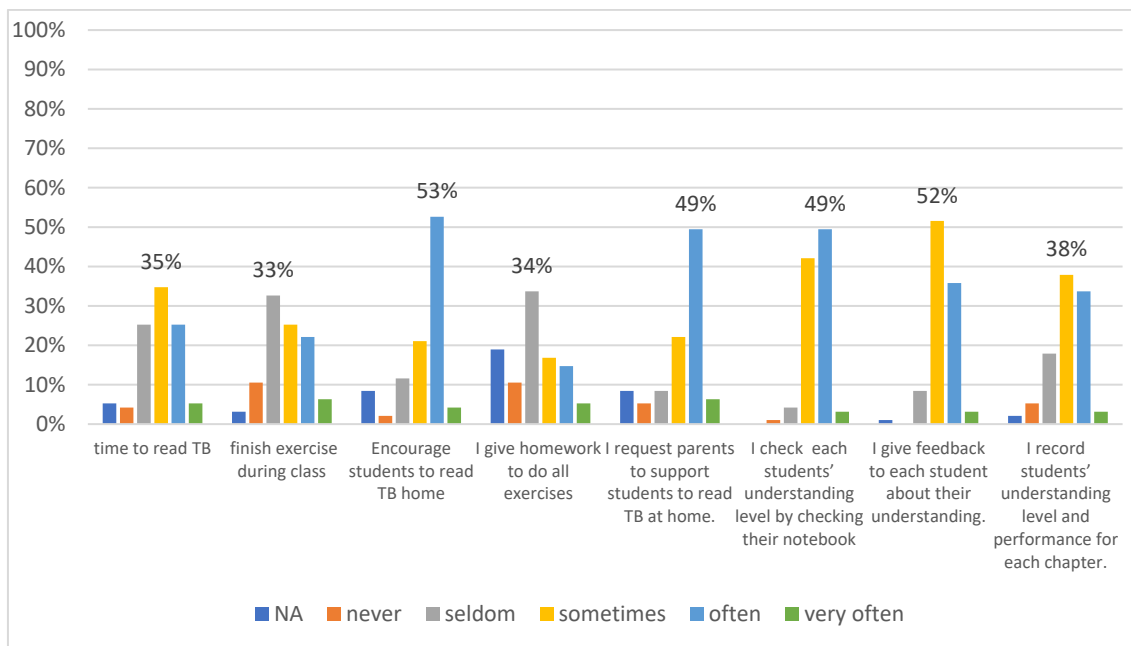


Figure 22 Textbook Usage (Teachers Without Follow-up Training)

Meanwhile, the group of teachers who received follow-up training used textbooks more appropriately than the group of teachers who did not receive follow-up training in five of the eight questions (having students solve all practice problems in class, having students take textbooks home to read, having parents help students read textbooks at home, checking students' notebooks for understanding, recording students' understanding for each chapter). In each of these five question items, 28% (+23%³⁰), 55% (+51%), 66% (+60%), 48% (+45%), and 36% (+33%) of teachers responded, "Very often", respectively.

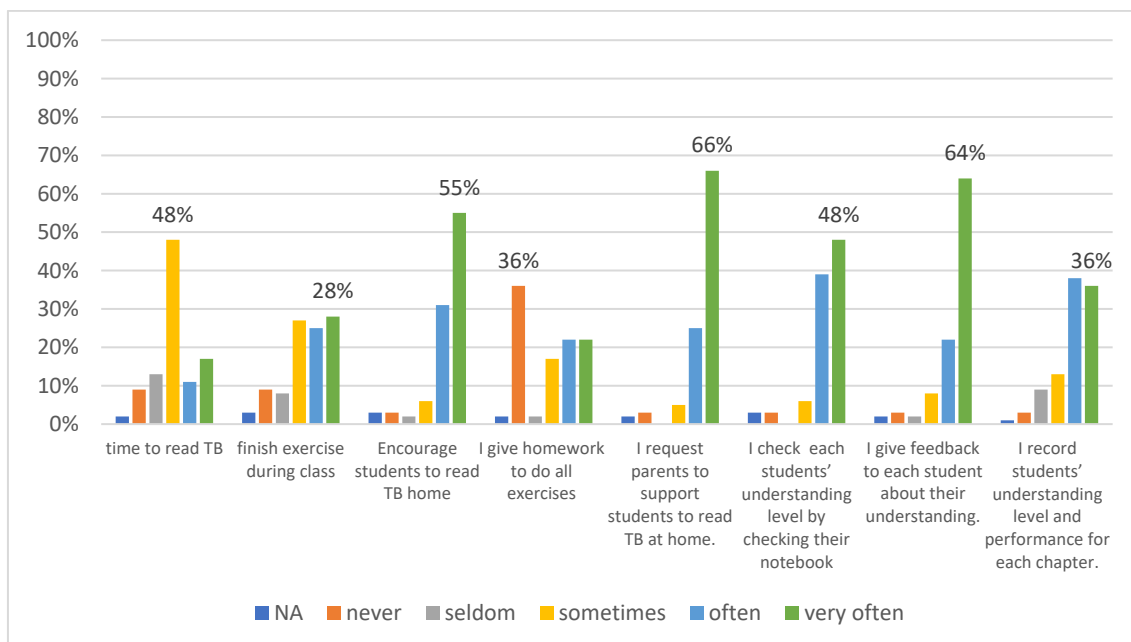


Figure 23 Textbook Usage (Teachers With Follow-up Training)

³⁰ () is the % point difference when compared with the teachers without follow-up training.

Therefore, it was found that it is fully expected that teacher’s understanding of the proper use of textbooks will improve through follow-up training.

The results of the second indicator, the teacher’s teaching methodology test are presented. For teachers who participated in the G4 TOT and some of the school-level trainings and the G5 TOT and some of the school-level trainings, the "Teaching Methodology Test" was conducted before and after the training. As a result of conducting the "Teaching Methodology Test" before and after the training, a 10% point improvement was not attained over the two days of training, with only a 6-7% point increase for G4 and a 1-3% point increase for G5.

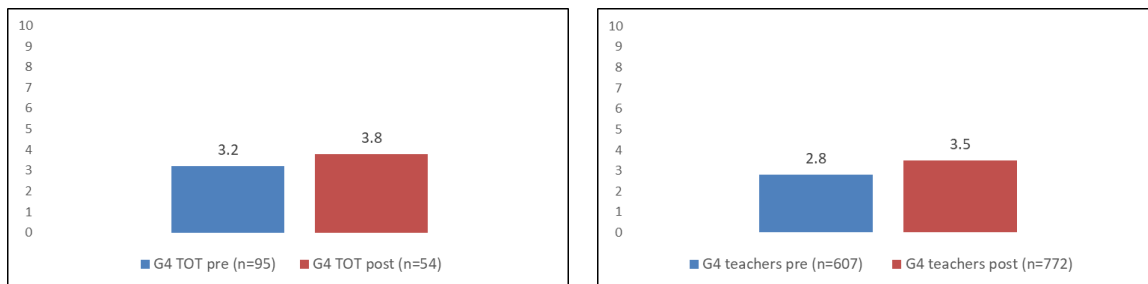


Figure 24 G4 TOT/School Level Trainings Pre-Post Test Results

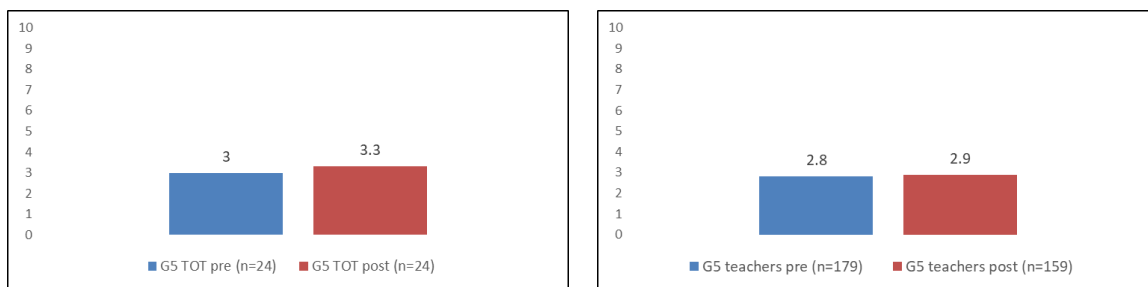


Figure 25 G5 TOT/School Level Trainings Pre and Post-Test Results

On the other hand, when the results were compared between G3 teachers who did not receive follow-up training after the introduction of the new textbooks and G3 teachers who received follow-up training and teachers of other grades (G1, G2, G4, and G5), the latter showed a higher level of understanding by 4% to 13% points (target value of the index is 10% points). This suggests that, although a 2-day introductory training does not result in a significant improvement in the level of understanding, continuous follow-up training will gradually increase the level of understanding of teaching methodology.

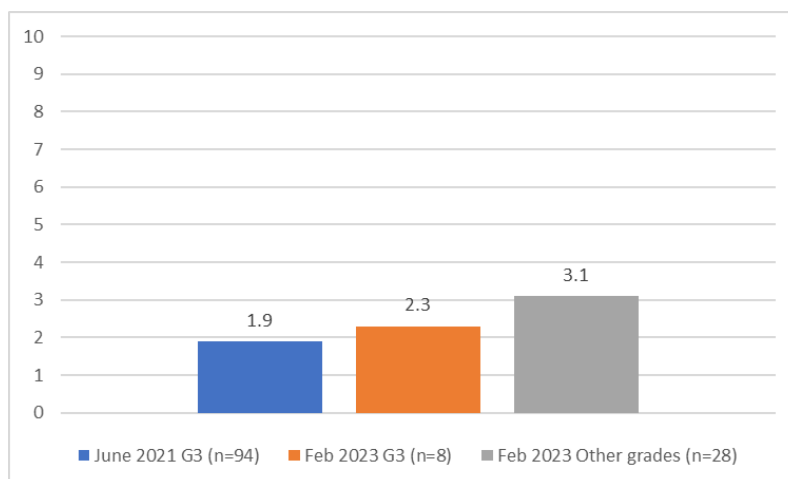


Figure 26 Comparison of Teaching Methodology Test Results (Teachers With and Without Follow-up Training)

For the third indicator, achievement of half of the standards on the lesson observation checklist, the five-step lesson observation checklist (points of teacher’s instruction and student’s learning to be considered for each step) created by the project was used to analyze lesson videos by the Math Education Specialist. The achievement of the indicator was set as "Level 1" with a score of 42.5 points, half of the total of 85 points of the checklist. According to the observations, only three (33.3% < 50%) of the nine G1-3 lessons conducted by teachers without the INSET follow-up training achieved Level 1, whereas eight (72.7% > 50%) of the eleven G1-4 lessons conducted by teachers with follow-up training were able to achieve Level 1. In particular, the average score increased by 5.3 points in the second step of the 5 step lesson, "Individual Solving" and by 4.1 points in the fourth step "Doing exercise". See Appendix 8 for detailed results.

Table 42 Comparison of Lesson Observation Results (Teachers With and Without Follow-up Training)

Lesson Observation Category (5 Steps + Additional aspects)	Without Follow-up 9 lessons (G1-G3) Average Scores	With Follow-up 11 lessons (G1-G4) Average Scores	Difference
Step 1: Understanding the Problem (10 points)	6.8	6.7	-0.1
Step 2: Individual Solving (20 points)	9.3	14.7	5.3
Step 3: Comparison of students’ ideas and discussion (10 points)	4.9	5.8	0.9
Step 4: Doing exercise (10 points)	2.1	6.2	4.1
Step 5: Conclusion (10 points)	1.2	2.6	1.4
Additional (25 points)	11.9	15.9	4.0
Total (85 points) Level 1: half of total – 42.5 points	36.2	51.9	15.7

4.1.3 Achievement of Outputs

The following indicators have been established for the project outputs; development of textbooks and teacher’s guide, revision of the TTC curriculum and teaching materials, and activities to disseminate teaching methods based on the new textbooks. Although some indicators have limited data to support them, they were generally achieved. Below is the status of achievement and rationale for each of the output indicators.

Output 1: Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.

Indicator	Degree of Achievement	Rationale
Approval of the textbook and teaching/learning materials by MOES.	Achieved	<ul style="list-style-type: none"> • G1 textbook, teacher’s guide: CACIM approval July 2017, nationwide induction September 2018 • G2 textbook, teacher’s guide: CACIM approval July 2018, nationwide induction September 2019 • G3 textbook, teacher’s guide: CACIM approval August 2019, nationwide induction December 2020 (induction delayed due to COVID-19 pandemic) • G4 textbook, teacher’s guide: CACIM approval December 2020, nationwide induction September 2022 (induction delayed due to COVID-19 pandemic) • G4 textbook, teacher’s guide: CACIM approval January 2022, nationwide induction September 2023 (induction delayed due to COVID-19 pandemic)

Output 2: TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.

Indicator	Degree of Achievement	Rationale
Increment TTC students' academic performance in mathematics subject. (1) 10% point improvement on TTC student’s math assessment (Basic Math) (2) 10% point improvement on TTC student’s math assessment (Teaching Math 2)	Partially achieved	(1) Y1 students (2019 cohort) in the 12+2 and 12+4 modules were tested to see how much their comprehension improved before and after learning the Basic Mathematics module. The results showed that Y1 students’ comprehension in the 12+2 module improved by 11.5% points and 19.5% points for students in the 12+4 module. (2) Y2 students (2021 cohort) were tested in 2022-23 school year to see how much their understanding improved before and after studying the Teaching Math 2 module. Post-test results showed a 9.3% point increase for the students in 6 TTCs, but the overall average was still low (50% average for only 3 TTCs).

Output 3: The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET programs and materials promoting lessons in line with the new primary mathematics textbooks.

Indicator	Degree of Achievement	Rationale
(1) Teachers are conducting lessons in line with the new primary mathematics textbooks in schools and meeting with other teachers in their school to discuss about their lessons at least once a month.	Indication of possibility of achievement	(1) Teachers with INSET follow-up training were less likely than those without training to respond "Never" in terms of the frequency of implementation of any of the INSET activities. On the other hand, the frequency of INSET activities with other schools was the same among the teachers with and without follow-up training, indicating that gradually teachers are starting to improve their lessons through INSET follow-up trainings.

Teachers without follow-up training most frequently responded "Never," at 45%, 65%, and 69% respectively, when asked to “discuss lessons with teachers at other schools”, “observe lessons taught by teachers at other schools”, or “have lessons watched by teachers at other schools”. The most frequent response was "Once a month or more" for “discussing lessons with teachers”, at 31%.

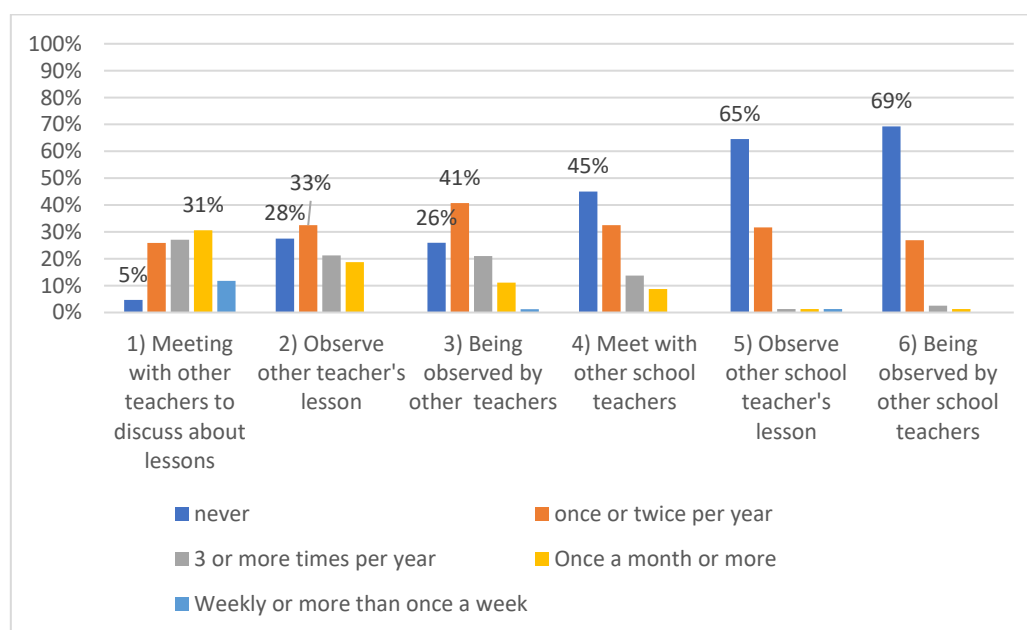


Figure 27 Frequency of Discussing about Lessons and Observing Lessons (Teachers Without Follow-up Training)

Among teachers with follow-up training, 42% responded they “discussed lessons with other teachers” once a month or more. The number of teachers who responded, "Once a month or more" or more to the items about “observing other teachers' lessons”, “observing lessons of teachers from other schools”, and “having their lesson observed by teachers from other schools” remained small, but fewer teachers responded "Never" to all of the items than teachers without follow-up training. For “being observed by other teachers”, most of the teachers without follow-up training responded, "Once or twice per year" (33%), while most of the teachers with follow-up training answered, "3 or more times per year" (39%).

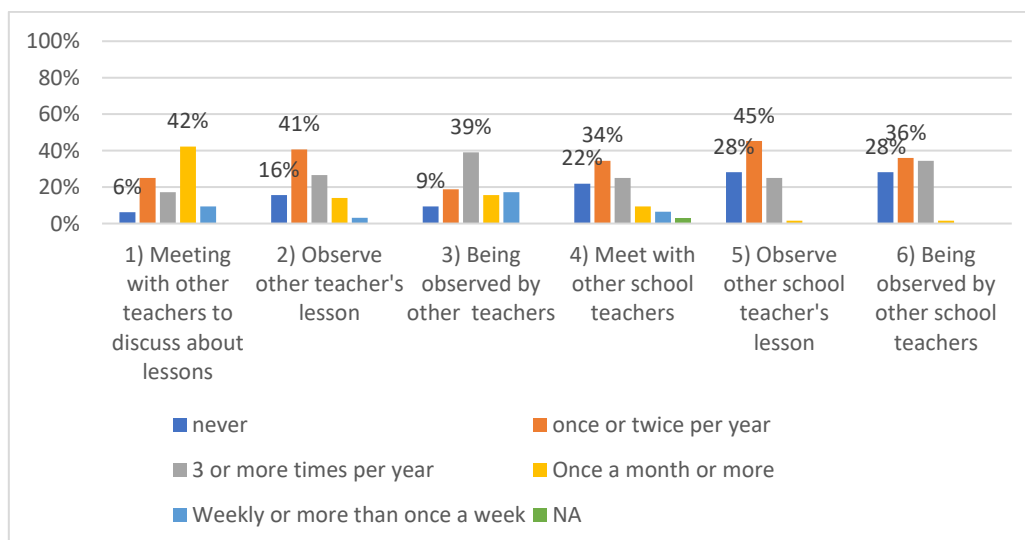


Figure 28 Frequency of Discussing about Lessons and Observing Lessons (Teachers With Follow-up Training)

Indicator	Degree of Achievement	Rationale
(2) Improvement of Grade 1- Grade 5 students' learning by conducting lessons in line with the new primary mathematics textbooks. (trial schools)	Partially Achieved	(2) RIES math team conducted "good lessons" ³¹ according to the textbook for Chapter 5 "Rules of Calculation " and Chapter 17 "Area" with G4 students at three pilot schools in Vientiane and found statistically significant improvements in students' comprehension. The results of the study showed the possibility that students' understanding of the new textbooks may increase when they were taught in a problem-solving style lesson as intended by the new textbooks. In addition, students who were accustomed to teacher centered lessons showed a willingness to think for themselves. On the other hand, it was found that many students were not able to master the four arithmetic operations in the first place, partly due to schools being closed due to the COVID-19 pandemic.

In chapter 5, "Rules of Calculation," the overall pre-test average increased by 1.85 points (12%) and the post-test average increased by 1.05 points (7%) to 2.89 points (19%), but no statistically significant difference was identified in School III Class B. The post-test score in School III Class A was lower than the pre-test. Statistically significant ($p < 0.05$) differences in the test scores were confirmed in the other schools.

³¹ 5 step lessons, teaching and learning material study, blackboard plan, micro teaching and post-lesson discussions

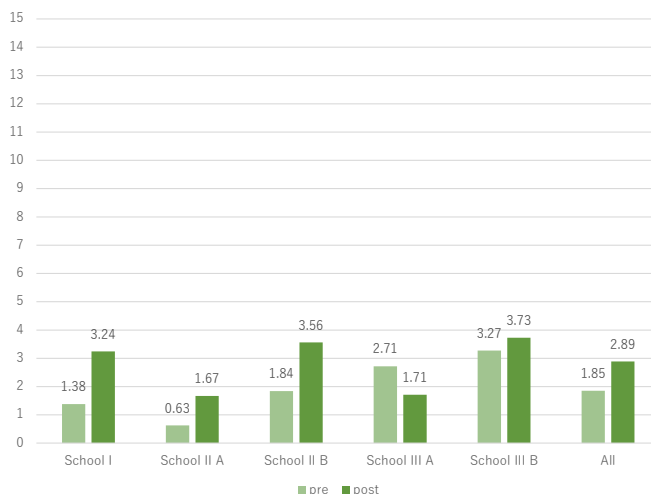


Figure 29 Pre and Post-test Results of Chapter 5 “Rules of Calculation”

The following issues and trends were also identified from the students' answers.

- Due to a lack of basic calculation skills (inadequate understanding of multiplication times table, inability to perform multiplication and subtraction with two-digit carrying and borrowing), although students have a good understanding of the sequence of calculations, they are unable to produce correct answers as a result of calculation errors. Furthermore, as they don't have a firm understanding of the rules of calculation rules, their calculations are inefficient.

Example: When calculating $140 - 25 \times 4$, if students understood that $25 \times 4 = 100$, they would realize they should do the multiplication first, followed by $140 - 100$. However, since the students don't have a firm grasp of $25 \times 4 = 100$, they start calculating from the beginning $140 - 25$.

- In addition, they are accustomed to being taught by teachers and do not try to think for themselves, or they lack the ability to think.

Chapter 17, "Area," is a completely new chapter for the students, and in the pre-test, the average score was zero for all schools. In the post-test, the overall average score rose to 2.66 (38%).

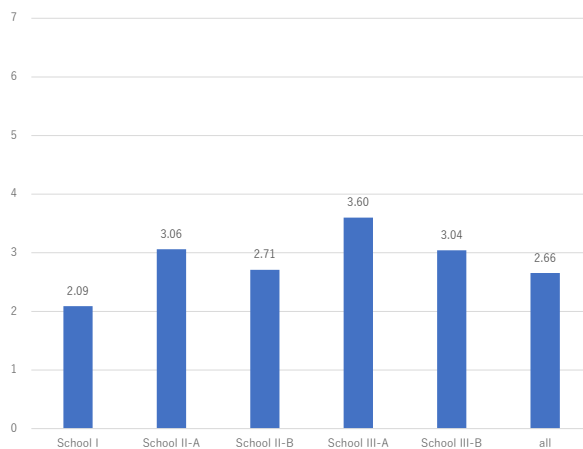


Figure 30 Pre and Post-test Result of Chapter 17 “Area”

The average percentage of correct answers for the questions that expressed the area of a figure in terms of the number of divisions of 1 cm² and the questions that calculated the area of a square or rectangle was more than 50%. On the other hand, the percentage of correct answers for questions involving the area of a shape combining rectangles and squares dropped drastically to less than 20%. The reason for this is thought to be a lack of mathematical thinking ability to divide a figure into several parts or to compensate for the missing parts to obtain the answer, or a simple calculation error that prevented the correct answer.

As supplementary information for the second indicator, the improvement of student learning through conducting lessons in line with the new primary math textbooks, results of comprehension tests conducted during the G1-G5 piloting of the new math textbooks in the 13 pilot schools are presented. Only one of the 13 pilot schools (Luangnamtha TTC demonstration school) had one teacher teach from G1 to G5 during the five-year trial. Table 43 shows the results of the student comprehension test (average percentage of correct answers for the school in question compared to the average percentage of correct answers for individual students) conducted during the piloting for each grade level. The results showed that the learning of the G1 to G5 students is stable. In the other schools, student test results varied because teachers changed each school year and were teaching with the new math textbooks for the first time. Since the new math curriculum has a structured sequence of learning, it was suggested that it is important for teachers at each grade level to understand the contents of all grades, not just their own, in order to provide high quality lessons that lead to improved student learning.

Table 43 Results of Pilot School's G1-G5 Textbook Comprehension Tests

Pilot Schools		G1	G2	G3	G4	G5
LNT	Soptout	NA	69%	61%	91%	32%
	Khuasoung	91%	51%	111%	83%	54%
	TTC Demonstration School	132%	140%	140%	213%	178%
SLV	Boungsui	NA	126%	148%	56%	61%
	Senvangnoy	NA	72%	135%	52%	73%
	Nadon (TTC Demonstration School)	90%	106%	88%	105%	80%
SVK	TTC Demonstration School	110%	96%	108%	100%	114%
	Phonsavan	109%	55%	100%	106%	37%
	Kadap	NA	86%	53%	105%	67%
	Kaengkham	NA	118%	111%	79%	68%
VTE	Phonxay	78%	115%	75%	89%	88%
	Sokpaluang	105%	101%	100%	95%	179%
	TTC Demonstration School	NA	NA	99%	108%	145%

Source: G1: 2017 G1 Mid-Semester Test (L,R), G2: G2 Final Test May 2018, G3: Pilot Test Set 1,2,3 A, G4: Pilot Test Set 1 A, G5: Pilot Test Chapter 1, 8, 9 A (due to the COVID-19 pandemic testing was restricted in schools and test results are aggregated from the sections which there is data from all schools)

Indicator	Degree of Achievement	Rationale
(3) INSET programs and materials are incorporated into future CPD activities by MOES or other donors.	Achieved	(3) G1-5 TOT training materials and INSET follow-up training materials and videos developed by the project are uploaded to Khang Panya Lao, developed by UNICEF, for instructors to use for trainings and for teachers to be able to access anytime from their own devices. Some videos of the INSET follow-up training have been uploaded to YouTube and will be disseminated via DTE.

Chapter 5 Issues, Solutions, and Lessons Learned

During the first and second phase of the project, the development of textbooks and teacher’s guides for G1-G5 was completed, and printing and distribution was also completed using budget from MOES and other donor’s funds. TOT and school-level trainings for each grade level were also conducted with MOES budget (partially funded by the project budget). In addition, part of the INSET follow-up training was funded using budget from other donors which contributed to strengthening MOES’s ability to implement projects, and also strengthen collaboration with each donor. On the other hand, as some technical and operational issues of the counterparts were identified, what problems have arisen, what has been solved, what has yet to be solved, future prospects and measures, as well as some of the solutions and notable lessons learned in the implementation and management of the project will be shared below.

5.1 Technical Issues and Project’s Responses

5.1.1 Textbook and Teacher’s Guide Development

(1) Understanding of the Structure and Features of the New Textbook

Background and Issues

As explained in 3.2.6, the new textbooks and teacher’s guides have undergone significant changes from the old textbooks and teacher’s guides, from the curriculum to the structure. One of these changes is a structure that allows students to develop the ability to solve problems on their own through math in a 5 step lesson. The activities and content are arranged in such a way that allows teachers to naturally teach according to the new lesson flow by following the descriptions in the textbook. One of the other little innovations is the yellow character (Bankam), which acts as a teacher who gives hints for individual solving and expresses important ideas. On the other hand, there is also a student character but this one expresses expected ideas from the child's perspective. These are features that can also be found in Japanese math textbooks, and they serve to elicit children's ideas based on what they have already learned. However, primary school teachers with limited understanding of the new textbooks often tend to read out the entire content in the lesson, which is no different from traditional teaching, making it difficult to take advantage of the new textbook’s features.

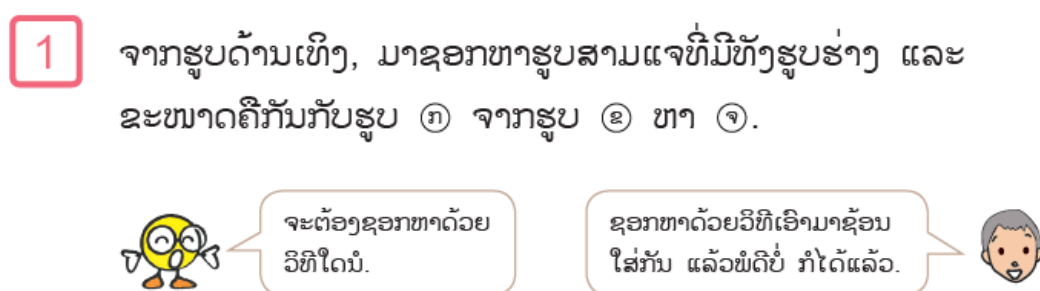


Figure 31 Bankam and Student Characters in the Textbook

Project’s Response and Remaining Challenges

As mentioned in 4.1, it has been suggested that the level of understanding of the proper use of textbooks will increase significantly when INSET follow-up activities are conducted on an ongoing basis, and this is expected to be improved through the INSET follow-up activities in Outcome 3. The features of textbooks were repeatedly emphasized by the Japanese team members who were the training instructors during the TOT, school-level training, and INSET follow-up

trainings. In order for all primary school teachers to deepen their understanding of the new textbooks, it is necessary to continue to conduct INSET follow-up activities with TTCs taking the lead.

There are still other revisions and improvements to be made to the textbooks (e.g., Lao language expressions, setting numeric values, illustrations, setting of word problems, etc.), and for the next revision, RIES needs to conduct monitoring to listen to the actual voices of textbook users on the previously mentioned improvement points, and share and discuss information within the math team.

(2) Capacity Development of RIES Math Team

Background and Issues

This project revised the curriculum and made major revisions to the textbooks and teacher's guides. However, due to the time constraints of the development schedule and the inexperience of the math team in developing textbooks and teacher's guides, it was very difficult to transfer all of these skills from the Japanese experts to the math team during the project period. In order to complete the development of textbooks and teacher's guides based on the new curriculum according to schedule, while at the same time strengthening the capacity of the math team, it was necessary for the Japanese experts to provide careful guidance to each of the Lao members and consult with them on the development work.

Project's Response and Remaining Challenges

Although the ideal situation would have been for the math team to write the manuscript from scratch during the project period so that they could write all the textbooks by themselves. Taking into account various circumstances, the project team placed the highest priority on completing Output 1, the development of textbooks and teacher's guides for G1 to G5, during the project period, while at the same time focus was placed on technical transfer to enable the math team to do the next revision³² alone. Emphasis was also placed on promoting understanding of the textbook and teacher's guide development process, as well as the contents of the new textbooks and their teaching methods. For this reason, the Japanese side took the lead in G1 and G2 development, but from G3 onwards, the work of the Lao side gradually increased, and the RIES math team also subcontracted illustration and DTP work, which was difficult for them to do by themselves, to locally hired personnel which contributed to developing the capacity of counterparts and local human resources.

In the first phase, through the development of the G1-G2 textbooks and teacher's guides, the math team was given intensive instruction in writing manuscripts and DTP typesetting techniques (mainly for the teacher's guides). From G3 onward, based on the drafts made by the Japanese experts, the math team revised the necessary parts as needed according to the current situation in Laos (whether the scene settings could be found anywhere, whether the content is not too difficult, etc.), decided on the setting of the questions and illustrations, wrote review and summary pages for each grade, etc., and the Japanese experts provided advice as necessary. Development of illustrations and DTP typesetting for the textbooks were also outsourced from G3 by hiring local staff for the project, and DTP typesetting for the teacher's guides was handled by the RIES Math Team.

Thus, textbooks and teacher's guides for all grades were successfully developed during the project period. As for the technical achievements of the math team that wrote the textbooks, the young

³² It is assumed that RIES will be collecting and monitoring information for the next revision of textbooks and teacher's guides, and although the extent of the revision work that will occur has not yet been determined at this stage, it is assumed here that future revisions will be based on what has been developed in the project.

math technicians were able to write parts of the textbook manuscripts (selection of review questions, setting numerical values for exercises, setting questions, drafting illustrations, adjusting the layout with DTP in mind, etc.), order illustrations and DTP work, and manage most of the process on their own. In addition, through the experience of developing teacher's guides for G2-G5, the young technicians in charge of writing teacher's guides and DTP typesetting for the RIES math team have acquired typesetting skills. Because the formatting of the teacher's guides is less complicated than that of textbooks (the formatting is done by embedding the data from the textbook in the center and inserting information on teaching methods into the outer frame), the RIES math team is now able to complete the formatting of teacher's guides on their own. It can be said that the team was able to acquire basic skills for developing textbooks and teacher's guides for the next revision.

The remaining issue, however, is that the math team was not able to complete the writing of the textbooks alone due to technical and time constraints. If major changes are needed in the next revision process, the team will need the assistance of a specialist to assist in draft writing of the textbooks and teacher's guides. In addition, a local illustrator and desktop publishing operator was hired for the project, but if the revision work is to be outsourced, the government will need to either provide a budget or the math team will need to be trained to be able to carry out the work.

5.1.2 Teacher Education

(1) Strengthening TTC Instructor's and Demonstration School Teacher's Understanding on the New Textbook's Teaching Methodology

Background, Solutions, and Issues

The goal of this project is to improve the quality of math lessons through using the new math textbooks and teacher's guides. It is important for each teacher to deepen his or her understanding of the objectives and lesson flow adopted in the new math textbooks (problem-solving lessons using the 5 step method), and to put them into practice in their daily lessons and so the project has been working closely with TTC instructors and demonstration school teachers to strengthen their understanding and capacity on these points. In the INSET follow-up training, emphasis is placed on practice in order to deepen TTC instructors' and demonstration school teachers' understanding of the new mathematics textbooks and their teaching methods, and after introducing theory, participants conducted activities and presentations, and micro-teaching.

During the training, the theory was explained, followed by activities and presentations by the participants during the training, and mock classes. In addition, many opportunities were provided after the training for the participants to practice teaching using the new textbooks to TTC demonstration school students to consolidate their understanding of the training content.

In addition, the initial plan was to conduct training for TTC instructors and demonstration school teachers in the four target provinces, but through collaboration with UNICEF, it became possible to expand the target to TTC instructors and demonstration school teachers in all 8 provinces by using the International Agencies Grant from the Japanese government. As a result of 3.4.2 (1) INSET follow-up training and (3) post-training activities, it was observed that TTC instructors and demonstration school teachers deepened their understanding of the 5 step lesson. In addition, as mentioned in 4.1.2, the results of the teaching methodology test of the TTC demonstration school teachers were higher than those of the teachers who did not participate in follow-up activities. From 4.1.2 observation of the lesson videos, improvements such as TTC demonstration school teachers' strengthened understanding of the lesson flow of the 5 step lesson, teachers giving students time to think, providing individual guidance during individual solving, preparing learning materials for students, and students using semi-concrete objects for manipulation were found.

Project’s Response and Remaining Challenges

The results of the teaching methodology test for the TTC demonstration school teachers who participated in the follow-up training are still low, with an average of 50% not yet reached. In addition, teachers do not understand the objective of the class, not all students are doing all the exercises, and lesson time is not being allocated properly. The biggest problem in the time allocation of lessons is that students spend too much time at the beginning of class reviewing the previous lesson’s contents, which shortens the time of the lesson, and then they are spending more time reviewing in the next lesson. This vicious cycle tends to result in poor quality lessons, and it is important to ensure that students have time to solve the exercises in Step 4 and summarize what they learned in Step 5 in order to consolidate their learning of the lesson. In addition to the review time, if the amount of time wasted in lessons can be reduced, for example, when students write answers on the blackboard, several students write the same answer one by one, or students copy the answers in their notebooks after the teacher has finished all the writing on the board, the necessary time can for the lesson can be secured.

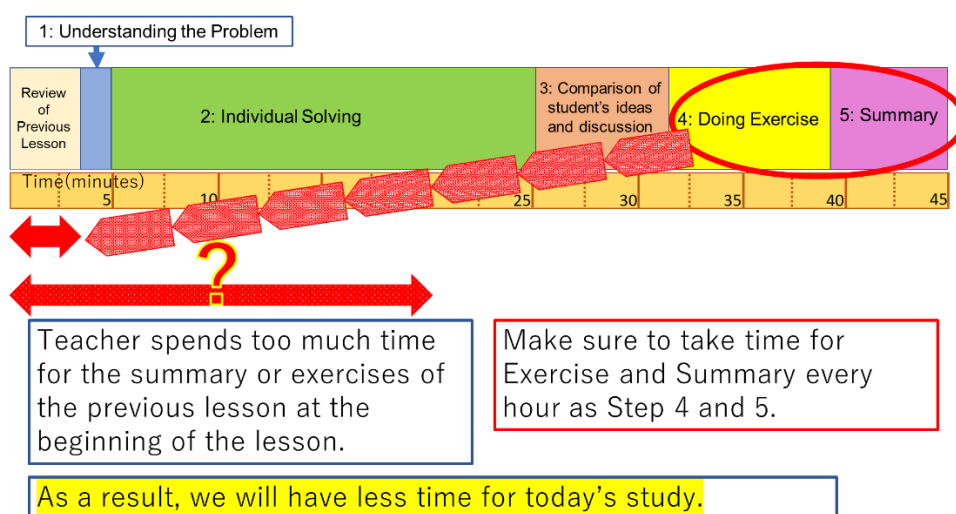


Figure 32 Issue of Time Allocation in Lesson

Some of the TTC instructors who are teaching the new TTC curriculum are also trainers for the school level training, but the results of the TTC instructors’ teaching methodology test conducted during the G4 and G5 TOTs are still low although there has been improvement. As the TTC demonstration school teachers, the average test scores for TTC instructors has not even reached 50%. In addition, as mentioned in 3.3.2, training on each module of the new TTC curriculum has been conducted once or twice, but 3.3.3 TTC students’ Teaching Math 2 post-test results also indicate that TTC instructors do not understand the teaching methods of the new math textbooks, as there was a decrease in the percentage of correct answers on the post-test compared to the pre-test for some questions, and therefore they may be teaching the TTC students incorrectly. Since TTC instructors also vary in their level of understanding and ability, continuous learning of the new math primary school textbooks is necessary regardless of whether or not they have attended training on the TOT and the new TTC curriculum.

5.2 Management Issues, Solutions, and Lessons Learned

5.2.1 Textbook and Teacher's Guide Development

(1) Printing of Textbook and Teacher's Guide in Laos

Background and Issues

There was initially a proposal to outsource the printing of textbooks and teacher's guides to a vendor outside of Laos, rather than printing them in Laos. This is because when textbooks are printed outside of Laos, customs duties are not so high because the textbooks are imported as educational materials, whereas when textbooks are printed in one's own country, customs duties are high because raw materials such as paper and ink are imported, resulting in higher prices for printing textbooks in one's own country. Therefore, for this project, the initial estimate was based on the assumption that the textbooks would be printed in Vietnam and shipped to Laos. However, RIES requested that the textbooks be printed in their own country and be 100% domestically produced.

Solutions and Lessons Learned

The project respected the MOES's insistence on printing in its own country and provided as much support as possible. The project asked Livretech Co., Ltd., a printing company affiliated with Tokyo Shoseki Co., Ltd., to dispatch a professional editor to RIES to provide guidance on editing techniques up to the stage of DTP typesetting to be submitted for printing. The Educational Printing House also set up a system for printing and binding with a binding machine provided by KOICA in the past and a newly purchased color printing machine from RYOBI in Japan. Nationwide delivery was possible by using the existing MOES textbook delivery system, although there were some delivery delays.

The fact that textbook printing was carried out domestically, rather than outsourced to a vendor in another country, strengthened the capacity of the editing technology, and enabled the project to take advantage of the strengths of technical cooperation projects, where the project supports the ownership of MOES, rather than being left to the donor.

(2) Textbook and Teacher's Guide Printing and Distribution Budget

Background and Issues

Since BEQUAL, which supports other subjects except math, is responsible for funding textbook printing and distribution, at the beginning of the project, it was expected that the printing and distribution costs of textbooks and teacher's guides for the four pilot provinces (Luangnamtha, Vientiane, Salavan, and Savannakhet) would be covered by the JICA technical assistance project budget. The project requested that MOES cover the printing and distribution costs after CACIM approval in order to establish ownership in the development of textbooks and teacher's guides within MOES and to have the Ministry strongly recognize the importance of textbooks and teacher's guides in primary education.

Solutions and Lessons Learned

The project held discussions with MOES and it was agreed that the Lao government would be responsible for the printing and delivery of math textbooks and teacher's guide by the respective government agencies (printing of textbooks and teacher's guide: National Educational Printing House; nationwide delivery: MOES Warehouse), and that the printing costs for G1 and G2 math textbooks and teacher's guides would be fully covered by the Lao government. The printing and distribution of G3 was expected to be fully funded by the MOES Finance Department's Asset Division budget, but due to financial difficulties caused by the pandemic from 2020, the GPE's

COVID-19 emergency fund was used for printing and distribution (see 5.3.3 for details). The cost burden for the printing and delivery of textbooks and teacher’s guide is shown in the figure below.

New Math TB & TG Printing and Distribution

	Mathematics		Other Subjects	Assessment?
Printing	G1 (2017)	MOES Budget	X	X
	G2 (2018)	MOES Budget	G1: BEQUAL (2019)	X
	G3 (2020)	GPE COVID-19 Grant	G2: BEQUAL (2020)	X
	G4 (2021)	GPE COVID-19 Grant	G3: BEQUAL (2021)	X
	G5 (2022)	GPE COVID-19 Grant	G4: BEQUAL (2022) G4: MOES (2022)	?
Delivery	G1 (2018): MOES National Warehouse → DESB	MOES Budget	X	X
	G1 (2018): DESB → School	MOES Budget	X	X
	G2 (2019): MOES → DESB → School	MOES Budget	G1: BEQUAL	X
	G3 (2020): MOES → DESB → School	GPE COVID-19 Grant	G2: BEQUAL	X
	G4 (2021): MOES → DESB → School	GPE COVID-19 Grant	G3: BEQUAL	X
	G5 (2022): MOES → DESB → School	GPE COVID-19 Grant	G4: BEQUAL (2022) G4: MOES (2022)	?

*G4 BEQUAL: Lao, English, Science and Environment

Figure 33 Cost Burden of Textbook and Teacher’s Guide Printing and Distribution

Although the spread of the COVID-19 was unexpected, MOES took the lead in raising funds for the printing and delivery of textbooks for all five grades, which greatly contributed to the achievement of Outcome 1. Coordination between RIES and the Finance Bureau was essential for textbook printing, and this also led to the strengthening of the internal coordination system within MOES.

5.2.2 Teacher Education

(1) New Textbook and Teacher’s Guide Teacher Training

Background, Solutions, and Results

One of the major achievements of the project was to secure a budget for training costs for the dissemination of new textbooks for G1-G5 by RIES and DTE. "Master Trainer Training (TOT)" and "School Level Training" for the introduction of math textbooks for G1 and G2 were conducted with the budget of RIES and DTE, respectively, with cost share from the project. The training costs for G3-G5, except for the G4 TOT, which was conducted online, were funded by RIES and DTE budgets.

The table below summarizes the cost-sharing status of the dissemination training for the G1 math textbooks.

	Mathematics	Other Subjects	Assessment?	
Master Trainer Training (TOT)	G1 (Feb. 2018): TOT	MOES Budget (2017) 359,563,000 LAK	X	
	Additional TOT (May 2018)	JICA iTEAM Budget 82,248,000 LAK		X
	G2 (Mar. 2019): TOT	MOES Budget (2018) 378,378,000 LAK JICA iTEAM Budget 54,590,000 LAK	G1: BEQUAL (2019) 16 Master Trainers + 611 Provincial Trainers	X
	G3 (2020): TOT	MOES Budget (2019)	G2: BEQUAL (2020)	X
	G4 (2021): TOT	MOES Budget (2021) →Online	G3: BEQUAL (2021)	X
	G5 (2022): TOT	MOES Budget (2022) 323,600,000 LAK ?	G4: BEQUAL (2022) G4: MOES (2022) ?	?
School-Level Training	G1 (2018): School Level Training	MOES: 2,866,194,000 LAK JICA iTEAM: 1,078,000,000 LAK	X	X
	G2 (2019): School Level Training	MOES: 2,800,000,000 LAK JICA iTEAM: 1,063,718,000 LAK	G1: BEQUAL (2019) (6-day at all districts)	X
	G3 (2020): School Level Training	MOES: 2,892,000,000 LAK	G2: BEQUAL (2020)	X
	G4 (2021): School Level Training	MOES: 2,700,000,000 LAK	G3: BEQUAL (2021)	X
	G5 (2022): School Level Training	MOES: 3,000,000,000 LAK	G4: BEQUAL (2022) G4: MOES (2022) ?	?

Figure 34 Cost Burden of TOT and School Level Training

One of the challenges of implementing training under the MOES budget was that even though the budget was secured, delays in budget allocation delayed the implementation of training. The math textbook induction training for G1 was completed by around October 2018 (two months after the start of the new school year), but G2 and G3 took until around December 2018 (four months after the start of the new school year). For G4, the budget for TOT was received around August 2021, but due to the pandemic, it was not possible to conduct face-to-face training, so online training was conducted in October 2021, and then induction training was conducted in each district starting from around January 2022. G5 TOT was completed in December 2022, followed by the induction training which was completed around March 2023.

Remaining Challenges

Teachers began using the new math textbooks in their classes after the induction trainings, so they may not have had enough time to finish teaching the entire content of the textbooks.

Another issue is that due to budget constraints at MOES, TOT participants have been limited to TTC instructors and PESS technicians since G3, and DESB PAs are no longer allowed to participate. In addition, the G5 TOT was held jointly with the G4 TOT in other subjects not supported by BEQUAL, halving the number of participants in the G5 TOT, with only 2 out of 4 TTC instructors and 1 out of 2 PESS technicians participating. The TTC instructors, PESS technicians, and DESB PAs are working as a team to conduct the training in each district, but when there is a shortage of trainers, the TTC instructors, PESS technicians, and DESB PAs who did not participate in the TOT will also conduct the training. However, in order to ensure the quality of the training, it is necessary for all PESS technicians and DESB PAs who did not participate in the TOT to learn the content of the TOT.

One of the challenges in terms of training participants is that the induction training for each grade level was conducted only once, so when teachers change grades, some teachers are still teaching without having received the training (without learning the new curriculum content). However, there should be opportunities for teachers to continue to deepen their understanding of math textbooks through school-based, cluster training, or self-study.

(2) Careful Coordination to Maximize Inputs

Background and Issues

RIES, DTE, and TTC instructors are involved in a variety of donor projects, and if they can coordinate their training and activity schedules, they will have more opportunities to strengthen their capacity. However, after face to face work has resumed again after the pandemic, it has become difficult to coordinate dates for training and activities, and donors competing with each other for counterparts is a challenge. On the other hand, close collaboration with BEQUAL, which also supports TTC curriculum revision, school-level training, and in-service teacher training, is essential for the project's teacher education activities.

Solutions

Through collaborating with BEQUAL for the TTC curriculum revision, the project was able to strengthen support provided to the math writing team by holding additional workshops. Also, as the math textbook induction training was conducted before the induction training for other subjects, the project was able to provide information on how to conduct the textbook introduction training, and INSET follow-up training and activities to BEQUAL. Furthermore, through collaborating with the project on the usage of the International Agencies Grant, UNICEF was also able to provide training to TTC instructors and demonstration school teachers on Khang Panya Lao for the first time.

(3) Networking among TTCs

Through the experience of preparing for and hosting the Complementary Training for the JICA Improvement of Quality of Education through Lesson Study in Asia Training, several opportunities were provided for TTCs to come together and share information on their Lesson Study activities, discuss issues they were facing, and offer advice to one another. Afterwards, in January 2018 and February 2019, and March 2020 in Lesson Study Workshops supported by the project, TTC instructors and demonstration school teachers from all TTCs were able to gather together to conduct Lesson Study. Then after the pandemic through utilizing the International Agencies Grant mentioned above, the project was able to conduct trainings in November 2022, January and February 2023, for TTC instructors and demonstration school teachers from all 8 TTCs. In preparation for the lesson demonstration in the training in February 2023, 8 TTCs worked in pairs of 2 TTCs each to develop a lesson plan jointly. From Monday to Friday, in the morning session, a lesson demonstration was conducted for one grade, and after the post-lesson discussion in the afternoon, training participants immediately worked on incorporating what they had learned in the training that day into their lesson plans and blackboard plans and stayed up late in preparation for their lesson the following day. In the reflection at the end of the training, teachers commented that they had never discussed about how to improve their lesson and revise their lesson plans so many times. However, through this process of continuous discussion to improve their lessons, they were able to learn from each other. Through these trainings, the TTCs were able to work together and have opportunities to interact with each other, building a relationship of mutual friendly rivalry.

5.2.3 Other

It is unclear how much horizontal collaboration has taken place within the Ministry to date, but it is assumed that due to the vertically divided organizational structure, each departmental unit has reported to the Minister via the respective Vice Minister in charge. However, there are three major outputs of this project, each of which is the responsibility of a different department. This has led to the establishment of the SC, as mentioned above, and discussions on the progress of the project with the participation of all the departments involved.

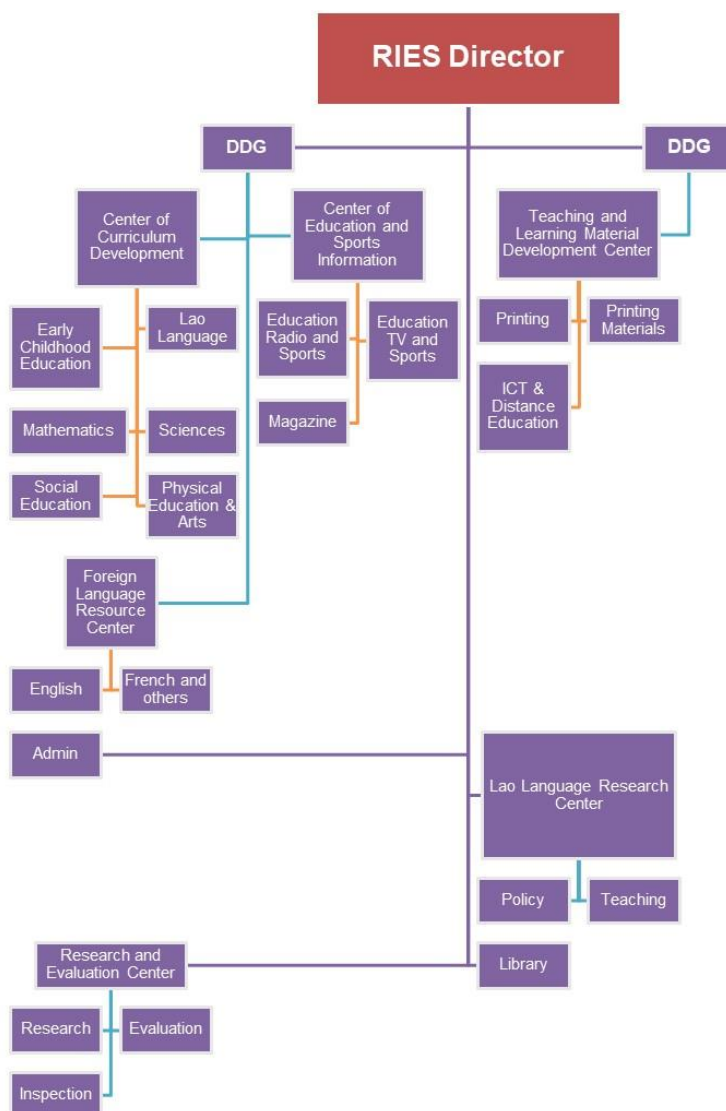
The following is a detailed description of how each of the relevant counterpart organizations (departments) and others have been involved in the actual management of the project.

Table 44 Status of Cooperation with each Counterpart Organization

	RIES	DTE	DGE	Other
Central (MOES)	<p>DG of RIES, as Vice-Chair of the SC, coordinates the entire project.</p> <ol style="list-style-type: none"> 1) Responsible for the development of the math curriculum and CACIM approval. 2) Responsible for the development of math textbooks and instructional materials for CACIM approval 3) Overall coordination of textbooks, including other subjects 4) Secure budget for TOT within the Ministry 5) In charge of ASLO 6) Dispatch training and workshop instructors 	<ol style="list-style-type: none"> 1) Responsible for TTC curriculum development 2) Department responsible for supervising TTCs 3) Securing budget for school level training 4) Monitoring of TOT and school level training 5) Cooperation in TTC student's assessments 	<ol style="list-style-type: none"> 1) Local education administration support through PESS/DESB 2) Contact department for Assessment development 3) Consultation on textbook delivery monitoring 	<ul style="list-style-type: none"> • Asset Division of the Finance Bureau: Budget provision for textbook printing and delivery • Ministry of Education Warehouse: post-printing storage and nationwide delivery • Printing House: Printing of textbooks and teacher's guides (G1-2) and sales to private primary schools • IFEAD: Human resources provided by the Teacher Education Development Center (TEDC) to the RIES math team
TTC	<ol style="list-style-type: none"> 7) 4 TTC demonstration schools are textbook pilot schools (Salavan, Savannakhet, Luangnamtha, and Dongkhamxang) 	<ol style="list-style-type: none"> 6) Organize TTC curriculum writing team 7) Convening instructors for various trainings 8) Cooperation in conducting TTC students' assessment 9) INSET follow-up training 10) Lesson Study Workshops 	N/A	<ul style="list-style-type: none"> • IFEAD: TEDC to provide human resources for TTC curriculum writing team
PESS DESB	<ol style="list-style-type: none"> 8) N/A 	<ol style="list-style-type: none"> 11) Supervision of school level trainings 	N/A	N/A
Schools	<ol style="list-style-type: none"> 9) Pilot school for textbook development 	N/A	N/A	N/A

RIES: The Director General (DG), Dr. Onekeo, and Deputy Director General (DDG), Mr. Outhit who is also the leader of the Math team, are very committed to the project. Due to the delay in the development of textbooks for other subjects supported by BEQUAL, JICA's support is highly trusted and smooth project management has been achieved. In total, 12 people are assigned to the Math team; 1 DDG, 2 people from the Teaching and Learning Materials Development Center, 4 people from the Mathematics Section under the Center of Curriculum Development, 1 person from Mathematics and ICT Section, 1 person from DTE, 1 person from IFEAD, 1 person from Thaphalanxai Primary School and 1 person from Dongkhamxang TTC.

As mentioned above, the entire math team was responsible for writing textbooks, conducting pilot teacher workshops/monitoring, and revising content, while the technical officers of the math section mainly managed the ordering of illustrations and DTP typesetting, writing and DTP typesetting of the teacher's guide, and dealt with CACIM, and this was continued in the second phase. In addition, throughout the project period, RIES was actively engaged in obtaining MOES budget for the TOT for the new math textbook induction, and the training was not delayed during the pandemic, although it was conducted online for G4.



*Developed by Project based on information from RIES.

Figure 35 New Organization Chart of RIES

DTE: iTEAM is conducting the TTC curriculum revision, School Level Training, INSET Follow-up activities, and Lesson Study workshops together with DTE during both phases of the project. In the TTC curriculum revision, in the beginning of the project, Pre-service Division was responsible, however, due to MOES's organization restructuring in 2018, TEDC was transferred from being under DTE to the IFEAD, and TEDC was responsible for the TTC curriculum revision, and 1 technical staff from TEDC is a member of the math writer's team. In the School-Level Training and Follow-up INSET activities, the Head of In-Service Division and 3 technical staff are providing support. During Phase 1, DG of DTE and the DDGs have been supportive of the project's activities and this continued during phase 2. In addition, throughout the project period, DTE actively obtained budget for the school-level training each year, and the training was not delayed during the pandemic. However, the DTE DG and other staff members are busy with meetings and training for other donors, and so consideration should be made for forming a small team consisting of staff from DTE, RIES, and DGE in order for future projects to be able to provide further technical support for capacity development.

DGE: In the first phase, iTEAM discussed the delivery and monitoring from DESB to schools with Dr. Sisouk, current Vice Minister of MOES, and she followed up with DTE's budget application for the School Level Training. Also, one technical staff from DGE participated in TOT and INSET follow-up activities. In the second phase, in order to develop a nationwide plan for monitoring and INSET activities, iTEAM planned to work more closely together with DGE, however the responsibility of supervision of PAs was shifted from DGE to DTE. At the end of the second phase, UNICEF has approached DGE for assistance in development of formative assessment, and discussions on assessment are currently centered around DGE. Alignment with assessment in math education is envisioned in the future.

TTC: iTEAM works with TTCs on TTC curriculum revision, School Level Training, and INSET Follow-up activities. TTC curriculum writers were selected by BEQUAL and in the math writer's team, there are TTC instructors from Dongkhamxang, Luangnamtha, Salavan, and Pakse TTCs. Since the School Level Training and INSET Follow-up activities are conducted in the 4 pilot provinces, TTC instructors from these provinces who received the TOT (4 instructors from the 4 TTCs) participate in monitoring and are trainers for the follow-up workshop. In each TTC, there is a situation where the work is concentrated on high-performing instructors, and donors are vying over them to be trainers. In Phase 2, as the teacher education activities were gaining momentum, it was necessary to find and train young TTC instructors (or PAs). Fortunately, several TTC instructors have participated in JICA's training programs in Japan including for the project, studied abroad at Japanese universities, or are working with other donors, which has strengthened their capacity and they have demonstrated leadership in math education. As observed through this project, TTC instructors in Laos are experts with knowledge and experience in both subject content and teaching methods. Therefore, in the context of INSET rather than PRESET, technical support for TTC instructors as a link between the curriculum and school practice will become even more important in the future.

PESS/DESB: Two technical staff from the Teacher Development Section and General Education Sections of PESS and 1 PA from each DESB are trainers for the School Level Training and conduct Follow-up INSET activities with iTEAM. PESS and PAs participate in the School Level Training as trainers, monitoring and workshops as part of the project's activities, and so the project covers their travel allowance. However, in Kaisone District in Savannakhet Province, PAs visits schools on their DESB budget as their routine tasks. TTC instructors are more skilled as trainers, but a secondary effect would be for PESS and DESB to strengthen their skills through working together with TTC instructors.

In general, TTC instructors are more skilled trainers, but by pairing up with TTC instructors for the training, allowed TTC instructors to be able to provide support to PESS and DESB as needed.

Since the PESS and DESB were indispensable in the implementation of training at the school level (teachers) in each district, it will be necessary to work more closely with DGE in the future to find more effective ways to utilize local education personnel.

(1) Coordination with JICA Volunteers

Solutions and Lessons Learned

During the project period, information was frequently shared with TTC-assigned in-service teacher JICA volunteers, who were also asked to participate and cooperate in project activities to the extent they could. Many JICA volunteers from both Vientiane capital and other provinces participated in trainings in Japan, overseas supplementary training, Lesson Study workshops, and INSET follow-up training and activities together with their counterpart TTC instructors and assisted the TTC instructors in various ways in the preparation and implementation of demonstration lessons, from researching teaching materials and preparing lesson plans to providing advice during post-lesson discussions. The project collected information on the situation in schools during COVID-19 and interviewed the JICA volunteers about the challenges teachers were facing in implementing what they had learned in trainings. One issue identified was that some TTC instructors are often absent from their workplaces to participate in training programs for other donors and are not able to provide much support for the activities of teachers at TTC demonstration schools, and so towards the end of the project, the project invited teachers from demonstration schools to participate in trainings and to work with and learn from TTC instructors. JOCV commented that while the revised textbooks are close to those used in Japanese primary schools, making it easier for them to support development of lessons, it was difficult for them to make teachers understand the importance of material research and the 5 step lesson flow by themselves. They commented that the lectures by Japanese experts during the training program made their own daily advice more persuasive, and that it was a useful collaboration to make each other's activities more effective. This is a good example of the cooperation between a JICA project and JOCV which can be disseminated.

(2) Coordination with MOES and other donors during COVID-19

Background and Issues

The printing and distribution of textbooks and teacher's guides for G1-G5 were originally to be funded by the government budget, but due to the strain on MOES budget after the spread of COVID-19 in 2020, the printing and distribution of textbooks and teacher's guides for G3-G5 was done using GPE COVID-19 emergency funds. However, the start of printing was significantly delayed as the GPE, the source of funds, UNICEF, grant agent, and several related departments within MOES worked together to prepare various procedures and documents. Therefore, the introduction of new textbooks for G3 was delayed to around December 2020, G4 to September 2022, and G5 to September 2023, resulting in a significant impact on children's learning, as students had to learn with old textbooks until the introduction of new textbooks.

Solutions and Lessons Learned

Partnerships with other donors were a notable achievement for both MOES and the project. A series of unprecedented events, including a prolonged period of school closure, difficult to estimate printing and distribution timings, and loss of learning opportunities for children, required greater coordination among all parties involved. Due to school closures, the school calendar was severely affected, and teachers needed guidance on contents to be covered with the limited number of school days. DGE worked with RIES math team, in September 2021, in developing a condensed curriculum (80% of the curriculum) for math which could be taught when schools reopened. Additionally, in order to provide catch-up remedial support to students, DGE and UNICEF piloted remedial lessons for G1 and G2 students in Lao language and math, in areas

most affected by the school closures due to COVID-19, during July – August 2022. The project discussed with RIES math team members on content to be included in the program.

From the 9th SCM onwards, delays in the introduction of the new curriculum were placed on the agenda, and discussions were held among the parties concerned regarding the use of old and new textbooks. Although the delay in the introduction of the new curriculum caused confusion at the school level and had a significant impact on student learning (students who had studied with the new textbooks from G1 to G3 would study with the old textbooks in G4 and the old textbooks/new textbooks in G5), it was a great achievement that multiple stakeholders worked together under difficult circumstances and were able to complete the printing and distribution of the new textbooks. As there may be more cases in the future in which collaboration among donors on funding and technical assistance may be needed, good practices in such collaboration from the project can be shared.

Chapter 6 Recommendations

6.1 Overall

This project, which started in February 2016, will be completed by the end of March 2023. Looking back on the challenges and lessons learned during the project's seven-year implementation period, this section will present recommendations for how to further develop primary mathematics education in Laos in the future.

As described in "Chapter 4: Achievement of Project Goals," the Project Purpose of "improving the quality of math lessons" was achieved to some extent. However, it was not possible to confirm the Overall Goal, "Improvement of math learning outcomes for students in primary education. The main reason for this was that the project activities were restricted due to the spread of COVID-19 that began in March 2020, but an even bigger impediment was the lack of normal lessons in schools. In fact, the implementation of the ASLO, which measures learning achievement and serves as an evaluation indicator, was also postponed, and the degree of improvement in student learning at the end of the project (March 2023) has not been measured. From lesson observations during school visits, it is a fact that some teachers are trying to teach lessons in the new way even though they are confused by the new curriculum and textbooks, and it is also a fact that many students like and enjoy math. The distribution of textbooks is not the end of the project. As the content is not inferior to that of other countries, if both teachers and students become more familiar with the new way of learning math through continuous support, although it may be difficult in the next ASLO 2023, it is expected that impacts of the project can be seen in the next ASLO 2025. Therefore, the following two years after the project completion will be a very important phase.

On the other hand, it deserves special mention that the printing and delivery of math textbooks and training for the dissemination of the new textbooks continued despite the difficult situation, thanks to the high commitment of MOES to secure funding and the timely provision of external funds such as World Bank funding (GPE Covid-19 Grant) and Japanese government funds through UNICEF (International Agencies Grant), and was a good example of collaboration among all parties involved.

The project sees the challenges in the area leading from "Teachers' improvement of math classes" to "Students' improvement of learning math" from two major perspectives.

The first is that the new math textbooks are not being used properly (by teachers and students), and the second is that the new math textbooks are not being taught as intended (by teachers). The former is a problem that became clear especially from lesson observations while collecting indicator data for Output 1 and Output 3 in Chapter 4, "Achievement of Project Purpose" and it can be said that, for example, one textbook was not given to each student, students were not given opportunities to take the textbook home and study at home, and they did not do all the exercises. The latter is due to the teachers' lack of understanding of the new math textbooks. Lesson observations also revealed the following issues: teachers were not able to finish the lesson's contents during the 45-minute lesson time, appropriate teaching methods were not used to conduct problem-solving style lessons, and teaching materials were not used appropriately.

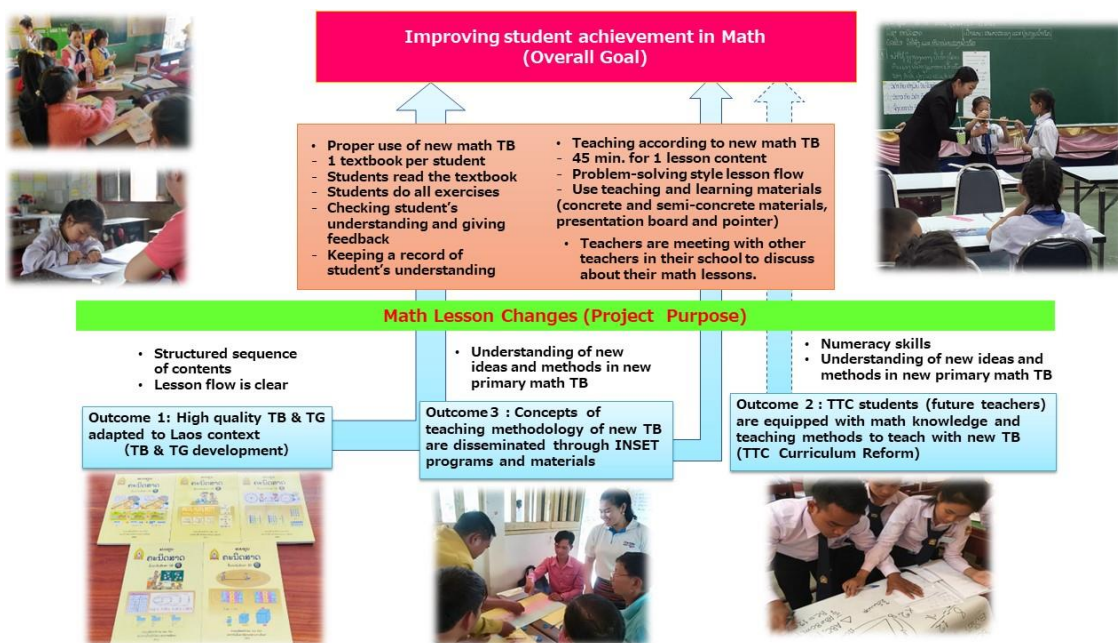


Figure 36 “Teachers’ Improvement of Math Classes” to “Students’ Improvement of Learning Math”

In order to achieve improvement in student learning in the future, it will be essential to address these issues, and the recommendations from the project in Figure 32 were presented to the departments concerned, focusing mainly on the following three targets of support.

- Better use of TB & TG
- Support to Teachers
- Support to Students

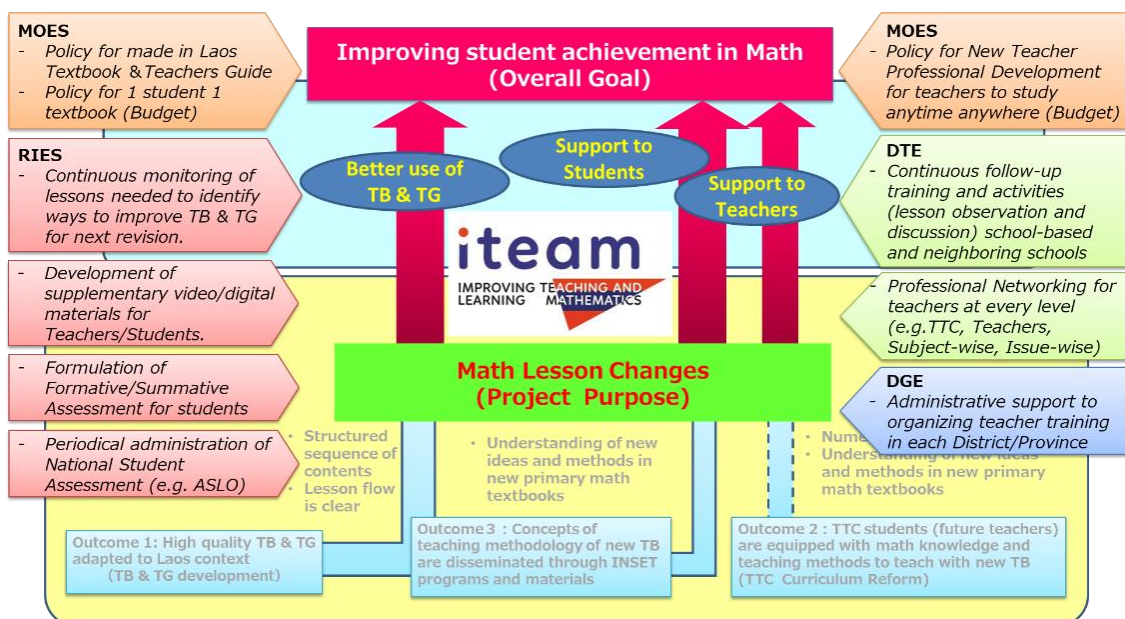


Figure 37 Recommendations from the Project

6.1.1 Recommendations to MOES

For MOES, which is responsible for formulating education policy, several policy guidelines and policy implementation frameworks need to be strengthened, and new efforts to secure budgets through these efforts will need to be considered.

1. "Made in Laos Textbooks and Teacher's Guides" policy: This is not to deny technical assistance from other countries, but textbook development requires a large amount of funds, and budgetary measures are essential to continue to revise the curriculum periodically and revise textbooks accordingly. Due to tariff rates, the economic advantages of printing textbooks outside of Laos have been prioritized in the past, but the academic, technical, and psychological benefits to the people and institutions involved from developing textbooks in their own countries addressed in this project will outweigh the economic benefits.
2. The "one textbook per student" policy (not for lending): There are various issues related to math learning that would be improved if textbooks were distributed to all students every year. Securing time for self-learning by each student (at school and at home) is the biggest of them all. When visiting some schools, it was found that textbooks are still stored in cabinets and not used. In some classrooms, one textbook is shared by several students. This is an issue that should be considered.
3. "New teacher professional development" policy that allows teachers to learn anytime, anywhere: The global trend in teacher education is "continuous learning," and the target of SDG 4 also includes the training of high-quality teachers. The results of teaching methodology tests on the new math textbooks show that follow-up training after the initial introductory training can improve teachers' understanding. Therefore, creating an environment and working conditions where teachers can learn anytime after graduating from TTCs and after being hired as teachers will also contribute to continuous learning quality improvement. One suggestion is to encourage continuous teacher learning by issuing a ministerial decree that allows a certain number of hours of self-learning opportunities (participation in face-to-face training within the school or cluster based training/online learning, self-study/observation of other teachers' classes, etc.) even during working hours. It would also motivate teachers if their self-improvement activities could be recorded and incorporated into future teacher evaluation, salary, and promotion systems.

6.1.2 Recommendations to RIES

In order to make better use of textbooks and teacher's guides, RIES, which is responsible for curriculum development, should be strengthened in capacity for conducting academic research and surveys.

1. Ongoing monitoring of lessons by RIES math experts to identify ways to improve textbooks and teacher's guides for the next curriculum revision is needed to collect information on classroom-level issues. There are concerns that the new textbooks and teacher's guides may be too difficult for students and teachers in Laos. In addition, in rural areas there is still a shortage of teachers, so that students are being taught in multi-grade classes, and that there are also situations where instruction for students whose native language is not Lao is not being adequately handled. If there are areas that can be improved in the curriculum, textbooks and teacher's guide, they should be considered in the next revision. One suggestion for the former issue is to revise the Lao language wording and sentences in the textbooks to make them easier to read and write, given the current situation where many students cannot read and write Lao well enough. As for the teacher's guide, the process of calculation process should be included in red print as much as possible, so that teachers can study on their own. In addition, for teachers who are still inexperienced in 5 step lessons, it would be easier for

them to visualize the development of 5 step lessons if the teacher's guide has questioning methods that encourage students to solve problems on their own and expressions that lead discussion during comparison and discussion. Regarding the latter issue, RIES can continue to work with other organizations such as NGOs that support multi-grade classes and ethnic students and consider including guidelines³³ in the teacher's guide.

2. RIES has a department that can develop supplementary video and digital materials for teachers and students and has the equipment in place. If RIES can record the contents of TOT as was done for G4 TOT and upload the edited videos to YouTube or Khang Panya Lao, they can be used for school-based and cluster-based training and self-study materials.
3. To support students' learning, it has been recommended that the exercises in the math textbooks should be utilized, but this is not necessarily consistent with other subjects. RIES should also urgently consider developing a "formative/summative assessment" framework for comprehensive learning activities throughout primary education. However, a shift to formative assessment would require a dramatic shift in the thinking and attitude of teachers toward assessment and should not be implemented too hastily.
4. In order to check student achievement, national student assessments should be implemented periodically. ASLO, which is also meant to be a self-diagnosis of the implementation of the curriculum (educational policy) for MOES should be implemented continuously.

6.1.3 Recommendations to DTE

For DTE, which is responsible for teacher education and training, in order to strengthen teachers' Content Knowledge and Pedagogical Skills, continuous and more practical support to teachers is needed.

1. It is strongly recommended that ongoing follow-up training and activities be conducted within schools or with neighboring or cluster schools. A "New Teacher Professional Development" policy is required not only because of the training budget, but also because of the need to review the environment and working conditions in which it is acceptable for primary school teachers to leave their workplaces for a few days in order to participate in ongoing training. Expansion of the role of TTCs, which is expected to play a leadership role, is also suggested, but this is not so difficult since there have already been changes in job descriptions that also internalize the function of TTCs to provide support to in-service teachers at the province and district levels. Rather, the difficult part will be the formulation of specific training programs with budget. The effectiveness of follow-up training and activities is suggested in Chapter 4, "Achievement of Project Purpose," and if there is a government-approved program that allows TTCs to visit neighboring schools and other schools to provide guidance to teachers or for teachers to come to TTC to attend training, it would be possible to provide travel allowances and establish a system where TTCs can take the lead in providing more continuous support to teachers. Information on the G2 INSET follow-up training budget implemented in the project for budgetary reference is shown in Table 45.

³³ "Multi-grade Teaching Handbook" supported by Shanti Volunteer Association was approved by DTE in January 2022.

Table 45 Overview of G2 INSET Follow-up Training Budget

Training	G2 INSET Follow-up Training
Days	2 days
Venue	4 TTCs (Luangnamtha, Salavan, Savannakhet, Dongkhamxang)
Target Participants	1 G2 teacher from each cluster (4 target provinces) 1 DESB PA from each district (4 target provinces) Total 429 people
Budget LAK	250,000,000

For this training, one G2 teacher from each cluster in the four target provinces and one DESB PA from each district participated in the 2-day training at 4 TTCs at a total cost of LAK 250,000³⁴. If it is difficult to secure a training budget of a similar amount as the new textbook dissemination training each year, we would like each TTC to consider securing a budget to hold the training with a limited number of participants.

2. Encourage professional networking activities for teachers and instructors at all levels. It is still fresh in our memory that a TTC instructor who participated in this project emotionally announced at the closing seminar that he "was able to learn more deeply about math education through the project activities". In Japan, it is stipulated³⁵ that "teachers are strongly expected to continue learning". In Laos, it is obvious that teachers and instructors must continue to learn as the times change drastically, such as the arrival of "Society 5.0". Furthermore, the effectiveness of cooperative learning has been evaluated, and it is time to materialize networking, both formal and non-formal. During the project period, the project contributed to building a network among TTCs by providing learning opportunities for teachers from 8 TTC, NUOL, and demonstration schools to get together through Lesson Study workshops and training sessions. It is important for DTE to continue to provide annual networking and learning opportunities for TTC, NUOL, and demonstration school teachers with budget support to strengthen the capacity of TTCs. There is already a What's App group for interaction among those involved in this project. In other countries, there are also Lesson Study forums and education practice research groups by subject on Facebook. In Japan, there are many examples of networks, and there are also many online sites and publications.

6.1.4 Recommendations to DGE

For DGEs, support for facilities, equipment, and services for both teachers and students in each province and county is recommended, especially since this will be important during the phase of initiatives targeting schools nationwide.

1. It is requested that administrative support for teacher training to be implemented nationwide in the future be materialized. Specifically, the project proposes that the budget for group training (follow-up training) on math education be included in the annual plan at the province (PESS) and district (DESB) levels, and that the facilities be provided. Although the 2 day

³⁴ Budget was calculated using Laos government budget rate in 2020 and includes participant's daily allowance, accommodation, transportation, and coffee break costs. Government rate was revised on 25th January 2023 and the daily allowance rate has increased from LAK 100,000/day to LAK 150,000/day and accommodation rate from LAK 150,000 – 200,000/night to LAK 200,000 – 300,000/night.

³⁵ For example, "Teachers of schools stipulated by law shall be deeply aware of their noble mission, and shall continually endeavor to study and cultivate themselves in order to carry out their duties" (Article 9 of the Fundamental Law of Education),

They shall endeavor to carry out their professional responsibilities" (Article 9 of the Fundamental Law of Education), "Educational public officials shall endeavor to constantly study and cultivate themselves in order to carry out their professional responsibilities" (Article 21 of the Act on Special Measures for Educational Public Officials), and so on.

new textbook induction training conducted with DTE budget is not enough, if the effectiveness of the follow-up training is emphasized, it would be cost-effective to create training opportunities for teachers in rural areas by securing a budget for PESS/DESB. For budgetary measures, the training at the TTC in Table 45 above can be used as a reference when conducted at the provincial level (PESS), and at the district level (DESB), the DTE budget³⁶ for new textbook dissemination training can be used as a reference. Table 46 summarizes the G5 new textbook dissemination training budget, number of teachers, and training budget per teacher for each county.

Table 46 G5 New Textbook Dissemination Training Budget and Number of Teachers by Province

No.	Province	Training Budget (LAK)	Number of Teachers	Budget per person (LAK)
1	Vientiane Capital	91,630,000	416.00	220,264
2	Khammouan	220,649,000	536.00	411,659
3	Champasack	194,551,000	670	290,375
4	Savannakhet	336,384,000	1,128	298,213
5	Salavan	159,700,000	481	332,017
6	Xiengkhouang	131,245,000	382	343,573
7	Borkeo	110,124,000	228	483,000
8	Bolikhamxay	110,032,000	288	382,056
9	Phongsaly	173,516,000	476	364,529
10	Vientiane	133,946,000	422	317,408
11	Houaphan	242,855,000	670	362,470
12	Luangnamtha	120,688,000	397	304,000
13	Attapeu	70,935,000	194	365,644
14	Sekong	86,020,000	235	366,043
15	Xaysomboun	58,936,000	152	387,737
16	Xaiyabouly	184,318,000	465	396,383
17	Oudomxay	186,456,000	528	353,136
18	Luangprabang	237,037,000	650	364,672
Total		2,849,022,000	8,318	

Source: Compiled by project based on DTE's G5 New Textbook Dissemination Training Budget

Although the training budget per participant varies from LAK 220,264 to 483,000/person from province to province, it may be possible to reduce the training budget if part of the training could be conducted online and the number of face to face training days is reduced or if participants are able to use the School Block Grant based on chapter expenditure to cover some of the participation costs. Support should be provided to schools to also include participation in follow-up trainings in their School Development Plans to allocate funds from the School Block Grant.

³⁶ Budget was calculated using Laos government rate in 2022 and since then the government rate was revised on 25th January 2023.

It is also easy to develop teaching materials and discuss teaching methods (e.g., minority languages, multi-grade classes, etc.) tailored to local conditions. Although training sessions are usually held in the PESS/DESB meeting rooms or at schools, there are still some obstacles to using the Internet and WiFi for activities. In the future, Internet access in educational facilities will be necessary to correct the educational disparity between urban and rural (remote) areas.

2. Collaborate with RIES and DTE in monitoring implementation of curriculum and teacher trainings. As DGE is working with UNICEF to develop a formative assessment system in order for teachers to be able to support students in their learning before they fall behind, through monitoring of lessons and teacher trainings, information can be collected on how to support teachers in conducting formative assessment in their lessons and identifying areas in which further training is needed for teachers and Internal Pedagogical Support (IPS) staff in schools.

Appendices

Appendix 1

PDM (Ver. 0, Ver. 1, Ver. 2)

**MINUTES OF MEETINGS
BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF EDUCATION AND SPORTS
FOR AMENDMENT OF THE RECORD OF DISCUSSIONS
ON
THE PROJECT FOR IMPROVING TEACHING AND LEARNING MATHEMATICS
FOR PRIMARY EDUCATION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC**

The 10th Joint Coordination Committee (hereinafter referred to as JCC) Meeting was held on 20th October 2021 on the amendment of PDM on the Project for Improving Teaching and Learning Mathematics for Primary Education (hereinafter referred to as "the Project") signed on 5th November 2015 initially and 28th December 2018 secondly between Ministry of Education and Sports (hereinafter referred to as "MOES") and the Japan International Cooperation Agency (hereinafter referred to as "JICA"). MOES and JICA hereby agreed upon the contents of the amendment through the discussions at JCC. The Details of amendment is shown in ANNEX1. This amendment will become effective as of *17th* November 2021.

Vientiane, *17th* November 2021


NAGASE Toshio
Chief Representative
Laos Office
Japan International Cooperation Agency
Japan



Assoc. Prof Dr. Phout SIMMALAVONG
Minister
Ministry of Education and Sports
Lao People's Democratic Republic

ANNEX 1: Details of Amendment

ANNEX 2: Amended version of Project Design Matrix (PDM)

ANNEX 3: Amended version of Plan of Operations (PO)

Annex 4: Record of Discussions (Signed on 28th December 2018)

Annex 1: Details of Amendment

Project Title: Project for Improving Teaching and Learning Mathematics for Primary Education
Comparison between PDM1 and PDM2

	Current version (PDM1) 11.2018	Revised version (PDM2) ** **.2021	Reason for Change
Duration	February, 2016 – March, 2022	February, 2016 – March, 2023	Extend for 1 year due to delays in inputs and activities from COVID-19.
Target Group (Direct)	Implementing Agency: RIES, DGE, DTE Target Group: (Direct) Teachers Training College (TTC) trainers in pilot provinces and teachers in pilot schools, (Indirect) primary school pupils		No change
Target Area	Nationwide (pilot provinces ¹ are Luang Namtha, Salavan, Savannakhet, and Vientiane Capital) (at footnote) ¹ Pilot Provinces: Provinces for piloting draft textbooks and teachers' guides and conducting Textbook Effectiveness Study and Base / End-line surveys		No change

Overall Goal	Students' learning outcome in mathematics at primary level is improved.		No change from the previous Overall Goal
Objectively Verifiable Indicators	Results of National Assessment in Primary mathematics	Results of Grade 3 ASLO are higher than the previous Grade 3 ASLO.	Propose to use Grade 3 ASLO.
Means of Verification	ASLO (or its equivalent)	Grade 3 ASLO	Added details.

Project Purpose	Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.		No change
Important Assumption	Developed mathematics educational materials are continuously distributed and being used by children and teachers.		No change
Objectively Verifiable	Level of improved lessons in line with textbook of primary mathematics implemented in target area	Level of improved lessons in line with textbook of primary mathematics implemented in target area.	Proposed indicators.

Indicators	(indicators to be developed by the project).	<p>(1) Status of proper use of textbooks by teachers</p> <p>(2) 10% point improvement on average score in Teaching Methodology Test</p> <p>(3) 50% of Grade 1 - Grade 4 TTC demonstration school teachers in pilot provinces achieve Level 1 (half of Lesson Observation Checklist criteria)</p>	
Means of Verification		<p>(1) Questionnaire for teacher, principal, and students</p> <p>(2) Teaching Methodology Test</p> <p>(3) Results of Lesson Observation</p>	<ul style="list-style-type: none"> Situation of usage of textbooks during lesson and for homework – Comparison of questionnaire responses from June 2021 and May 2022 after TTC demonstration school teachers use INSET materials developed in Output 3. Teaching Methodology Test – Comparison of G3 Teacher's Teaching Methodology Test results from June 2021 and May 2022 results after TTC demonstration school teachers use INSET materials developed in Output 3. Lesson observation comparison of TTC demonstration school teachers before and after introducing INSET materials in Output 3.

Output 1	Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.		No change
Objectively Verifiable Indicators	Approval of the textbook and teaching/learning materials by MOES.		No change
Means of Verification	MOES	CACIM Report/MOES Decree	Added details.
Important Assumption	Developed mathematics educational materials are distributed and being used by children and teachers.		No change
Activity	1-1. Revise the primary mathematics curriculum framework.		No change
	1-2. Conduct baseline survey to assess academic performance of students.		No change
	1-3. Develop draft textbook and teacher's guide for primary mathematics education in line with		No change

	curriculum revision.		
	1-4. Pilot draft textbook and teacher's guide for primary mathematics education in pilot provinces throughout academic year.		No change
	1-5. Finalize draft textbook and teacher's guide for primary mathematics education based on the piloting results.	1-5. Conduct tests to pilot school students to assess their understanding of the draft textbook.	Changed from 1-7 "annual survey to assess the effectiveness of newly developed mathematical materials" to "tests to pilot school students to assess their understanding of the draft textbook".
	1-6. Submit the final version to CACIM for approval and prepare final data for printing.	1-6. Finalize draft textbook and teacher's guide for primary mathematics education based on the piloting results.	Moved from 1-5 to 1-6.
	1-7. Conduct annual survey to assess the effectiveness of newly developed mathematical materials at school level in pilot provinces.	1-7. Submit the final version to CACIM for approval and prepare final data for printing.	Moved from 1-6 to 1-7.
	1-8. Conduct end-line survey to assess academic performance of students.		No change
	1-9. Coordinate with development partners on textbook and teacher's guide development activities.		No change

Output 2	TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.		No change
Objectively Verifiable Indicators	Increment TTC students' academic performance in mathematics subject (indicators to be developed by the project).	Increment TTC students' academic performance in mathematics subject. (1) 10% point improvement on TTC student's math assessment (Basic Math) (2) 10% point improvement on TTC student's math assessment (Teaching Math 2)	Proposed indicators.
Means of Verification		(1) Basic Math Test (2) Teaching Math Test	Basic Math: 2019 cohort - Pre-test 42.8%→ Post-test 54.4% (+11.5%) 2020 cohort (currently analyzing data) and 2021 cohort (plan to conduct tests in Oct 2021 and Jan 2022) Teaching Math 2: 2019 cohort - Post-test

			average 46.9% (2019 cohort) 2020 cohort (plan to conduct tests in Oct 2021 and Jan 2022)
Activity	2-1. Conduct baseline survey to assess mathematical knowledge and teaching skills of TTC students in pilot provinces.		No change
	2-2. Review and revise TTC curriculum and syllabi relating to primary mathematics education.		No change
	2-3. Develop mathematics exercise books to be incorporated in syllabi based on the results of the baseline survey in line with the revised TTC and primary mathematics curriculum.		No change
	2-4. Introduce the exercise books to TTCs in pilot provinces and monitor their usage.		No change
	2-5. Conduct follow-up survey to assess the mathematical knowledge and teaching skills of TTC students in pilot provinces.		No change
	2-6. By coordinating with other stakeholders, introduce the revised TTC curriculum and syllabi including the exercise books for nationwide use.		No change
	2-7. Coordinate with development partners on the activities associated with TTCs.		No change

Output 3	The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET activities.	The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET programs and materials promoting lessons in line with the new primary mathematics textbooks.	Revised to reflect changes in Output 3 activities.
Objectively Verifiable Indicators	(1) Increment in score of training evaluation, comparing between pre and post-test. (2) Number of teacher training activities conducted for target schools (indicators to be developed by the project).	(1) Teachers are conducting lessons in line with the new primary mathematics textbooks in schools and meeting with other teachers in their school to discuss about their lessons at least once a month. (2) Improvement of Grade 1-Grade 5 students' learning by conducting lessons in line with the new primary mathematics	Proposed indicators.

		textbooks. (trial schools) (3) INSET programs and materials are incorporated into future CPD activities by MOES or other donors.	
Means of Verification		(1) Questionnaire for teachers/principals/School INSET Report (2) Student test /assessment (3) Project Report	(1) Check to see teachers are practicing 5 step math lessons after workshop through lesson observation, report from schools. (2) Student assessment (small test) of TTC demonstration school students after teachers conduct lesson. (3) Discuss with other donors about utilizing program materials developed.
Activity	3-1. Prepare a plan for the new curriculum school level training and follow-up in-service teacher training programme activities to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.	3-1. Prepare a plan for and conduct the new curriculum school level training for Grade 1- Grade 5.	Change in wording
	3-2. Implement the new curriculum school level training.	3-2. Prepare and conduct pedagogical training/workshops on conducting and promoting lessons in line with the new primary mathematics textbooks in schools.	New
	3-3. Introduce follow-up in-service teacher training activities (such as Lesson Study) in line with the new textbooks and teacher's guides in pilot provinces.	3-3. Conduct monitoring to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks.	New
	3-4. Conduct a survey to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks.	3-4. Collaborate with MOES/other donors to conceptualize CPD implementation process in other provinces.	New
	3-5. Disseminate the follow-up in-service teacher training activities to other provinces to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.		Changed to 3-4

Inputs by the Japanese side	<u>Inputs by the Japanese side</u> <u>1. Dispatch of experts</u> - Project Team Leader/Education Planning Advisor 1/Education Administration/ Donor Coordination Advisor - Assistant Project Team Leader/Education Planning Advisor 2 - Mathematics Education Advisor 1 - Mathematics Education Advisor 2 - Teacher Education Advisor	<u>Inputs by the Japanese side</u> <u>1. Dispatch of experts</u> - Project Team Leader/Education Planning Advisor 1/Education Administration/ Donor Coordination Advisor - Assistant Project Team Leader/Education Planning Advisor 2 - Mathematics Education Advisor 1 - Mathematics Education Advisor 2 - Mathematics Education Advisor 3 - Teacher Education Advisor	As actual
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	<ul style="list-style-type: none"> - Textbook Development Advisor 1(Math Editing Advisor) - Textbook Development Advisor 2(Editing Technology Advisor) - Textbook Development Advisor 3(Math Textbook Advisor) - Textbook Development Advisor 4 (Printing Technology Specialist) - Education Evaluation Advisor 1 - Education Evaluation Advisor 2/Project Coordinator/ Training Management 1 	<ul style="list-style-type: none"> - Textbook Development Advisor 1(Math Editing Advisor) - Textbook Development Advisor 2(Editing Technology Advisor) - Textbook Development Advisor 3(Math Textbook Advisor) - Textbook Development Advisor 4 (Printing Technology Specialist) - Education Evaluation Advisor 1 - Education Evaluation Advisor 2/Project Coordinator/ Training Management 1 	
Inputs by the Lao side	<u>Inputs by the Lao side</u> <u>1. Assignment of counterpart personnel:</u> <ul style="list-style-type: none"> - <u>Project Director:</u> Vice Minister of Education and Sports - <u>Project Manager:</u> Director of Research Institute for Educational Sciences (RIES) -Member of the Technical Committee (Math) - Head of math unit - Technical staff of RIES - Technical staff of Department of General Education (DGE) - Technical staff of Department of Teacher Education (DTE) and Teacher Development Center (TDC) - Teaching staff of TTC - Primary Teachers - Other persons if necessary 		No change
	<u>3. Bearing of expenses as necessary:</u> <ul style="list-style-type: none"> - Printing and distribution of the textbook and teacher's guide - Honorarium payment for textbook writers. - Monitoring and follow-up activities for in-service teacher training activities 		No change

(Prepared on 20th October, 2021)

ANNEX 2: PDM2 (Amended version of Project Design Matrix)

20th October, 2021

Project Design Matrix (PDM2)

Project Title: Project for Improving Teaching and Learning Mathematics for Primary Education

Implementing Agency: RIES, DGE, DTE

Target Group: (Direct) Teachers Training College (TTC) trainers in pilot provinces and teachers in pilot schools, (Indirect) primary school pupils

Period of Project: February, 2016 - March, 2023

Target Area: Nationwide (Pilot provinces¹ are Luang Namtha, Salavan, Savannakhet, and Vientiane Capital)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p>Overall Goal Students' learning outcome in mathematics at primary level is improved.</p>	<p>Results of Grade 3 ASLO are higher than previous Grade 3 ASLO.</p>	<p>Grade 3 ASLO</p>	
<p>Project Purpose Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.</p>	<p>Level of improved lessons in line with textbook of primary mathematics implemented in target area.</p> <p>(1) Status of proper use of textbooks by teachers (2) 10% point improvement on average score in Teaching Methodology Test (3) 50% of Grade 1 - Grade 4 TTC demonstration school teachers in pilot provinces achieve Level 1 (half of Lesson Observation Checklist criteria)</p>	<p>(1) Questionnaire for teacher, principal, and students (2) Teaching Methodology Test (3) Results of Lesson Observation</p>	<p>Developed mathematics educational materials are continuously distributed and being used by children and teachers.</p>
<p>Output 1: Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.</p>	<p>Approval of the textbook and teaching/learning materials by MOES.</p>	<p>CACIM Report/MOES Decree</p>	<p>Developed mathematics educational materials are distributed and being used by children and teachers.</p>
<p>Output 2: TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.</p>	<p>Increment TTC students' academic performance in mathematics subject.</p> <p>(1) 10% point improvement on TTC student's math assessment (Basic Math) (2) 10% point improvement on TTC student's math assessment (Teaching Math 2)</p>	<p>(1) Basic Math Test (2) Teaching Math Test</p>	

¹ Pilot Provinces: Provinces for piloting draft textbooks and teachers' guides and conducting Textbook Effectiveness Study, follow-up in-service teacher training activities and Base / End-line surveys

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p>Output 3: The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET programs and materials promoting lessons in line with the new primary mathematics textbooks.</p>	<p>(1) Teachers are conducting lessons in line with the new primary mathematics textbooks in schools and meeting with other teachers in their school to discuss about their lessons at least once a month.</p> <p>(2) Improvement of Grade 1- Grade 5 students' learning by conducting lessons in line with the new primary mathematics textbooks. (trial schools)</p> <p>(3) INSET programs and materials are incorporated into future CPD activities by MOES or other donors.</p>	<p>(1) Questionnaire for teachers/principals/School INSET Report</p> <p>(2) Student test /assessment</p> <p>(3) Project Report</p>	
Activities	Inputs		Pre-Conditions
<p>1-1. Revise the primary mathematics curriculum framework.</p> <p>1-2. Conduct baseline survey to assess academic performance of students.</p> <p>1-3. Develop draft textbook and teacher's guide for primary mathematics education in line with curriculum revision.</p> <p>1-4. Pilot draft textbook and teacher's guide for primary mathematics education in pilot provinces throughout academic year.</p> <p>1-5. Conduct tests to pilot school students to assess their understanding of the draft textbook.</p> <p>1-6. Finalize draft textbook and teacher's guide for primary mathematics education based on the piloting results.</p> <p>1-7. Submit the final version to CACIM for approval and prepare final data for printing.</p> <p>1-8. Conduct end-line survey to assess academic performance of students.</p> <p>1-9. Coordinate with development partners on textbook and teacher's guide development activities.</p>	<p><u>Inputs by the Japanese side</u></p> <p><u>1. Dispatch of experts</u></p> <ul style="list-style-type: none"> - Project Team Leader/Education Planning Advisor 1/Education Administration/ Donor Coordination Advisor - Assistant Project Team Leader/Education Planning Advisor 2 - Mathematics Education Advisor 1 - Mathematics Education Advisor 2 - Mathematics Education Advisor 3 - Teacher Education Advisor - Textbook Development Advisor 1(Math Editing Advisor) - Textbook Development Advisor 2(Editing Technology Advisor) - Textbook Development Advisor 3(Math Textbook Advisor) - Textbook Development Advisor 4 (Printing Technology Specialist) - Education Evaluation Advisor 1 - Education Evaluation Advisor 2/Project Coordinator/ Training Management 1 <p><u>2. Provision of the equipment including:</u></p> <ul style="list-style-type: none"> - 1 vehicle - 1 photocopy machine - 3 video cameras - 8 computers (depend on the number of C/PS) 		<p>Curriculum reform policy is maintained.</p>

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
<p>2-1. Conduct baseline survey to assess mathematical knowledge and teaching skills of TTC students in pilot provinces.</p> <p>2-2. Review and revise TTC curriculum and syllabi relating to primary mathematics education.</p> <p>2-3. Develop mathematics exercise books to be incorporated in syllabi based on the results of the baseline survey in line with the revised TTC and primary mathematics curriculum.</p> <p>2-4. Introduce the exercise books to TTCs in pilot provinces and monitor their usage.</p> <p>2-5. Conduct follow-up survey to assess the mathematical knowledge and teaching skills of TTC students in pilot provinces.</p> <p>2-6. By coordinating with other stakeholders, introduce the revised TTC curriculum and syllabi including the exercise books for nationwide use.</p> <p>2-7. Coordinate with development partners on the activities associated with TTCs.</p>	<p><u>3. Bearing of expenses as necessary:</u></p> <ul style="list-style-type: none"> - Trainings in third countries and Japan - Workshops for educational materials including textbook, teacher's guide and teaching/learning materials development including travel allowance for the participants (transportation, daily allowance and accommodation as necessary) - Workshops for orientation of trainers and primary teachers <p>Total cost of project expected to be US\$ 7 million.</p> <p><u>Inputs by the Lao side</u></p> <p><u>1. Assignment of counterpart personnel:</u></p> <ul style="list-style-type: none"> - <u>Project Director:</u> Vice Minister of Education and Sports - <u>Project Manager:</u> Director of Research Institute for Educational Sciences (RIES) - Member of the Technical Committee (Math) - Head of math unit - Technical staff of RIES - Technical staff of Department of General Education (DGE) - Technical staff of Department of Teacher Education (DTE) and Teacher Development Center (TDC) - Teaching staff of TTC - Primary Teachers - Other persons if necessary 		
<p>3-1. Prepare a plan for and conduct the new curriculum school level training for Grade 1-Grade 5.</p> <p>3-2. Prepare and conduct pedagogical training/workshops on conducting and promoting lessons in line with the new primary mathematics textbooks in schools.</p> <p>3-3. Conduct monitoring to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks.</p> <p>3-4. Collaborate with MOES/other donors to conceptualize CPD implementation process in other provinces.</p>	<p><u>2. The Project Office</u> RIES and DTE</p> <p><u>3. Bearing of expenses as necessary:</u></p> <ul style="list-style-type: none"> - Printing and distribution of the textbook and teacher's guide - Honorarium payment for textbook writers. - Monitoring and follow-up activities for in-service teacher training activities 		

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MINUTES OF MEETINGS
FOR AMENDMENT OF THE RECORD OF DISCUSSIONSON

ON
THE PROJECT FOR IMPROVING TEACHING AND LEARNING MATHEMATICS
FOR PRIMARY EDUCATION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

BETWEEN
MINISTRY OF EDUCATION AND SPORTS
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

The meeting of the Steering Committee for the Project for Improving Teaching and Learning Mathematics for Primary Education (hereinafter referred to as "the Project") was held on 5th March 2018, and through the following discussions, the Ministry of Education and Sports (hereinafter referred to as "MOES") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") agreed to amend the Project Design Matrix, which was attached to the Record of Discussions (hereinafter referred to as "R/D") on the Project signed on 5th November 2015 between MOES and JICA. MOES and JICA hereby agreed upon the contents of the amendment including the Plan of Operations and the List of Members of the Steering Committee as attached hereto. This amendment will become effective as of 28th December 2018.

Vientiane, 28th December 2018

米山 芳春

Mr. Yoshiharu Yoneyama
Chief Representative
Lao Office
Japan International Cooperation Agency
Japan



A blue ink signature of Dr. Khamphay Sisavan, Vice Minister of Education and Sports, written over a red circular official seal of the Ministry of Education and Sports of the Lao People's Democratic Republic.

Dr. Khamphay Sisavan Vice Minister
Ministry of Education and Sports
Lao People's Democratic Republic

- Annex 1: Details of Amendment (Comparison of PDM0 and PDM1)
- Annex 2: PDM1 (Amended version of Project Design Matrix)
- Annex 3: Revised Plan of Operations (PO) based on PDM1
- Annex 4: Member List of the Steering Committee (Ministerial Decree No. 4867) in Lao
- Annex 5: English Translation of Annex 4

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Project Title: Project for Improving Teaching and Learning Mathematics for Primary Education
Comparison between PDM0 and PDM1

Annex 1: Details of Amendment

	Current version (PDM0) 5.11.2015	Revised version (PDM1) **.**.2018	Reason for Change
Duration	6 years and 3 months (January, 2016 – March, 2022)	February, 2016 – March, 2022	
Target Group (Direct)	RIES, DPPE, DTE staffs, TTC trainers and teachers in schools for validation and target area for printing of textbook areas,	As Implementing Agencies, RIES, DTE, DGE are added. Rewritten as Target Group (Direct): Teacher Training College (TTC) trainers in pilot provinces and primary school teachers in pilot schools	Aligned with actual commencement Due to restructuring of MOES, target group is specified.
Target Area	Nationwide (3 Pilot Provinces for printing TB&TG)	Nationwide (pilot provinces ¹ are Luang Namtha, Salavan, Savannakhet, and Vientiane Capital) for validation of TB&TG and for teachers education as well (at footnote) ¹ Pilot Provinces: Provinces for piloting draft textbooks and teachers' guides and conducting Textbook Effectiveness Study and Base / End-line surveys	Due to alignment with BEQUAL program, Savannakhet province has been added as a pilot province.

Super Goal	Students' academic achievement in mathematics at primary level is improved.	Moved to "Overall Goal".	"Super Goal" is moved to "Overall Goal", because the difference between the previous Overall Goal and Project Purpose was not clear, and the previous Super Goal is more relevant to be set as the Overall Goal, which is expected to achieve around three years after the completion of the project.
Objectively Verifiable Indicators	Results of National Assessment in Primary mathematics		
Means of Verification	MOES Report		

Overall Goal	Effective teaching and learning methods for primary mathematics are disseminated with the mathematics educational materials...	Students' learning outcome in mathematics at primary level is improved.	Shifted the focus to "learning", not just the "academic achievement."
Objectively Verifiable Indicators	(1) Percentage of the textbook of primary mathematics distributed. (2) Percentage of improved lessons in line with textbook of primary mathematics implemented.	Results of National Assessment in Primary mathematics	No change from the previous Super Goal
Important Assumption	- Textbook and teacher's guide of primary mathematics are distributed as planned by MOES.	ASLO (or its equivalent)	ASLO has been identified as one of the possible indicators.

Project Purpose	Quality of primary mathematic lessons is enhanced in <i>target area</i> through mathematical educational materials...	Deleted "in target area"	This project purpose is meant to nationwide, but the original description was confusing. ("in target area" could be read as the pilot provinces.)
Important Assumption	- Appropriate number of counterparts continues to be assigned to the Project.	Developed mathematics educational materials are continuously distributed and being used by children and teachers.	Moved from Overall Goal level and rewritten in more relevant wording.

Output 1	No change	-	
Important Assumption	(None)	Developed mathematics educational materials are distributed and being used by children and teachers.	Added to Output level as well, since it is essential to reach Project Purpose.
Activity	1-1 Clarify implementation strategies for development of textbook and teacher's guide for primary mathematics education (Curriculum implementation study for experience in Laos/Japan)	(Rewritten as) 1-1 Revise the primary mathematics curriculum framework.	At commencement of the project, revision process was being done by RIES.
	1-2 Select and appoint schools and teachers in target areas	(Deleted)	Deleted as BEQUAL did it
	1-3 Develop indicators (for academic performance of pupils etc.)	(1-3 & 1-4 combined as)	Combined process of baseline survey
	1-4 Conduct baseline survey in <i>target areas</i> (teachers/pupil performance etc.)	1-2. Conduct baseline survey to assess academic performance of students.	
	1-5 Review and develop draft textbook and teacher's guide for primary mathematics education in the line with curriculum revision.	(Delete "Review") 1-3. Develop draft textbook and teacher's guide for primary mathematics education in line with the curriculum revision.	At commencement of the project, review process was being done by RIES.
	1-6. Validate draft textbook and teacher's guide for primary mathematics education in <i>target areas</i> .	(Rewritten as) 1-4. Pilot draft textbook and teacher's guide for primary mathematics education in pilot provinces throughout academic year.	Due to alignment with BEQUAL program, same modality and wording have been used.
	1-7. Finalize draft textbook and teacher's guide for primary mathematics education based on feedback from <i>target areas</i> after Activities 1-6.	(Rewritten as) 1-5. Finalize draft textbook and teacher's guide for primary mathematics education based on the <i>piloting results</i> .	Due to alignment with BEQUAL program, same modality and wording have been used
	1-8. Approve textbook and teacher's guide by CACIM workshop.	(1-8, 1-9, 1-10 combined as) 1-6. Submit the final version to CACIM for approval and prepare final data for printing.	Combined as part of finalization of textbook
	1-9. Finalize textbook and teacher's guide for printing through workshops.		
	1-10. Print and distribute textbook and teacher's guide for primary mathematics education in <i>target areas</i> .		
	(Additional activity) 1-7. Conduct annual survey to assess the effectiveness of newly	As mathematical materials are being developed and implemented year-wise from	

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		developed mathematical materials at school level in pilot provinces.	G1 to G5, survey should also be year-wise.
	1-11 Conduct endline survey in target areas (teachers/pupil performance, etc.)	(Rewritten as) 1-8. Conduct end-line survey to assess academic performance of students.	Rewritten more specifically
		(Additional activity) 1-9. Coordinate with development partners on textbook and teacher's guide development activities.	Importance of coordination has been recognized and included as an activity.

Output 2	Mathematic subject knowledge of students at TTC in target areas is enhanced with revised contents of TTC curriculum and mathematics educational materials for primary education.	(By adding Skill aspect, rewritten as) TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.	Skill aspect has been incorporated focusing more on the relevance between TTC Curriculum and its material development.
Activity	2-1. Clarify implementation strategies for enhancing Mathematic subject knowledge of TTC students in target areas with revised contents of TTC curriculum and mathematics educational materials for primary education.	(Deleted)	Activities in Output 2 have been integrated and modified in a more practical form.
	2-2 Develop indicators (for academic performance of TTC students, etc.) 2-3 Conduct baseline survey in target areas	(2-2 & 2-3 combined as) 2-1 Conduct baseline survey to assess mathematical knowledge and teaching skills of TTC students in pilot provinces.	Combined process of baseline survey
	2-4. Review and revise TTC curriculum and training materials for primary mathematics contents along line with textbook and teacher's guide for primary mathematics education.	(Rewritten as) 2-2 Review and revise TTC curriculum and syllabi relating to primary mathematics education.	Specified details on curriculum revision
	2-5. Implement PRESET with revised TTC curriculum and training materials.	(Separate 2-5 into 2 activities as) 2-3 Develop mathematics exercise books to be incorporated in syllabi based on the results of the baseline survey in line with the revised TTC and primary mathematics curriculum. 2-4 Introduce the exercise books to TTCs in pilot provinces and monitor their usage.	Specified activities
	2-6 Access mathematic subject knowledge of TTC students in target areas 2-7 Compile results of mathematic subject knowledge of TTC students in target areas 2-8 Conduct baseline survey in target areas	(2-6, 2-7, 2-8 combined as) 2-5 Conduct follow-up survey to assess the mathematical knowledge and teaching skills of TTC students in pilot provinces.	Combined process of assessment survey of TTC students
		(Additional activities) 2-6 By coordinating with other stakeholders, introduce the revised TTC curriculum and syllabi including the exercise books for nationwide use.	As actual plan

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		2-7 Coordinate with development partners on the activities associated with TTCs.	Importance of coordination has been recognized and included as an activity
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Output 3	INSET program with Professional Development Network (PDN) for primary mathematics in target areas is enhanced through development of mathematics educational materials.	(Modified based on actual activity as) The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET activities.	PDN is substituted with INSET activities in a broader sense of teachers continuing professional development.
Activity	3-1. Clarify implementation strategies for INSET for enhancing primary mathematics through development of mathematics educational materials.	(Modified based on actual activity as) 3-1 Prepare a plan for the new curriculum school level training and follow-up in-service teacher training programme activities to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.	As actual plan
	3-4. Develop materials on orientation programs for teachers. 3-5. Support Professional Development Network (PDN) by use of textbook and teacher's guide for primary mathematics education in target areas.	(Modified 3-4 & 3-5 based on actual activity as) 3-2 Implement the new curriculum school level training. 3-3 Introduce follow-up in-service teacher training activities (such as Lesson Study) in line with the new textbooks and teacher's guides in pilot provinces.	As actual plan
	3-2 Develop indicators (performance of teachers, institutional capacity of RIES and TTC, etc.) 3-3 Conduct baseline survey in target areas 3-7. Conduct ending survey in target areas.	(3-2, 3-3, 3-7 combined as) 3-4 Conduct a survey to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks.	Combined process of assessment survey of teachers with new textbooks
	3-6. Outline INSET program for effective use of textbook and teacher's guide for primary mathematics education.	(Modified based on actual activity as) 3-5 Disseminate the follow-up in-service teacher training activities to other provinces to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.	As actual plan

Inputs by the Japanese side	<u>Inputs by the Japanese side</u> <u>1. Dispatch of experts</u> - Chief Advisor - Mathematics Education - Teacher Education - Textbook Development - Educational Administration - Education Evaluation - Coordinator - Other experts when necessary	<u>Inputs by the Japanese side</u> <u>1. Dispatch of experts</u> - Project Team Leader/Education Planning Advisor 1/Education Administration/ Donor Coordination Advisor - Assistant Project Team Leader/Education Planning Advisor 2 - Mathematics Education Advisor 1 - Mathematics Education Advisor 2 - Teacher Education Advisor - Textbook Development Advisor 1(Math Editing Advisor) - Textbook Development Advisor 2(Editing Technology Advisor) - Textbook Development Advisor 3(Math Textbook Advisor) - Textbook Development Advisor 4 (Printing Technology Specialist) - Education Evaluation Advisor 1 - Education Evaluation Advisor 2/Project Coordinator/ Training	As actual
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	3. Bearing of expenses as necessary: - Printing textbook, teacher's guide for the target areas (3 provinces)	3. Bearing of expenses as necessary: (Deleted)	Not specified
Inputs by the Lao side	Inputs by the Lao side 1. Assignment of counterpart personnel: - Project Director: Vice Minister of Education and Sports - Project Manager: Director of Research Institute for Educational Sciences (RIES) - Member of the Technical Committee (Math) - Head of math unit - Technical staff(s) of RIES - Technical staff(s) of Department of Pre-school and Primary Education (DPPE) - Technical staff(s) of Department of Teacher Education (DTE) and Teacher Development Center (TDC) - Teaching staff(s) of TTC - Primary Teachers - Other persons if necessary	Inputs by the Lao side 1. Assignment of counterpart personnel: - Project Director: Vice Minister of Education and Sports - Project Manager: Director of Research Institute for Educational Sciences (RIES) - Member of the Technical Committee (Math) - Head of math unit - Technical staff of RIES - Technical staff of Department of General Education (DGE) - Technical staff of Department of Teacher Education (DTE) and Teacher Development Center (TDC) - Teaching staff of TTC - Primary Teachers - Other persons if necessary	Due to restructuring of MOES
	3. Bearing of expenses as necessary: - Printing and distribution of the textbook and teacher's guide - Honorarium payment for textbook writers. - Monitoring and follow-up activities for PDN.	3. Bearing of expenses as necessary: - Printing and distribution of the textbook and teacher's guide - Honorarium payment for textbook writers. - Monitoring and follow-up activities for in-service teacher training activities	

(Prepared on November 14, 2018)

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ANNEX 2: PDM1 (Amended version of Project Design Matrix)
 ** November 2018

Project Design Matrix (PDM1)

Project Title: Project for Improving Teaching and Learning Mathematics for Primary Education
 Implementing Agency: RIES, DGE, DTE
 Target Group: (Direct) Teachers Training College (TTC) trainers in pilot provinces and teachers in pilot schools, (Indirect) primary school pupils
 Period of Project: February, 2016 - March, 2022
 Target Area: Nationwide (Pilot provinces¹ are Luang Namtha, Salavan, Savannakhet, and Vientiane Capital

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Students' learning outcome in mathematics at primary level is improved.	Results of National Assessment in Primary mathematics	ASLO (or its equivalent)	
Project Purpose Quality of primary mathematics lessons is enhanced through mathematical educational materials including textbook, teacher's guide and teaching/learning materials.	Level of improved lessons in line with textbook of primary mathematics implemented in target area (indicators to be developed by the project).	Project report	Developed mathematics educational materials are continuously distributed and being used by children and teachers.
Output 1: Mathematics educational materials including textbook, teacher's guide and teaching/learning materials are developed.	Approval of the textbook and teaching/learning materials by MOES.	MOES	Developed mathematics educational materials are distributed and being used by children and teachers.
Output 2: TTC curriculum and educational materials relating to primary mathematics become effective for improving mathematical subject knowledge and teaching skills of TTC students.	Increment TTC students' academic performance in mathematics subject (indicators to be developed by the project).	Project reports	
Output 3: The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET activities.	(1) Increment in score of training evaluation, comparing between pre and post-test. (2) Number of teacher training activities conducted for target schools (indicators to be developed by the project).	Project reports	

¹ Pilot Provinces: Provinces for piloting draft textbooks and teachers' guides and conducting Textbook Effectiveness Study, follow-up in-service teacher training activities and Base / End-line surveys

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Activities	Inputs	Pre-Conditions
<p>1-1. Revise the primary mathematics curriculum framework.</p> <p>1-2. Conduct baseline survey to assess academic performance of students.</p> <p>1-3. Develop draft textbook and teacher's guide for primary mathematics education in line with curriculum revision.</p> <p>1-4. Pilot draft textbook and teacher's guide for primary mathematics education in pilot provinces throughout academic year.</p> <p>1-5. Finalize draft textbook and teacher's guide for primary mathematics education based on the piloting results.</p> <p>1-6. Submit the final version to CACIM for approval and prepare final data for printing.</p> <p>1-7. Conduct annual survey to assess the effectiveness of newly developed mathematical materials at school level in pilot provinces.</p> <p>1-8. Conduct end-line survey to assess academic performance of students.</p> <p>1-9. Coordinate with development partners on textbook and teacher's guide development activities.</p>	<p><u>Inputs by the Japanese side</u></p> <p><u>1. Dispatch of experts</u></p> <ul style="list-style-type: none"> - Project Team Leader/Education Planning Advisor 1/Education Administration/ Donor Coordination Advisor - Assistant Project Team Leader/Education Planning Advisor 2 - Mathematics Education Advisor 1 - Mathematics Education Advisor 2 - Teacher Education Advisor - Textbook Development Advisor 1(Math Editing Advisor) - Textbook Development Advisor 2(Editing Technology Advisor) - Textbook Development Advisor 3(Math Textbook Advisor) - Textbook Development Advisor 4 (Printing Technology Specialist) - Education Evaluation Advisor 1 - Education Evaluation Advisor 2/Project Coordinator/ Training Management 1 <p><u>2. Provision of the equipment including:</u></p> <ul style="list-style-type: none"> - 1 vehicle - 1 photocopy machine - 3 video cameras - 8 computers (depend on the number of C/Ps) <p><u>3. Bearing of expenses as necessary:</u></p> <ul style="list-style-type: none"> - Trainings in third countries and Japan - Workshops for educational materials including textbook, teacher's guide and teaching/learning materials development including travel allowance for the participants (transportation, daily allowance and accommodation as necessary) - Workshops for orientation of trainers and primary teachers <p>Total cost of project expected to be US\$ 7 million.</p> <p><u>Inputs by the Lao side</u></p> <p><u>1. Assignment of counterpart personnel:</u></p> <ul style="list-style-type: none"> - <u>Project Director:</u> Vice Minister of Education and Sports - <u>Project Manager:</u> Director of Research Institute for Educational Sciences (RIES) Member of the Technical Committee (Math) - Head of math unit - Technical staff of RIES - Technical staff of Department of General Education (DGE) 	<p><u>Pre-Conditions</u></p> <p>Curriculum reform policy is maintained.</p>
<p>2-1. Conduct baseline survey to assess mathematical knowledge and teaching skills of TTC students in pilot provinces.</p> <p>2-2. Review and revise TTC curriculum and syllabi relating to primary mathematics education.</p> <p>2-3. Develop mathematics exercise books to be incorporated in syllabi based on the results of the baseline survey in line with the revised TTC and primary mathematics curriculum.</p> <p>2-4. Introduce the exercise books to TTCs in pilot provinces and monitor their usage.</p> <p>2-5. Conduct follow-up survey to assess the mathematical knowledge and teaching skills of TTC students in pilot provinces.</p> <p>2-6. By coordinating with other stakeholders, introduce the revised TTC curriculum and syllabi including the exercise books for</p>		

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<p>nationwide use. 2-7. Coordinate with development partners on the activities associated with TTCs.</p>	<ul style="list-style-type: none">- Technical staff of Department of Teacher Education (DTE) and Teacher Development Center (TDC)- Teaching staff of TTC- Primary Teachers- Other persons if necessary	
<p>3-1. Prepare a plan for the new curriculum school level training and follow-up in-service teacher training programme activities to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.</p> <p>3-2. Implement the new curriculum school level training.</p> <p>3-3. Introduce follow-up in-service teacher training activities (such as Lesson Study) in line with the new textbooks and teacher's guides in pilot provinces.</p> <p>3-4. Conduct a survey to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks.</p> <p>3-5. Disseminate the follow-up in-service teacher training activities to other provinces to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks.</p>	<p><u>2. The Project Office</u> RIES and DTE</p> <p><u>3. Bearing of expenses as necessary:</u></p> <ul style="list-style-type: none">- Printing and distribution of the textbook and teacher's guide- Honorarium payment for textbook writers.- Monitoring and follow-up activities for in-service teacher training activities	

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Output 3: The concepts of new teaching methodology for primary mathematics are disseminated to teachers through INSET activities.		Plan																Actual																			
3-1: Prepare a plan for the new curriculum school level training and follow-up in-service teacher training programme activities to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks		[Grid]																[Grid]																JICA	DTE, DGE		
3-2: Implement the new curriculum school level training		[Grid]																[Grid]																JICA	DTE, DGE		
3-3: Introduce follow-up in-service teacher training activities (such as Lesson Study) in line with the new textbooks and teacher's guides in pilot provinces		[Grid]																[Grid]																JICA	DTE, DGE		
3-4: Conduct a survey to assess the degree of teachers' understanding about the concepts of new teaching methodologies introduced by the new textbooks		[Grid]																[Grid]																JICA	DTE, DGE		
3-5: Disseminate the follow-up in-service teacher training activities to other provinces to strengthen teacher's understanding about the concepts of new teaching methodologies introduced by the new textbooks		[Grid]																[Grid]																JICA	DTE, DGE		

* Activities listed and schedule of "Plan" are according to Revised PDM approved in July, 2018

Duration / Phasing		Plan																Actual																		
Monitoring Plan		2016				2017				2018				2019				2020				2021				2022				Remarks	Issue	Solution				
Monitoring		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV											
Joint Coordinating Committee	Plan																																			
	Actual																																			
Set-up the Detailed Plan of Operation	Plan	▲																																		
	Actual																																			
Submission of Monitoring Sheet	Plan			▲		▲		▲		▲		▲		▲		▲		▲		▲		▲		▲		▲										
	Actual																																			
Monitoring Mission from Japan	Plan																																			
	Actual																																			
Joint Monitoring	Plan																																			
	Actual																																			
Post Monitoring	Plan																																			
	Actual																																			
Reports/Documents																																				
Work Plan	Plan			▲																																
	Actual																																			
Progress Report	Plan																																			
	Actual																																			
Project Completion Report	Plan																																			
	Actual																																			
Public Relations																																				
Newspaper Advertisement	Plan																																			
	Actual																																			
Radio Commercial	Plan																																			
	Actual																																			
TV Spot	Plan																																			
	Actual																																			

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Appendix 2

Plan and Actual Schedule of Operations

2. Work in Japan

Name (Title)	Rank	No. of travel	2019年												2020年											
			4月	5月	6月	7月	8月	9月	10月	11月	12月	1月	2月	3月	4月	5月	6月	7月	8月	9月	10月	11月	12月			
Takashi Soma (Team Leader / Education Planning 1)	1	Plan																								
		Actual																								
Akiko Nakano (Deputy Team Leader / Education Planning 2)	3	Plan																								
		Actual																								
Akiko Nakano (Teacher Education)	4	Plan																								
		Actual																								
Koji Takahashi (Mathematics Education 1)	3	Plan																								
		Actual																								
Kenji Saito (Mathematics Education 2)	3	Plan																								
		Actual																								
Isamu Imahori (Mathematics Education 3)	3	Plan																								
		Actual																								
Toshinari Ogasawara (Textbook Development 1 (Mathematics Editing))	3	Plan																								
		Actual																								
Shigeaki Sasaki (Textbook Development 2 (Textbook Editing))	3	Plan																								
		Actual																								
Toshiaki Fuji (Textbook Development 3 (Mathematics))	3	Plan																								
		Actual																								
Ryo Nakamizu (Textbook Development 4 (Editing/Printing))	3	Plan																								
		Actual																								
Kaori Tanaka (Education Avaluation 1)	3	Plan																								
		Actual																								
Kana Takahashi (Education Avaluation 2)	6	Plan																								
		Actual																								
Kana Takahashi (Project Coordinator / Training Planning 1)	5	Plan																								
		Actual																								
Rio Nishihara (Project Coordinator / Training Planning 1)	5	Plan																								
		Actual																								

Work Engagement Plan
 Work Engagement Plan in Japan
 Work Engagement Actual (Field/in Japan)

Appendix 3

Scope and Sequence

A. Numbers and Calculations

	Grade1	Grade2	Grade3	Grade4	Grade5
Integers	Making sets, 1-to-1 correspondence				
	1-10, 0	100-1,000	1,000-10,000	10,000-100,000,000	Summary of Base-10 numeration system
	Ordinal number			Approximate numbers (rounding, etc.)	
	10-20, 21-40				
	21-100, (100-120)				
Addition and Subtraction	Composition and Decomposition of 5-10	2digit±2digit in column forms	+ and -, with 1000 as a unit	+ and -, with 10,000/100,000 /1,000,000/10,000,000 as a unit	
	Meaning of Addition	Relationship between + and -, (inverse operation)			
	1digit+1digit, less than 10	+ and -, with 100 as a unit			
	Meaning of Subtraction	2,3digit±1,2digit in column forms			
	1digit-1digit, less than 10				
	[10 + 1digit] and Subtraction as inverse				
	Mixture of + and -, with 3, numbers				
	1digit+1digit, bigger than 10				
	2digit(less than 20)-1digit				
	+ and -, with 10 as a unit				
Multiplication and division		Meaning of Multiplication	Multiplication with 0		
		1digit × 1digit up to 9 × 9	2,3digit × 1digit in column forms		
			2,3digit × 2digit in column forms		
			Meaning of Division		
			Division by multiplication table once (with/without remainder)		
			2,3,4digit ÷ 1digit in column forms	Division by 2,3-digit in column forms	
			Relationship between × and ÷	Properties of ×, Properties of ÷	
				Order of operations	
				Mixture of × and ÷, with integers	

				Multiples and Divisors	
Decimals and Fractions			<p>Meaning of Decimals (1/10) + and -, of Decimals (1/10)</p> <p>Meaning of Fraction (proper, improper) + and -, of fractions with the same denominator</p>	<p>Meaning of Decimals (up to 1/1000) + and -, of Decimals (up to 1/1000)</p> <p>Meaning of Fraction (fractions that are the same in size) + and -, of fractions with different denominators</p> <p>Relationship among Fractions, Decimals, and Integers</p> <p>Mixture of + and -, with Integers, Decimals and Fractions</p>	<p>"decimal \times integer" "integer \times decimal" "decimal \times decimal"</p> <p>"decimal \div integer" "integer \div decimal" "decimal \div decimal"</p> <p>"fraction \times integer" "integer \times fraction" "fraction \times fraction"</p> <p>"fraction \div integer" "integer \div fraction" "fraction \div fraction"</p> <p>Mixture of \times and \div, with Integers, Decimals and Fractions</p>
Laws	Commutative law in Addition	<p>Associative law in Addition</p> <p>Commutative law in Multiplication</p>	Distributive law and Associative law in Multiplication	Distributive law of Division	
Algebraic Expressions		Algebraic Expressions with \square		Algebraic Expressions with letters	
Currency		2,000kip, 5,000kip, 10,000kip	20,000kip, 50,000kip, 100,000kip		

B. Quantities and Measurements

	Grade1	Grade2	Grade3	Grade4	Grade5
Length	Concept of length (direct comparison, indirect comparison)	<p>Concept of length (comparison using arbitrary units, measurement by standard units: cm, mm)</p> <p>Units of length (cm, mm, m)</p>	<p>Unit conversion is to be confined to relationship among basic units</p> <p>Unit of length (km)</p>		
Area				<p>Concept of area</p> <p>Units of area (cm², m², km², a, ha)</p> <p>Area of rectangles and squares.</p>	Area of quadrilaterals

					<div style="border: 1px solid black; padding: 5px; text-align: center;">Area of triangles</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Area of a circle</div>
Volume	<div style="border: 1px solid black; padding: 5px;">Concept of volume (direct comparison, indirect comparison)</div>	<div style="border: 1px solid black; padding: 5px;">Concept of volume (comparison using arbitrary units, measurement by standard units: L, ML.)</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Units of volume (L, M, *DL)</div>			<div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of volume</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Units of volume (cm³, m³, ML, and L)</div>
Weight			<div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of weight</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Units of weight (g, kg, *t, *mg)</div>		
Angle				<div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of angles and measurement (To use protractors)</div>	
time	<div style="border: 1px solid black; padding: 5px;">Reading clock times (in full hours, in full hours and half)</div>	<div style="border: 1px solid black; padding: 5px;">Reading clock times (in full hours and minutes)</div> <div style="border: 1px solid black; padding: 5px;">Clock time and Elapsed time, Units of elapsed time (days, hours, minutes, a.m., p.m., 24-hour clock)</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Simple calculation of elapsed/clock time</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Unit of time (second)</div>		
Average and Speed					<div style="border: 1px solid black; padding: 5px; text-align: center;">Average and “Per-Unit quantities”</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Speed</div>
Metric system					<div style="border: 1px solid black; padding: 5px; text-align: center;">Metric system</div>

C. Geometrical figures

	Grade1	Grade2	Grade3	Grade4	Grade5
Plane figure	<div style="border: 1px solid black; padding: 5px; text-align: center;">Foundational understanding of Plane figure(Activities)</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Foundational understanding of Triangles, Quadrilaterals</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of Right angle, Rectangles and Squares</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Right triangle</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of Circle</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of Isosceles triangle and Equilateral triangle</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of angle as a part of shapes</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Perpendicular and Parallel relationships of straight lines</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Concept of Trapezoids, Parallelograms, (Kite shape), Rhombuses</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Congruency</div>	<div style="border: 1px solid black; padding: 5px; text-align: center;">Property of regular polygons</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">The ratio of the circumference of a circle to its diameter ($\pi \rightarrow 3.14$)</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">Enlargement and Reduction of geometrical figures</div>

				The sum of the three angles of a triangle, the sum of the four angles of a	Symmetry (line symmetry, point symmetry)
				The position of objects	
Space figure	Foundational understanding of Space figure (Activities) To categorize boxes and cans by observing the characteristics of shapes of them		Concept of Sphere	Perpendicular and Parallel relationships of faces and edges Concept of Cube and Rectangular parallelepiped Sketch and development view The position of objects	Cylinder and Prisms, Cones (up to nets)

D. Mathematical Relations (foundational knowledge of statistics and Functions)

	Grade1	Grade2	Grade3	Grade4	Grade5
Organizing and Interpreting data		Picture graphs and 1 dimensional table	Bar graphs (mainly interpretation)	Line graph Collecting, sorting, and organizing data	Pie charts, Percentage bar graphs
Ideas of functions					Proportion Ratio (The ratio of the value is to be taught) Seeing variation of two quantities Proportional relationship and graphs (foundational knowledge of coordinates)

Appendix 4

Math Curriculum (English)

Mathematics

■ What do we learn from Mathematics?

Learning mathematics aims to develop numbers and calculation, including the use of geometric shapes and their positions, quantity and measurements, mathematical relationship and symbols.

■ Why do primary school students learn mathematics?

Learning mathematics is very important to develop the conceptual knowledge of students in order to develop students' knowledge and basic skills of numbers, operations, quantity and measurement, geometric figures, mathematical relationship. So that, students are able to develop their knowledge, competency, positive attitudes and skills of mathematical process, particularly four basic methods of calculations (addition, subtraction, multiplication and division).

Learning mathematics aims that students will be able to logically think on the process of problem solving, making decision, analytical thinking and exposing ideas of students. Importantly, students enjoy doing activities of mathematics, love learning mathematics and commitment of using mathematics in daily life, for further study and developing their ways of thinking. In addition, mathematics is also a tool for science studies, technology and other subject matters.

■ Outline of Mathematics/ scope for learning.

The scope of learning mathematics consists of 4 components: Numbers and Calculation; Quantity and Measurement; Geometric Figures and Mathematical Relationship.

Learning Achievement Standards

Learning Achievement Standards	
G.1	<p>After completing G1, students will be able to:</p> <p>understand the meaning of numbers and acknowledge the numbers from 1-100; count, read, write and compare the number from 1 to 100 and 0; read Lao number from ໑-໑໐໐; understand the meanings and do addition and subtraction (Not exceeded 100); perceive the meanings and use the signs "=", "<" and ">"; compare the length, quantity and width, by using the standards measurement units; perceive the basic shapes and geometric figures, read the clock time as hour and half past.</p>
G.2	<p>After completing G2, students will be able to:</p> <p>understand the meanings of numbers from 100-1000; understand the calculation of addition and subtraction (not exceeded 1000) ; understand the meanings of multiplication; use the multiplication table of 1-digit number x 1-digit number up to 9x9; understand and use the standard units for measurement of length by using millimeter (mm), centimeter (cm), meter (m) and volume with liter (L), milliliter (mL), deciliter (dL); understand the time (minute, hour, day, month, year, A.M and P.M); know how to identify the geometric shapes (triangle, and rectangle); understand how to use Lao Kip, such as 1.000 kip, 2.000 kip, 5.000 kip and 10.000 kip; read and indicate the data information on the graph and table.</p>
G.3	<p>After completing G3, students will be able to:</p> <p>read, write and compare the numbers from 1.000 to 10.000; do addition and subtraction of the numbers (not exceeded 10.000); do multiplication of 2-3 digit numbers × 2 digit number; do division of 1-4 digit numbers divided by 1 digit number with/without remainder; analyze and solve simplified word-problems with addition, subtraction, multiplication and division</p>

	<p>respectively; read and write decimal numbers with 1 digit number after the decimal point (0.1); do addition and subtraction with decimals; read and write fractions with 2 digits of denominators $\frac{1}{10}$; do addition and subtractions of like fractions; use distributive law and associative law; tell the value and use Lao Kip in daily life, such as 20.000 kip, 50.000 kip and 100.000 kip; use the length measurement units as kilometer (km) and convert basic measurement units; tell the weight and its measurement units as gram (g), kilogram (kg), milligram (mg) and ton (t); do addition and subtraction with simple clock time and tell the time units as second; draw a circle, isosceles triangle and equilateral triangle with a ruler and a compass; interpret the data on the bar graph and 2-dimensional table.</p>
<p>G.4</p>	<p>After completing G4, students will be able to:</p> <p>understand the meanings and numeracy conceptual knowledge from 10,000-100,000,000; understand the decimal numbers and fractions; fluently calculate 4 fundamental operations with integers; understand the conceptual knowledge of 4 fundamental operations of decimals; understand addition and subtractions of fractions; understand the units and conceptual knowledge of area measurement as square centimetre (cm²), square meter (m²), square kilometer (km²), are (a) and hectare (ha) and convert basic metric units, and angles; find the areas of geometric shapes (rectangle, square); understand the conceptual knowledge on properties of 2-dimensional and 3-dimensional figures, such as trapezoid, parallelogram, kite, diamond, cube and cuboid; indicate and interpret numbers, quantity and relationship, by using the words, numbers, mathematical expressions, graph, table and lines: use the skills and mathematical process for solving problems, be interested in content domains of mathematics and actively participate in mathematic learning process.</p>
<p>G.5</p>	<p>After completing G5, students will be able to:</p> <p>understand the meanings and conceptual knowledge on properties of the whole numbers; calculate multiplication, division of decimals and fractions, including solving problem accurately; understand the units and concepts of volume measurement (L, mL, cm³ and m³); find the area of geometric figures such as quadrilaterals, triangle and circle; find the volume of geometric figures such as cuboid, cube, cylinder; understand the conceptual knowledge on content components and properties of 2-dimensional and 3-dimensional figures, such as cylinder, polygonal shapes and cone; indicate and interpret the meanings of numbers, quantity and relationship, by using words, numbers, graph and lines;</p>

	understand the meanings and calculate as percentage, average, proportion of two different quantities; use the knowledge and skills on the mathematical process for solving problems, be interested in contents of mathematics and actively participate in mathematic learning process.
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Chapter 1 Numbers and operations

Component	G.1	G.2	G.3	G.4	G.5
1. Whole number	1. Understand the concept of numbers from 1 to 100 and 0. Up to 120 as further study 2. Count, read, and write Arabic and Lao numerals from 1 to 100, and 0 3. Represent the numbers of objects from 1 to 100, and 0 4. Compare and rank/arrange numbers from 1 to 100, and 0	1. Understand the concept of numbers from 100 to 1,000 2. Count, read, and write numbers from 100 to 1,000 in numerals and letters 3. Compare and rank/arrange numbers with not exceed 1,000	1. Understand the concept of numbers from 1,000 to 10,000 2. Read and write numbers from 1000 to 10,000 in numerals and letters. 3. Compare and rank/arrange numbers with not exceed 10,000	1. Understand the concept of numbers from 10,000 to 100,000,000 2. Read and write numbers from 10,000 to 100,000,000 in numerals and letters. 3. Represent the whole number approximately (Rounding etc.) 4. Tell properties of the whole numbers (Odd number and Even number, Multiples and factors)	1. Understand base 10 numeration system.

<p>2. Addition and Subtraction</p>	<p>1. Understand the concept of Addition and Subtraction</p> <p>2. Addition, subtraction and their mixed operation in a mathematical expression and the result is not to exceed 100 and 0, and the appropriate checking of answer.</p> <p>3. Solve simplified word-problems using addition and subtraction, and the appropriate checking of answer</p>	<p>1. Do Addition and Subtraction of 2,3 digit number \pm 1,2 digit number, and mixed operation in a mathematical expression and the result is not to exceed 1,000 and 0, and the appropriate checking of answer</p> <p>2. Analyze and solve simplified word-problems using addition and subtraction, and the appropriate checking of answer.</p>	<p>1. Do Addition and Subtraction of 3,4 digit numbers, and mixed operation in a mathematical expression and the result is not to exceed 10,000 and 0, and the appropriate checking of the answer</p> <p>2. Analyze and solve word- problems by using addition and subtraction, and appropriate checking of the answer, and be able to create word-problem.</p>	<p>1. Do Addition and Subtraction, and mixed operation of numbers with 10,000/100,000/1,000,000/10,000,000 as a unit in a mathematical expression and the result is not to exceed 100,000,000 and 0, and appropriate checking of the answer.</p>	
<p>3. Multiplication and Division</p>		<p>1. Understand the concept of Multiplication</p> <p>2. Memorize and use Multiplication table of</p>	<p>1. Do Multiplication of 2,3-digit \times2-digit</p> <p>2. Understand the concept of Division</p>	<p>1. Do Division of 2,3,4 digit number \div 2,3-digit number</p> <p>2. Do calculation including some of</p>	

		<p>1-digit \times 1-digit up to 9×9</p> <p>3. Analyze and solve simplified word-problems using multiplication, and the appropriate checking of answer.</p>	<p>3. Division of 1,2,3,4 digit number \div 1-digit number without/with remainder</p> <p>4. Analyze and solve word- problems by using multiplication and division, and appropriate checking of the answer and be able to create word-problem.</p>	<p>four basic operations. (addition, subtraction, multiplication and division)</p> <p>3. Analyze and solve word-problems by calculation including some of four basic operations, and appropriate checking of the answer, and be able to create word-problems.</p> <p>4. Recognize the properties of multiplication and division</p>	
4. Decimal numbers and Fractions			<p>1. Understand the concept of Decimal numbers</p> <p>2. Read and write decimal numbers with 0.1 place.</p> <p>3. Addition and</p>	<p>1. Read, write, compare, and rank/arrange decimal numbers with 0.01 and 0.001 place</p> <p>2. Addition and subtraction of</p>	<p>1. Do Multiplication and Division of decimal numbers</p> <p>2. Do Multiplication and Division of fractions,</p> <p>3. Do Mixed</p>

			<p>subtraction of decimal numbers (with one digit on the right part of the decimal point)</p> <p>4. Understand the concept of Fraction</p> <p>5. Read and write Fraction with $\frac{1}{10}$ place.</p> <p>6. Do Addition and Subtraction of fractions with the same denominator</p>	<p>decimal numbers (with not exceed 3 digits on the right part of the decimal point)</p> <p>3. Read, write, compare, and rank/arrange fraction with $\frac{1}{100}$ and $\frac{1}{1000}$ place.</p> <p>4. Do Addition and Subtraction of fractions with the different denominator</p> <p>5. Represent the relationships among decimal numbers, fraction and whole numbers</p> <p>6. Do mixed calculation of addition and subtraction with decimal numbers, fraction and whole</p>	<p>calculation of multiplication and division with decimal numbers, fractions and whole numbers.</p> <p>4. Analyze and solve word-problems by multiplication and division of decimal number, fraction and whole number, and appropriate checking of the answer</p>
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				number.	
5. Laws	1. Understand and apply Commutative law in Addition	1. Understand and apply Associative law in Addition 2. Understand and apply Commutative law in Multiplication	1. Understand and apply Distributive law and Associative law in Multiplication	1. Understand and apply order of operations. 2. Understand and apply Distributive law of Division	
6. Currency		1. Tell the value of Kip notes (1kip to 10,000kip) 2. Apply the kip note in daily life (1,000kip, 2,000kip, 5,000kip and 10,000kip).	1. Tell the value and apply the kip note in daily life (20,000kip, 50,000kip and 100,000kip)		

Chapter 2 Quantities and Measurements

Component	G.1	G.2	G.3	G.4	G.5
1. Length	1. Understand direct comparison and indirect comparison of length 2. Use of non-standard measurement units to measure the length	1. Understand the concept of length. 2. Use the standard measurement units to measure the length in centimeter (cm), millimeter (mm), meter (m)	1. Use the measurement unit of the length in kilometer (km) and convert the basic measurement units.	1. Find the perimeter of quadrilaterals and triangles.	1. Identify the ratio of the circumference of a circle to its diameter (π) and find the circumference. (π is 3.14)
2. Area	1. Understand direct comparison of area			1. Understand the concept of Area.	1. Find the area of quadrilaterals and

	2. Use of non-standard measurement units to measure the area			2. Use the measurement units of area in square centimeter (cm ²), square meter (m ²), square kilo meter (km ²), are (a) and hectare (ha), and convert the basic units. 3. Find the area of rectangle and square	triangles. 2. Find the area of a circle.
3. Volume	1. Understand direct comparison and indirect comparison of volume 2. Use non-standard measurement units to measure the capacity	1. Understand the concept of capacity 2. Use the standard measurement units to measure the capacity in Liter (L), milliliter (mL) and deciliter (dL).			1. Understand the concept of Volume 2. Use the measurement units of volume in cubic centimeter (cm ³) and cubic meter (m ³) 3. Tell the relationships of the measurement units of volume (L, mL, dL, cm ³ and m ³)

					4. Find the volume of the Cube and Cuboid.
4. weight			<p>1. Understand the concept of Weight.</p> <p>2. Tell the weight and its' measurement units in gram (g), kilogram (kg) milligram (mg) and ton (t).</p>		
5. Angle				<p>1. Understand the concept of Angle.</p> <p>2. Measure angles with a protractor.</p>	
6. Time	<p>1. Understand the concept of clock time.</p> <p>2. Read and tell clock time with hour and half-hour</p>	<p>1. Read clock time in hour and minute</p> <p>2. Understand the concept of elapsed time.</p> <p>3. Tell the elapsed time in days, hours, and minutes</p> <p>4. Know week, month and year in calendar.</p>	<p>1. Do simplified addition and subtraction of time</p> <p>2. Tell the measurement unit of time in seconds.</p>		

		5. Tell a.m., p.m. and 24-hour clock)			
7. Average and speed					<p>1. Understand the concept of Average of value.</p> <p>2. Find the distance, average speed and duration of moving.</p>
8. Metric System					1. Understand the Metric system.

Chapter 3 Geometrical figure

Component	G.1	G.2	G.3	G.4	G.5
1. Plane figure	<p>1. Understand fundamental idea of plane shapes through activities. (With folding paper, composing shapes using chop sticks, making shapes by connecting dots, etc.)</p>	<p>1. Understand fundamental idea of triangles and quadrilaterals.</p> <p>2. Understand the concept of right angle. (Without using set squares)</p> <p>3. Understand the concept of rectangles and squares. (By folding paper, connecting</p>	<p>1. Understand the concept of circle.</p> <p>2. Draw a circle with a compass.</p> <p>3. Understand the concept of isosceles triangle and equilateral triangle, and draw them by using ruler and compass.</p> <p>4. Understand the</p>	<p>1. Tell and draw the perpendicular and parallel lines.</p> <p>2. Understand the concept of trapezoids, parallelograms, (kite shapes), rhombuses and draw them (Using a Compass, Set squares or a Protractor)</p> <p>3. Understand the</p>	<p>1. Understand the Property of regular polygons</p> <p>2. Understand Enlargement and reduction of plane figures</p> <p>3. Understand Line Symmetry and Point symmetry.</p>

		dots, etc.) 4. Describe the properties of right triangles.	concept and the name of angles as a part of shapes	concept of congruency 4. Find the sum of the three angles of a triangle, the sum of the four angles of a quadrilateral 5. Indicate the position of objects	
2. Space Figure	1. Understand fundamental idea of space figure through activities. (With creating objects in daily life with boxes, cans and so on.)		1. Understand the concept of sphere.	1. Understand the perpendicular and parallel of faces and edges 2. Understand the concept of cube and cuboid. 3. Draw Sketch and Nets of cube and cuboid. 4. Indicate the position of objects	1. Tell the name and properties of cylinders, prisms, cones and pyramids. 2. Draw Sketch and Nets of cylinders, prisms, cones and pyramids.

Chapter 4 Mathematics relations

Component	G.1	G.2	G.3	G.4	G.5
1. Data collection and interpreting data		1. Read and Represent the data on the picture graph and 1-dimensional table.	1. Interpret data displayed on a bar graph. 2. Interpret data displayed on a 2-dimensional table.	1. Collect, sort and organize data 2. Interpret data displayed on a line graph.	1. Interpret data displayed on a pie chart and a percentage bar graph.
2. Ideas related to function	–	–	–	1. Find variation of two quantities 2. Describe the meaning of proportional relationship.	1. Understand the concept of Proportion and percentage 2. Understand the concept of Ratio 3. Interpret a graph of the proportional relationship. 4. Understand the concept of Inverse proportional relationship
3. Algebraic Expressions	1. Tell the meaning of "=", "<" and ">"	1. Use Algebraic Expressions with \square		1. Use Algebraic Expressions with letters	

Appendix 5

G1-5 TOT Participation List

Appendix 5 G1-5 TOT Participation List

No.	Affiliation	G1 Name	G2 Name	G3 Name	G4 Name	G5 Name
TTC						
1	Dongkhamxang TTC	Mr. Vilath Viphongxay	Mr. Vilath Viphongxay	Mr. Vilath Viphongxay	Mr. Vilath Viphongxay	Mr. Vilath Viphongxay
2	Dongkhamxang TTC	Mr. Vannasone Thepphavong	Mr. Vannasone Thepphavong	Mr. Vannasone Thepphavong	Mr. Vannasone Thepphavong	Mr. Vannasone Thepphavong
3	Dongkhamxang TTC	Mr. Teuy Vongdara	Mr. Teuy Vongdara			Mr. Teuy Vongdara
4	Dongkhamxang TTC	Ms. Hongthong Fongsamouth	Ms. Hongthong Fongsamouth	Ms. Hongthong Fongsamouth	Ms. Hongthong Fongsamouth	Ms. Hongthong Fongsamouth
5	Dongkhamxang TTC		Ms. Ekalack Phahamonty	Ms. Ekalack Phahamonty	Ms. Ekalack Phahamonty	
8	Luangnamtha TTC	Ms. Viengkham Xaybounthip	Ms. Viengkham Xaybounthip			
9	Luangnamtha TTC	Ms. Thanou Bouvilay	Ms. Thanou Bouvilay	Ms. Thanou Bouvilay	Ms. Thanou Bouvilay	Ms. Thanou Bouvilay
10	Luangnamtha TTC	Ms. Deang Thonsing	Ms. Deang Thonsing			
11	Luangnamtha TTC		Mr. Bounphan INTHAVONGSA	Mr. Bounphan INTHAVONGSA	Mr. Bounphan INTHAVONGSA	Mr. Bounphan INTHAVONGSA
12	Luangnamtha TTC	Ms. Bounthien PHOUNSAVATH	Ms. Bounthien PHOUNSAVATH	Ms. Bounthien PHOUNSAVATH	Ms. Bounthien PHOUNSAVATH	Ms. Bounthien PHOUNSAVATH
15	Luangnamtha TTC			Ms. Saiysoulin LARLUANGSEE	Ms. Saiysoulin LARLUANGSEE	Ms. Saiysoulin LARLUANGSEE
16	Savannakhet TTC	Ms. Sonesamlane Soulivong	Ms. Sonesamlane Soulivong			
17	Savannakhet TTC	Mr. Kone PHIMMACHACK	Mr. Kone Phimmachak	Mr. Kone PHIMMACHACK	Mr. Kone PHIMMACHACK	
18	Savannakhet TTC	Mr. Vannakone Khamsounthavong	Mr. Vannakone Khamsounthavong	Mr. Vannakone Khamsounthavong	Mr. Vannakone Khamsounthavong	Mr. Vannakone Khamsounthavong
19	Savannakhet TTC		Mr. Phailat SITHONG			Mr. Phailat SITHONG
20	Savannakhet TTC		Ms. Douangsamone SITHICHACK	Ms. Douangsamone SITHICHACK	Ms. Douangsamone SITHICHACK	
21	Savannakhet TTC		Mr. Bounpone PHETBOUNHUEANG			
25	Savannakhet TTC			Ms. Chinnalone KETTAVONG		Ms. Chinnalone KETTAVONG
26	Savannakhet TTC				Mr. Buakham KEOMEXAY	
27	Savannakhet TTC					Mr. Phenthanongsack PHAKDIVICHIT
28	Salavan TTC	Ms. Inthava SENGCHAN	Ms. Inthava SENGCHAN	Ms. Inthava SENGCHAN	Ms. Inthava SENGCHAN	Ms. Inthava SENGCHAN
29	Salavan TTC	Mr. Bounneua INTHALATH	Mr. Bounneua INTHALATH	Mr. Bounneua INTHALATH	Mr. Bounneua INTHALATH	Mr. Bounneua INTHALATH
30	Salavan TTC	Mr. Bachieng INTHAVONGSA	Mr. Bachieng INTHAVONGSA	Mr. Bachieng INTHAVONGSA	Mr. Bachieng INTHAVONGSA	Mr. Bachieng INTHAVONGSA
31	Salavan TTC		Mr. Saenhak BOUMY	Mr. Saenhak BOUMY	Mr. Saenhak BOUMY	
32	Salavan TTC	Ms. Manyphon HEMSOUVANH	Ms. Manyphon HEMSOUVANH			
33	Luangprabang TTC	Ms. Souksakhone Phouthavong	Ms. Souksakhone Phouthavong	Ms. Souksakhone Phouthavong	Ms. Souksakhone Phouthavong	Ms. Souksakhone Phouthavong
36	Luangprabang TTC	Ms. Bounyong Phatthana	Ms. Bounyong Phatthana	Ms. Bounyong Phatthana	Ms. Bounyong Phatthana	Ms. Bounyong Phatthana
37	Luangprabang TTC	Ms. Alounny Keovongsat				
38	Luangprabang TTC		Mr Phothisack VONGSY			
39	Luangprabang TTC		Ms Souksanguan PHONGSAVANH	Ms Souksanguan PHONGSAVANH	Ms Souksanguan PHONGSAVANH	Ms Souksanguan PHONGSAVANH
40	Luangprabang TTC		Ms Monnaly PHOMMACHAN	Ms Monnaly PHOMMACHAN	Ms Monnaly PHOMMACHAN	Ms Monnaly PHOMMACHAN
41	Khangkhai TTC	Mr. Vilaxay Phonthaxy	Mr. Vilaxay Phonthaxy	Mr. Vilaxay Phonthaxy	Mr. Vilaxay Phonthaxy	
42	Khangkhai TTC	Mr. Khamvong Oudomsouk	Mr Khamvong OUDOMSOUK	Mr. Khamvong Oudomsouk	Mr. Khamvong Oudomsouk	Mr. Khamvong Oudomsouk
43	Khangkhai TTC	Mr. Saytula Synuanphong				
44	Khangkhai TTC	Ms Mountha INBOUNPAN	Ms Mountha INBOUNPAN	Ms Mountha INBOUNPAN	Ms Mountha INBOUNPAN	Ms Mountha INBOUNPAN
45	Khangkhai TTC		Mr Phonphalaphone PHANTHAVONG	Mr Phonphalaphone PHANTHAVONG	Mr Phonphalaphone PHANTHAVONG	Mr Phonphalaphone PHANTHAVONG
46	Pakse TTC	Mr. Vanhvilay Thongkham				
47	Pakse TTC	Mr. Vongphacham Phommahaxay				
48	Pakse TTC	Mr. Sakkone Sylakham	Mr. Sakkone Sylakham	Mr. Sakkone Sylakham	Mr. Sakkone Sylakham	
49	Pakse TTC			Mr. Keoudone MAHATHONG	Mr. Keoudone MAHATHONG	Mr. Keoudone MAHATHONG
50	Pakse TTC			Ms. Vilaivanh MEKJHONE	Ms. Vilaivanh MEKJHONE	Ms. Vilaivanh MEKJHONE
51	Pakse TTC			Mr. Khamlar KHAMMUEANGKHOUN	Mr. Khamlar KHAMMUEANGKHOUN	Mr. Khamlar KHAMMUEANGKHOUN
52	Bank Keun TTC	Ms. Sisavone KEOPHASY	Ms. Sisavone KEOPHASY			
53	Bank Keun TTC	Ms. Viengxay XAMOUNTY	Ms. Viengxay XAMOUNTY	Ms. Viengxay XAMOUNTY	Ms. Viengxay XAMOUNTY	Ms. Viengxay XAMOUNTY
54	Bank Keun TTC	Mr. Thonglith VILAYSARN	Mr. Thonglith VILAYSARN	Mr. Thonglith VILAYSARN	Mr. Thonglith VILAYSARN	
55	Bank Keun TTC	Mr Xorvixay PHENGSIY	Mr Xorvixay PHENGSIY			
56	Bank Keun TTC			Ms. Laddavanh SOUTHAMMAVONG	Ms. Laddavanh SOUTHAMMAVONG	Ms. Laddavanh SOUTHAMMAVONG
57	Bank Keun TTC			Mr. Phalungsone SAENHUAPHAN	Mr. Phalungsone SAENHUAPHAN	Mr. Phalungsone SAENHUAPHAN

PESS						
1	Attapue PESS			Ms. Phoutdavanh KAENSAN		
2	Attapue PESS			Mr. Oulathai SEESAWAENGSOUK	Mr. Oulathai SEESAWAENGSOUK	Mr. Oulathai SEESAWAENGSOUK
3	Attapue PESS				Mr. Xaisomphone PHAISILAKONE	
4	Bolikhmxy PESS			Mr. Keooudone CHANDAMANY	Mr. Keooudone CHANDAMANY	
5	Bolikhmxy PESS			Ms. Chanthy KEOMINAVONG	Ms. Chanthy KEOMINAVONG	
6	Bolikhmxy PESS					Ms. Xonekin MOUNIN
7	Borkeo PESS			Ms. Phonethip OUTHTHAYORTH		
8	Borkeo PESS			Mr. Soulisack SOUVEE		Mr. Soulisack SOUVEE
9	Champasack PESS			Ms. Lamphan KETMALA	Ms. Lamphan KETMALA	
10	Champasack PESS			Mr. Vatthana SAIYSOPHA		Mr. Vatthana SAIYSOPHA
11	Champasack PESS				Mr. Phanongsith INTHAKOUMMAN	
12	Champasack PESS				Mr. Khamwa INTHANAM	
13	Huaphanh PESS			Mr. Khamman ONKHAMCHAN	Mr. Khamman ONKHAMCHAN	Mr. Khamman ONKHAMCHAN
14	Huaphanh PESS			Ms. Laiphone SEEDAVONG		
15	Huaphanh PESS				Mr. Vansy SOUKSAVANH	
16	Khammuan PESS			Mr. Outtama CHANNYYAVONG	Mr. Outtama CHANNYYAVONG	
17	Khammuan PESS			Mr. Vanxay THAMMAVONG	Mr. Vanxay THAMMAVONG	Mr. Vanxay THAMMAVONG
18	Luangnamtha PESS			Mr. Amphone PASERTHSACK	Mr. Amphone PASERTHSACK	Mr. Amphone PASERTHSACK
19	Luangnamtha PESS			Mr. Thongsee INTAVONG	Mr. Thongsee INTAVONG	
13	Luangnamtha PESS		Ms. Somy VANNAING			
14	Luangnamtha PESS		Mr. Aloon PHOTHIPANYA			
20	Luangpabang PESS			Mr. Sounthon CHANTHAVONG		
21	Luangpabang PESS			Mr. Thongloun KEOTHONGPHET		
22	Luangprabang PESS				Mr. Lerthmany LATANAKHOM	
23	Oudomxay PESS					Mr. Somphet SIVANXAI
24	Oudomxay PESS			Ms. Phanin INTHAKONE	Ms. Phanin INTHAKONE	
25	Oudomxay PESS			Ms. Soukinda VONGLASIN	Ms. Soukinda VONGLASIN	
26	Phongsaly PESS			Mr. Saiyphaphim Phomvichit		Mr. Saiyphaphim Phomvichit
27	Phongsaly PESS			Mr. Xaylar PHOMMANY	Mr. Xaylar PHOMMANY	
28	Phongsaly PESS				Mr. Vansouk CHOUMALY	
29	Phongsaly PESS				Mr. Somchit MUTHSOUDA	
30	Salavan PESS			Ms. Malaisith SEEBOUNHUEANG		
31	Salavan PESS			Mr. Mino XAYYASAN		
32	Salavan PESS					Ms. Bounnong SONELALY
34	Salavan PESS		Mr. Vilat NINHAKHAN			
35	Salavan PESS		Ms. Malaisid SEEBOUNGHUEANG			
33	Savannakhet PESS			Ms. Somvilai OUPHAXAY		
34	Savannakhet PESS			Ms. Phoukhaeng Luanglart		
35	Savannakhet PESS				Mr. Sithideth SENGSOULY	
36	Savannakhet PESS				Mr. Bounnak DUANGSAVANG	Mr. Bounnak DUANGSAVANG
22	Savannakhet PESS		Ms. Somilay OUPHAXAY			
23	Savannakhet PESS		Mr. BOUNNAK			
24	Savannakhet PESS		Mr. Bindavong XAYALIN			

37	Sekong PESS					Mr. Phouvieng THEPPHALAKSA
38	Sekong PESS			Ms. Kommaly KHAMASERTH		
39	Sekong PESS			Mr. Bountheuang KEOKHAMPHOU	Mr. Bountheuang KEOKHAMPHOU	
40	Vientiane PESS			Ms. Chanthaboun KEOVIPHONE	Ms. Chanthaboun KEOVIPHONE	
41	Vientiane PESS			Mr. Philinith NAMUEANGXAY	Mr. Philinith NAMUEANGXAY	
42	Vientiane PESS		Ms. Amphone Anouxayya	Ms. Amphone Anouxayya	Ms. Amphone Anouxayya	
43	Vientiane PESS		Mr. Phetsalai KEOPHILAVONG	Mr. Phetsalai KEOPHILAVONG		
44	Xaysomboun PESS			Mr. Kaisong NENG		
45	Xaysomboun PESS			Mr. Khualor		
46	Xayyabouly PESS			Ms. Sonethaly PHIEWPHAN	Ms. Sonethaly PHIEWPHAN	Ms. Sonethaly PHIEWPHAN
47	Xayyabouly PESS			Mr. Keovongdeuan PHANTHANIKHOM		
48	Xayyabouly PESS				Mr. Anousin PHANTHALASY	
49	Xiengkhuang PESS			Mr. Khampan BUALAPHA		
50	Xiengkhuang PESS			Mr. Sivone MALAVONG	Mr. Sivone MALAVONG	Mr. Sivone MALAVONG
DESB						
1	Champasack DESB				Mr. Seemoun KEOSILA	
2	Champasack DESB				Mr. Khunthone KHAMMANY	
3	Champasack DESB				Mr. Nilandone VONGKHAMTA	
4	Huaphanh DESB				Mr. Mondathong	
5	Huaphanh DESB				Mr. Khamsavanh	
6	Huaphanh DESB				Mr. Ten PANYAKHAM	
7	Huaphanh DESB				Mr. Somphaeng PHIMPHOUTH	
8	Huaphanh DESB				Mr. Nitxay VAIVANNY	
9	Huaphanh DESB				Mr. Phan KEOMANYVONG	
10	Huaphanh DESB				Ms. hHoiy SIMMAVONG	
11	Huaphanh DESB				Mr. Nakhonexay SINGSOUVANH	
12	Luangpabang DESB				Mr. Keooudone KHINDAVONG	
13	Luangpabang DESB				Ms. Phoutdavone PHANTHAVONG	
14	Nathom DESB					Mr. Keooudone SOUVANDY
15	Salavan DESB				Mr. Somkhit MATHTHAVONG	
16	Salavan DESB				Mr. Khammai HUEAHONGSA	
17	Salavan DESB				Mr. Sida PHOMMAKHUN	
18	Viengkham DESB					Mr. Vilayphone SOUTSANAHONG

Appendix 6

Comparative Analysis on the Results of Math Assessment Test for TTC Students (2016 and 2019 cohorts)

Comparative Analysis on the Results of Math Assessment Test for TTC Students (2016 and 2019 cohorts)

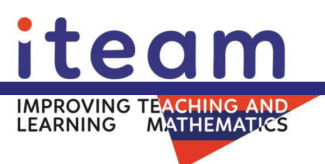
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1. Overview of Survey
2. Major Findings
3. Conclusion



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1. Overview of Survey

1.1. Objectives

- To assess the degree of improvement in the academic performance of TTC Year 1 students before and after the piloting of the new “Basic Mathematics” module in the school year 2019,
- To examine the chronological changes in the results of math tests conducted for the 2016 cohort when they were in Year 2 in 2017 and in Year 4 in 2019.

1. Overview of Survey

1.2. Target groups

- (A) **The 2019 cohort:** Year 1 students in the 12+2 programme in the school year 2019 in 5 TTCs with 12+4 students in Dongkhamxang TTC, who have studied “Basic Mathematics” in the pilot version of the new TTC curriculum, and
- (B) **The 2016 cohort:** Year 4 students of the 12+4 programme in the school year 2019 in all the 8 TTCs, who have gone through the old (current) TTC curriculum.

1. Overview of Survey

(1) The 2019 Cohort

TTCs	12+2					12+4	Total
	Luang Namtha	Pakse	Savanna-khet	Salavan	Dongkham-xang	Dongkham-xang	
Female	23	15	26	18	29	28	139
Exam	19	13	21	17	21	23	114
Scholarship	4	2	5	1	5	2	19
No category info	---	---	---	---	3	3	6
Male	5	7	4	12	4	7	39
Exam	5	5	3	10	3	6	32
Scholarship	0	2	1	2	1	0	6
No category info	---	---	---	---	---	1	1
Total	28	22	30	30	33	35	178

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1. Overview of Survey

(2) The 2016 Cohort

TTCs	Luang Namtha	Pakse	Savanna-khet	Ban Keun	Salavan	Khang-khai	Luang-phabang	Dongkham-xang	Total
Female	21	33	43	17	17	12	18	43	204
Exam	11	25	25	14	13	5	13	34	140
Scholarship	10	7	16	3	4	7	5	9	61
No category info	---	1	2	---	---	---	---	---	3
Male	23	12	14	17	18	20	12	30	146
Exam	13	5	6	9	13	17	9	27	99
Scholarship	10	7	7	8	5	3	3	3	46
No category info	---	---	1	---	---	---	---	---	1
Others	0	0	1	0	0	0	0	1	2
Exam but no info on sex	---	---	1	---	---	---	---	---	1
No info on sex and category	---	---	---	---	---	---	---	1	1
Total	44	45	58	34	35	32	30	74	352

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1. Overview of Assessment

1.3. Tests

The tests are divided into the following 6 parts.

Test	Category	Grade	# of Qs	Time
Test A	Calculation 1	Grade 1-3	32	6 min
Test B	Problem Solving 1	(Logical Thinking)	3	10 min
Test C	Problem Solving 2	Grade 1-3	4	8 min
Test D	Calculation 2	Grade 4-5	13	12 min
Test E	Problem Solving 3	Grade 4-5	5	15 min
Test F	Conceptual understanding	Grade 1-3	15	30 min

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2. Major Findings

Correct Answer Ratio (%)
(Average of 143 students in 12+2)

2.1. Findings in the test results of the 2019 cohort

- i. The implementation of the Basic Mathematics module has made a significant contribution to the improvement of TTC students' calculation and problem-solving skills in mathematics. However, their improved competence is still at the middle primary level.

All 12+2 (N = 143)		
Pre	Post	Diff
42.8%	54.4%	+11.5%

UP!

DKX 12+4 (N = 135)		
Pre	Post	Diff
42.9%	62.4%	+19.5%

UP!

12+2														
LNT			PKS			SVK			SLV			DKX		
Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
45.3%	55.0%	9.7%	50.8%	47.5%	-3.4%	38.1%	44.9%	6.7%	40.6%	56.8%	16.2%	40.9%	64.7%	23.8%

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2. Major Findings

2.1. Findings in the test results of the 2019 cohort

- ii. The calculation skills of around 10% of the TTC students are likely to be lower than those required for Grade 2 primary students.

Test A: Calculations and Correct Answer % (all 12+2)

Q	%	Q	%	Q	%	Q	%
(1)	94%	(9)	78%	(17)	90%	(25)	77%
(2)	97%	(10)	79%	(18)	85%	(26)	73%
(3)	96%	(11)	76%	(19)	90%	(27)	77%
(4)	92%	(12)	68%	(20)	85%	(28)	72%
(5)	90%	(13)	67%	(21)	77%	(29)	66%
(6)	92%	(14)	70%	(22)	77%	(30)	62%
(7)	87%	(15)	84%	(23)	64%	(31)	61%
(8)	72%	(16)	79%	(24)	77%	(32)	58%

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2. Major Findings

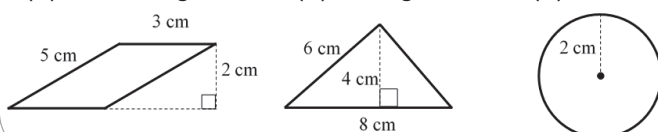
2.1. Findings in the test results of the 2019 cohort

- iii. There is a possibility that TTC lecturers have skipped some specific topics in which only at most 1 out of 10 students could successfully answer even in the post test. More than 75% of the students did not even try to solve some questions.

Test D: Question 4

Calculate the area of the following plane figures.

- (1) Parallelogram (2) Triangle (3) Circle



Question 4 (N =143)	(1)	(2)	(3)
Correct answer	12	4	7
Incorrect answer	18	27	26
No Answer	113	112	110
Correct answer %	8.4%	2.8%	4.9%
No answer %	79.0%	78.3%	76.9%

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2. Major Findings

2.1. Findings in the test results of the 2019 cohort

iv. In word problems, TTC students pay scarce attention to in what manner they are required to answer and confuse the calculation results with the answer to the question.

Test C Question 1:

“How many students were increased or decreased?”

→ Correct Answer:

“38 (students or people) increased”

Category	N = 143		
Correct answer	61	42.7%	
Incorrect answers	70	49.0%	
	38	12	8.4%
	38 students	7	4.9%
	38 people	7	4.9%

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2. Major Findings

2.1. Findings in the test results of the 2019 cohort

v. In Pakse TTC, the post-test result is worse than the pre-test, which is a bizarre case and does not normally come about in a classroom in such a short period of time.

Difference in the correct answer % in Pakse TTC

Test	A	B	C	D	E	F	Total
Pre-test	77.0%	2.9%	41.3%	30.8%	21.7%	43.5%	50.0%
Post-test	65.5%	7.6%	38.6%	39.2%	29.1%	40.9%	46.9%
Difference	-11.6%	4.7%	-2.7%	8.4%	7.4%	-2.6%	-3.1%

*In Test A, -11.6% = 65.48% - 77.04%.

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2. Major Findings

2.2. Findings in the test results of the 2016 cohort

- i. Overall, the 2016 cohort shows a slight, but statistically significant improvement in calculation and problem-solving skills between Year 2 and Year 4. But the skill level of Year 4 students of this cohort are still at the middle primary level as well.

Correct answer % in Year 2 and Year 4 of the 2016 cohort

Test	A	B	C	D	E	F	Total
Year 2	61.8%	20.8%	48.3%	34.3%	23.7%	41.5%	46.2%
Year 4	67.7%	17.4%	49.4%	36.8%	24.4%	44.7%	49.9%
Difference	5.9%	-3.4%	1.0%	2.6%	0.7%	3.2%	3.6%

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2. Major Findings

2.2. Findings in the test results of the 2016 cohort

- ii. The changes in the test results vary among TTCs. While most TTCs show some improvements, Luang Namtha and Khankhai TTCs show a slight decline in the post-test in Year 4.

Changes in the correct answer % in 8 TTCs

LNT			PKS			SVK			BK		
Y2	Y4	Diff	Y2	Y4	Diff	Y2	Y4	Diff	Y2	Y4	Diff
45.1%	44.2%	-0.9%	43.3%	49.4%	6.0%	48.2%	51.3%	3.2%	43.3%	50.8%	7.5%

SLV			KK			LPB			DKX		
Y2	Y4	Diff	Y2	Y4	Diff	Y2	Y4	Diff	Y2	Y4	Diff
53.4%	58.9%	5.6%	48.9%	47.6%	-1.3%	48.6%	54.2%	5.5%	41.4%	46.7%	5.3%

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2. Major Findings

2.2. Findings in the test results of the 2016 cohort

iii. It is often observed in word problems that students fail to interpret question sentences and be able to translate those into associated mathematical calculations. Even when they can write a correct mathematical calculation, their low calculation skills prevent them from reaching the correct answer.

Test C Question 2:

There are two brothers. The younger boy's height is 1 m 8 cm and the elder boy's is 125 cm. How many centimetres is the elder higher than the younger?

Correct answer:

$$1 \text{ m } 8 \text{ cm} = 108 \text{ cm}$$

$$125 - 108 = 17$$

Answer: 17 cm

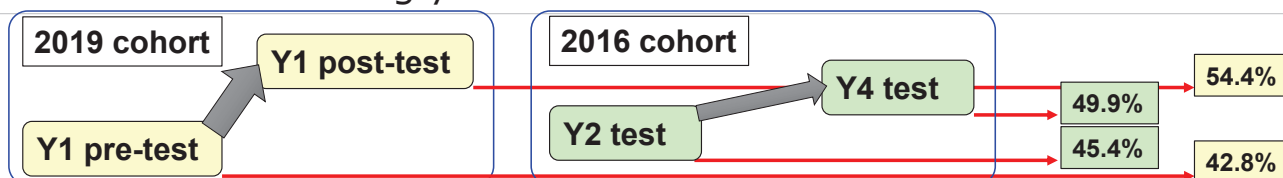
Test C (N = 352)	Question 2
Correct answer	115
Incorrect answer	145
No Answer	92
Example of incorrect answers	
17 (Correct calculation)	7
7 cm	9
107 cm	4
117 cm	4

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2. Major Findings

2.3. Findings in the comparison between 2 cohorts

- Overall, the pre-test results of the 2019 cohort was lower than the Year 2 test results of the 2016 cohort, but the post-test results exceeded the Year 4 test results with a statistically significant difference.
- The Basic Mathematics module in Year 1 has successfully developed students' mathematical skills, while in the old (current) curriculum it seems there is less opportunity for developing those skills in succeeding years.



2. Major Findings

2.3. Findings in the comparison between 2 cohorts

- iii. Pakse TTC is the only TTC where the academic performance of the 2019 cohort declined in the post-test, and the post-test results became lower than the Year 4 test score although the post-test results exceeded the Year 2 test results.

Comparison of 2 cohorts

2019 cohort	Correct %		2016 cohort	Total
Pre-test	50.0%	>	Year 2 test	43.3%
Post-test	46.9%	<	Year 4 test	49.4%
Difference	-3.1%		Difference	6.1%

Seen only in Pakse TTC.

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3. Conclusion

This analysis has shown that:

- The implementation of the Basic Mathematics module in Year 1 has made a significant contribution to enhancing the calculation and problem-solving skills of TTC students.
- It should be investigated why the skill level of the 2019 cohort in Pakse TTC has dropped after the completion of the Basic Mathematics module, which aims at developing those skills.

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3. Conclusion

Recommendations from the project include:

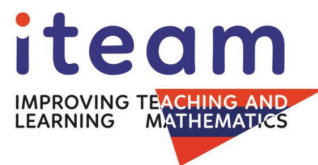
- To create a mechanism to retain and improve the basic skills on mathematics throughout the PRESET period.
- To conduct further study to clarify the relationship between the contents and level of a module and the academic development of TTC students by their level of competence.

Appendix 7

Comparative Analysis on the Results of Math Assessment Test for TTC Students 2023 (2021 cohort)

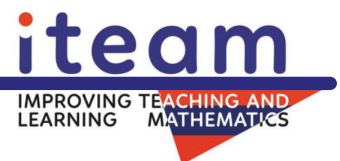
Comparative Analysis on the Results of Math Assessment Test for TTC Students 2023 (2021 cohort)

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3. Major findings
4. Recommendations

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1. Overview of Assessment

1.1. Objectives

- To examine chronological changes in the mathematical skills of TTC students before and after learning the “Teaching Mathematics 2” module.

1.2. Target group

- The 12+2 TTC students who were enrolled at 7 TTCs (except Luang Namtha) in the school year 2021 (= **The 2021 cohort**)

Note:
Luang Namtha TTC did not have students in this cohort.

1. Overview of Assessment

1.3. Testees

TTC	Abbrev.	Teaching Math 2 Test 2023										
		Pre-test (Nov 2022)			Post-test (Feb 2023)			Common in Pre&Post				
		Sex	#	Subtotal	Sex	#	Subtotal	Sex	#	Subtotal		
Salavan	SLV	M	11	21	M	11	21	M	11	21		
		F	10		F	10		F	10			
Pakse	PKS	M	11	31	M	11	31	M	11	31		
		F	20		F	20		F	20			
Savanna-khet	SVK	M	5	13	M	5	14	M	4	12		
		F	8		F	9		F	8			
Luang Prabang	LPB	M	2	14	M	2	14	M	2	14		
		F	12		F	12		F	12			
Khangkhai	KK	M	10	25	M	8	16	M	6	14		
		F	15		F	8		F	8			
Bankuen	BK	M	2	16	M	2	16	M	2	16		
		F	14		F	14		F	14			
Dongkham-xang	DKX	M	0	7	M	0	6	M	0	6		
		F	7		F	6		F	6			
		Total			127	Total			118	Total		114

1. Overview of Assessment

1.4. Teaching Mathematics test

The test

- Was conducted in those 7 TTCs in November 2022 and February 2023, before and after the lessons of Teaching Math 2.
- Consists of multiple choice questions, choosing one out of four approaches that is most similar to one's idea.
- Gives a point if the trainees choose the "expected" answer that is consistent with the ways of teaching and learning introduced through the new primary math curriculum and textbooks.
- Examines how much new ideas and methods have taken root in TTC trainees.

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1. Overview of Assessment

1.4. Teaching Mathematics test

The test questions are composed of the following topics.

Q	Topic	Domain	Grade	Q	Topic	Domain	Grade
(1)	10's decomposition	Numbers	1	(9)	Concept of measurement	Geometry	2
(2)	Place value	Numbers	2	(10)	Unit of length	Measurement	2
(3)	Addition up to 19	Numbers	1	(11)	Circles	Geometry	3
(4)	Concept of multiplication	Numbers	2	(12)	Isosceles and regular triangles	Geometry	3
(5)	Concept of decimal numbers	Numbers	3	(13)	Introduction to solid figures	Geometry	4
(6)	Addition of decimal numbers	Numbers	3	(14)	Concept of area	Measurement	4
(7)	Concept of fractions	Numbers	3	(15)	Use of pictograms	Measurement	2
(8)	Addition of fractions	Numbers	3	(16)	Direct proportion	Mathematical relations	4

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2. Analysis of the TM test results

2.1. Test results: By TTC [Increment in the scoring rate %]

	Pre	Post	Diff
LPB	34.4%	41.1%	+6.7%
KK	32.8%	37.5%	+4.7%
BK	51.2%	57.4%	+6.3%
DKX	33.0%	45.8%	+12.8%
SVK	32.2%	37.9%	+5.7%
PKS	38.1%	52.2%	+14.1%
6 TTCs	37.3%	46.6%	+9.3%
SLV	29.8%	79.2%	+49.4%

As seen in the table,

- Improvement in the test-score is observed in all the TTCs with +9.3% of the average increment in the scoring rate, while it varies widely from +4.7% in KK to +14.1% in PKS, and to 49.4% in SLV.
- There is much room for improvement because the post-test score exceeds 50% only in 3 TTCs.
- Both the post-test score and increment of SLV are unnaturally better than other TTCs. It is highly likely to be the consequence of "re-testing". The trainees of SLV TTC took the post-test 2 times due to suspicion of wrongdoing in the 1st time (→ All the trainees gave the same answer).

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2. Analysis of the TM test results

2.1. Test results: By TTC [Increase rate %]

The increase rate (%) calculated by $\frac{\text{Post test Score}}{\text{Pre test Score}} \times 100$ is summarized in the table below. As seen in the table,

- 53% of 6TTC trainees have shown at least 125% increase from the pre-test,
- In DKX, PKS and LPB TTCs, a majority of students have increased their scores.
- In SVK TTC, a large number of trainees have dropped their scores.

Post/Pre (%)	All (N=114)	SLV (N=21)	6TTCs (N=93)	DKX (N=6)	PKS (N=31)	SVK (N=12)	BK (N=16)	LPB (N=14)	KK (N=14)
125% ≤ *	61%	*100%	53%	83%	61%	50%	44%	43%	43%
100% < * < 125%	7%	0%	9%	0%	13%	0%	0%	21%	7%
* = 100%	16%	0%	19%	0%	10%	8%	38%	29%	29%
* < 100%	16%	0%	19%	17%	16%	42%	19%	7%	21%

*All the SLV TTC trainees have shown 167% to 650% increase in the post-test of the 2nd time.

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2. Analysis of the TM test results

2.2. Test results: By question

- More than 50% chose the "expected" answer in the post-test
- Less than 25% chose the "expected" answer in the post-test
- Result dropped in the post-test

Q 5, 7, 9 and 14 show a drop on the post-test

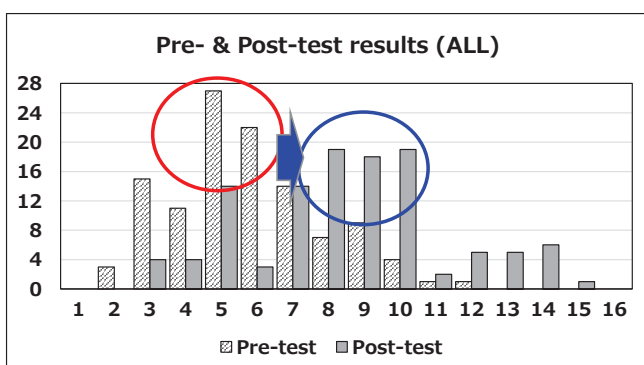
	ALL			ALL without SLV		
	Pre	Post	Diff	Pre	Post	Diff
(1)	81.1%	96.6%	15.5%	78.3%	97.9%	19.6%
(2)	60.6%	83.9%	23.3%	59.4%	82.5%	23.0%
(3)	26.8%	57.6%	30.9%	31.1%	54.6%	23.5%
(4)	11.0%	43.2%	32.2%	12.3%	34.0%	21.8%
(5)	11.0%	22.0%	11.0%	9.4%	7.2%	-2.2%
(6)	18.1%	38.1%	20.0%	17.9%	27.8%	9.9%
(7)	14.2%	23.7%	9.6%	15.1%	9.3%	-5.8%
(8)	2.4%	35.6%	33.2%	2.8%	22.7%	19.9%

	ALL			ALL without SLV		
	Pre	Post	Diff	Pre	Post	Diff
(9)	70.9%	35.6%	-35.3%	74.5%	23.7%	-50.8%
(10)	71.7%	88.1%	16.5%	75.5%	88.7%	13.2%
(11)	59.1%	85.6%	26.5%	60.4%	83.5%	23.1%
(12)	37.0%	65.3%	28.2%	38.7%	58.8%	20.1%
(13)	31.5%	32.2%	0.7%	31.1%	39.2%	8.0%
(14)	19.7%	25.4%	5.7%	23.6%	10.3%	-13.3%
(15)	44.9%	58.5%	13.6%	47.2%	69.1%	21.9%
(16)	16.5%	46.6%	30.1%	18.9%	36.1%	17.2%

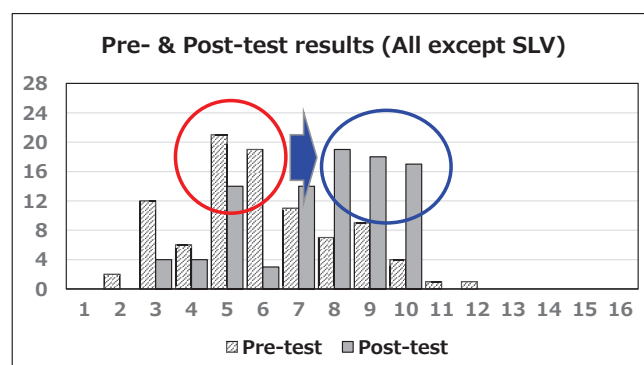
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2. Analysis of the TM test results

2.3. Test results: By student [Overview of improvement]



	N	Ave	Stdv	Max	Min	Med	Mode
Pre	114	5.8	2.10	12	2	6	5
Post	114	8.46	2.78	15	3	8	8, 10



	N	Ave	Stdv	Max	Min	Med	Mode
Pre	93	6.02	2.16	12	2	6	5
Post	93	7.51	2.03	10	3	8	8

Most students scored between 5-6 points in the pre-test, which increased to 8-10 points in the post-test. The peak of the above graphs are clearly shifted to the right-hand side.

2. Analysis of the TM test results

2.3. Test results: By student [Difference in the increment from the pre-test]

Increments from the pre-test (All TTC trainees except SLV) are as shown in the table below.

Pre-test score	2	3	4	5	6	7	8	9	10	11	12
# of trainees	2	12	6	21	19	11	7	9	4	1	1
Average increment in the post-test	3.0	2.7	3.5	2.2	1.3	0.6	1.1	-0.4	-0.3	-1.0	-1.0

This table indicates that those who have scored 2 to 5 points in the pre-test show a larger increment in the post-test than those who have scored 9 to 12 points.

(*As shown in the previous slide, the maximum score in the post-test is 10 point, dropped by 2 points from the pre-test.)

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2. Analysis of the TM test results

2.3. Test results: By student [Mistakes of good achievers]

In TTCs except SLV, there are 54 trainees who scored very high (8, 9 or 10 points) in the post-test. Their answers were as shown in the following table.

Questions	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
A	0	2	0	5	28	21	16	19	2	49	1	3	2	5	45	23
B	54	1	11	26	18	6	5	2	16	1	0	49	21	3	3	4
C	0	1	0	10	6	21	28	12	12	0	52	1	2	39	5	23
D	0	50	43	13	2	6	5	21	24	4	1	1	29	7	1	4
%	100%	93%	80%	48%	11%	39%	9%	39%	22%	91%	96%	91%	39%	13%	83%	43%

Even for those good achievers, Questions (5), (7), (9), (13) and (14) were confusing. While there seems to be a certain misunderstanding in Q (13) and (14), there were 2 choices that were chosen more than the expected answer in Q (5), (7) and (9).

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2. Analysis of the TM test results

2.3. Test results: By student [Mistakes of good achievers]

[Q13. Introduction to solid figures]

You introduce solid figures to Grade 4 students.

Among the following ways of teaching, which one is most similar to your approach?

- B) Examine solid figures from various viewpoints, such as “what is its net like?”, “By what shapes is it made?”, “How many vertices, sides and faces do they have?”, etc.

But more trainees preferred...

- D) Give much time to make a list of examples of each solid figure from our surroundings (e.g., Cuboid → carton box, textbook, etc.)

Expected answer

It does not seem to be appropriate for Grade 4 to use much time to make a list of examples, although such real-life examples can be used in the introductory part in Grade 4 math.

Note that this kind of activities would be appropriate for lower grades, such as “finding as many triangles and quadrilaterals as possible in our surroundings” in Grade 1

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2. Analysis of the TM test results

2.4. Comparison between the cohorts 2019 and 2021

The table below compares the TM test results between the cohorts 2019 and 2021, with the indicators of “Up” for more than 3% points increase, “Down” for more than 3% points drop, and “~” for the changes within $\pm 3\%$ points. As seen in the table, the score has been improved in 7 out of 13 questions.

		(1)	(2)	(3)	(4)	(5)*	(6)*	(7)	(8)	(9)	(10)	(11)	(12)*	(13)	(14)	(15)	(16)
2019	A	7.9%	7.0%	4.2%	27.9%	---	---	51.2%	27.9%	10.2%	73.0%	13.0%	---	3.7%	46.0%	47.0%	25.1%
	B	86.0%	1.4%	34.9%	32.1%	---	---	12.6%	14.0%	21.9%	3.7%	0.0%	---	40.5%	18.6%	10.7%	38.6%
	C	3.7%	16.3%	5.6%	23.7%	---	---	23.3%	53.0%	66.5%	2.8%	70.2%	---	37.2%	13.5%	23.7%	24.7%
	D	1.4%	75.3%	55.3%	15.3%	---	---	13.0%	5.1%	1.4%	20.5%	16.3%	---	17.7%	21.4%	18.1%	11.2%
2021**	A	1.0%	2.1%	0.0%	24.7%	59.8%	27.8%	51.5%	39.2%	21.6%	88.7%	10.3%	23.7%	7.2%	36.1%	69.1%	47.4%
	B	97.9%	2.1%	42.3%	34.0%	28.9%	14.4%	9.3%	3.1%	21.6%	3.1%	1.0%	58.8%	39.2%	9.3%	6.2%	6.2%
	C	0.0%	13.4%	3.1%	22.7%	7.2%	27.8%	34.0%	35.1%	23.7%	1.0%	83.5%	9.3%	14.4%	44.3%	18.6%	36.1%
	D	1.0%	82.5%	54.6%	18.6%	4.1%	28.9%	5.2%	22.7%	33.0%	7.2%	4.1%	8.2%	39.2%	10.3%	6.2%	10.3%
		UP	UP	~	~	---	---	Down	UP	Down	UP	UP	---	~	Down	UP	UP

*Questions 5, 6 and 12 in the analysis of 2019 cohort were removed because question sentences were found misleading.

** The data of the 2021 cohort is about 6 TTCs that excludes SLV.

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2. Analysis of the TM test results

2.5. Analysis of mistakes: Questions 5, 7, 9 and 14

- The TTC trainees in the 2021 cohort (excluding SLV) have shown the lowest scores in Question 5 and the 2nd, 3rd, and the 5th lowest in Questions 7, 14, and 9, respectively, among which the scores of Questions 5 and 7 are even below 10%.
- The score of Question 9 has declined precipitously in the post-test while a majority of trainees have given an expected answer in the pre-test. Question 9 is the only question in which each of the 4 choices is chosen by more than 20% of trainees.
- In comparing the test scores between the 2019 and 2021 cohorts, the score has significantly declined in Questions 7, 9 and 14.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q5. Concept of decimal numbers]

How do you introduce the concept of a tenth digit to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(5)	9.4%	7.2%	-2.2%

- The post-test score was critically low (<10%), and declined from the pre-test.

2021 cohort (Except SLV)	Choice	(5)	
		Pre	Post
	A	51.9%	59.8%
	B	28.3%	28.9%
	C	9.4%	7.2%
	D	10.4%	4.1%

[Choice C] (Expected answer) Begin the lesson by showing some examples of the use of a tenth digit in our daily life, such as the volume of liquid and the length of an object as an introduction.

→ Linking the new topic with our daily life is a very common way of introducing mathematical ideas particularly in lower primary grades.

*See [Reference] for complete question and answer choices.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q5. Concept of decimal numbers]

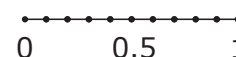
How do you introduce the concept of a tenth digit to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(5)	9.4%	7.2%	-2.2%

- Both of the pre- and post-test scores were critically low (<10%), and declined in the post-test.

2021 cohort (Except SLV)	Choice	(5)	
		Pre	Post
	A	51.9%	59.8%
	B	28.3%	28.9%
	C	9.4%	7.2%
	D	10.4%	4.1%

[Choice A] Begin the lesson by drawing a line segment with marks as shown on the right, and have students count those marks as 0, 0.1, 0.2, ..., 0.9 and 1.



- The TTC instructors are likely to give an instruction like Choice A, which does not encourage learners to learn math linking with real life, in the lessons, and often leaves them behind in the class.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q5. Concept of decimal numbers]

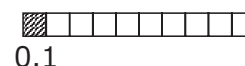
How do you introduce the concept of a tenth digit to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(5)	9.4%	7.2%	-2.2%

- The post-test score was critically low (<10%), and declined from the pre-test.

2021 cohort (Except SLV)	Choice	(5)	
		Pre	Post
	A	51.9%	59.8%
	B	28.3%	28.9%
	C	9.4%	7.2%
	D	10.4%	4.1%

[Choice B] Begin the lesson by defining 0.1 by dividing a large rectangle into 10 equal parts as shown on the right, so that students can visually recognize it.



- It is the same as Choice A. It would be more effective if Choices A and B comes after learners recognize decimal numbers around them and think about the meanings.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q7. Concept of fractions]

How do you introduce the concept of fractions to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(7)	15.1%	9.3%	-5.8%

- The post-test score was critically low (<10%), and declined from the pre-test. (Same as Q5)

2021 cohort (Except SLV)	Choice	(7)	
		Pre	Post
	A	61.3%	51.5%
	B	15.1%	9.3%
	C	16.0%	34.0%
	D	7.5%	5.2%

[Choice B] (Expected answer) Introduce a fraction through examples available around students, such as "1/3 meters" and "2/5 liters."

- Linking the new topic with our daily life increases learners' motivation, and is a very common way particularly in lower primary grades. In this case, the teacher often uses materials or figures to show a length, volume, etc.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q7. Concept of fractions]

How do you introduce the concept of fractions to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(7)	15.1%	9.3%	-5.8%

- The post-test score was critically low (<10%), and declined from the pre-test. (Same as Q5)

2021 cohort (Except SLV)	Choice	(7)	
		Pre	Post
	A	61.3%	51.5%
	B	15.1%	9.3%
	C	16.0%	34.0%
	D	7.5%	5.2%

[Choice A] Use real objects to define fractions, for example, 2/5 as "2 out of 5 marbles".

- Although Choice C tries to relate math with our daily life, introducing a fraction by proportion will cause a critical misunderstanding in learners, because if we learn 2/5 in this way, $2/5 + 2/5 = 4/10$ would be correct. But this Choice was most popular among the TTC trainees. This seems to result from the instruction of TTC instructors.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q7. Concept of fractions]

How do you introduce the concept of fractions to G3 students?

Q	All (except SLV)		
	Pre	Post	Diff
(7)	15.1%	9.3%	-5.8%

- The post-test score was critically low (<10%), and declined from the pre-test. (Same as Q5)

2021 cohort (Except SLV)	Choice	(7)	
		Pre	Post
	A	61.3%	51.5%
	B	15.1%	9.3%
	C	16.0%	34.0%
	D	7.5%	5.2%

[Choice C] Draw a line segment and divide it into several parts to define fractions.

- As seen in Q5, introducing a concept without considering real life often leaves many students behind in primary classes. More trainees have chosen this answer than before meaning that there seems to be some instructions on this from TTC instructors in the lessons of TM2.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q9. Concept of measurement]

How do you introduce the concept of length and volume to G2 students?

Q	All (except SLV)		
	Pre	Post	Diff
(9)	74.5%	23.7%	-50.8%

- The score has declined significantly, more than 50%, in the post-test while a majority of trainees have given an expected answer in the pre-test.

2021 cohort (Except SLV)	Choice	(9)	
		Pre	Post
	A	9.4%	21.6%
	B	14.2%	21.6%
	C	74.5%	23.7%
	D	1.9%	33.0%

[Choice C] (Expected answer) Introduce a standard unit of measurement after the activities to realise the limitations in measuring length and volume without using a common unit.

- The activity indicated in Choice C, which is given in the G2 textbook, helps learners become aware of the necessity of standard units and increases their motivation in learning math.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q9. Concept of measurement]

How do you introduce the concept of length and volume to G2 students?

Q	All (except SLV)		
	Pre	Post	Diff
(9)	74.5%	23.7%	-50.8%

- The score has declined significantly, more than 50%, in the post-test while a majority of trainees have given an expected answer in the pre-test.

2021 (Except SLV)	Choice	(9)	
		Pre	Post
	A	9.4%	21.6%
	B	14.2%	21.6%
	C	74.5%	23.7%
	D	1.9%	33.0%

[Choice D] Avoid talking about why we need standard units because it is difficult for students.

- Thinking about “Why” is at the heart of studying math (and science), and motivates students to learn more irrespective of the grade. This significant increase would indicate that TTC instructors have taught in this way.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q9. Concept of measurement]

How do you introduce the concept of length and volume to G2 students?

Q	All (except SLV)		
	Pre	Post	Diff
(9)	74.5%	23.7%	-50.8%

- The score has declined significantly, more than 50%, in the post-test while a majority of trainees have given an expected answer in the pre-test.

2021 (Except SLV)	Choice	(9)	
		Pre	Post
	A	9.4%	21.6%
	B	14.2%	21.6%
	C	74.5%	23.7%
	D	1.9%	33.0%

[Choice A] Concentrate on the direct comparison of two objects.

[Choice B] Give much time for students to compare a variety of objects directly and indirectly.

- Each of these is associated with the contents of the G2 and G3 textbook, and exceeds 20%. This likely results from the lack of understanding about the purpose of activities in the textbook.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q14. Concept of area]

How do you introduce the concept of area to G4 students?

Q	All (except SLV)		
	Pre	Post	Diff
(14)	23.6%	10.3%	-13.3%

- The score has declined in the post-test, and both the pre- and post-test scores are quite low (below 25%, less than the probability of random choice).

2021 (Except SLV)	Choice	(14)	
		Pre	Post
	A	57.5%	36.1%
B	15.1%	9.3%	
C	3.8%	44.3%	
D	23.6%	10.3%	

[Choice D] (Expected answer) Introduce and make students recognize how large a unit square (e.g., 1cm x 1cm) is, and then use it to measure the area of rectangles.

- The activity indicated in Choice D, which is given in G4 textbook, helps learners realize the size of a basic unit (=1cm²) and think about the area of figures based on it.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q14. Concept of area]

How do you introduce the concept of area to G4 students?

Q	All (except SLV)		
	Pre	Post	Diff
(14)	23.6%	10.3%	-13.3%

- The score has declined in the post-test, and both the pre- and post-test scores are quite low (below 25%, less than the probability of random choice).

2021 (Except SLV)	Choice	(14)	
		Pre	Post
	A	57.5%	36.1%
B	15.1%	9.3%	
C	3.8%	44.3%	
D	23.6%	10.3%	

[Choice A] Introduce the formula for the area of rectangles first, and then use it to find the area of various rectangles.

- This is not true as the textbook recommends doing the activity in Choice D to introduce the concept. If the teacher just requires learners to use a formula, they will neither be aware of how large it is nor think about why the formula holds true.

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2. Analysis of the TM test results

2.5. Analysis of mistakes

[Q14. Concept of area]

How do you introduce the concept of area to G4 students?

Q	All (except SLV)		
	Pre	Post	Diff
(14)	23.6%	10.3%	-13.3%

- The score has declined in the post-test, and both the pre- and post-test scores are quite low (below 25%, less than the probability of random choice).

2021 (Except SLV)	Choice	(14)	
		Pre	Post
	A	57.5%	36.1%
B	15.1%	9.3%	
C	3.8%	44.3%	
D	23.6%	10.3%	

[Choice C] Introduce the concept of area by conducting groupwork to find the way to compare the difference between 2 rectangles of different shape for an hour.

- The activity itself is very recommendable. However, we should not use 1 hour for it because this is a part of the preparation for the activity in Choice D. This significant increase (more than 40%) indicates the efforts of TTC instructors to introduce comparing activities, although they should learn more about what this activity aims at.

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3. Major findings

3.1. Overview of the test results

- Overall, a certain level of improvement is observed in the test results when we compare the scores between the pre- and post-test conducted before and after the lessons of Teaching Math 2 in the 2022 academic year, and between the post-test scores of the 2019 and 2021 cohorts.
- However, there is a big gap in the test results between the questions. In some questions, the post-test results were even worse than the pre-test, and more students preferred the options other than the expected one.
- A big gap is also observed between TTCs. The average scores of some TTCs exceeded 50%, but others remained between 37%-46% although they showed some improvements.

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3. Major findings

3.2. Implications from students' test results

Through the detailed analysis of students' test results, we have found that:

- As shown in the bar-chart previously in slide 10, the students' test scores (the mode of the data) have been clearly shifted from the 5-6 point band in the pre-test to the 8-10 point band in the post-test.
- In 7 out of 16 questions, more than 50% (at maximum 97.9% in Q1) chose the "expected" answer in the post-test. It is presumable that TTC instructors have taught these topics well.
- There is a big gap in the test results between questions. It is likely to result from the focus or emphasis of TTC instructors in daily lessons.

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3. Major findings

3.2. Implications from students' test results

(Continued)

- In the questions whose scores have been critically low in both the pre- and post-tests, it seems that both TTC instructors and trainees do not have sufficient understanding about the ways of instruction that the new math textbooks expect. For example;
 - In some questions, TTC trainees chose an option that introduces a concept "mathematically" (like secondary math), NOT by examples taken from our daily life to promote the learning of primary students .
 - Particularly in the questions related to measurement (e.g., length, volume and area), both TTC instructors and trainees should learn more about the reasons that the new textbooks begin by "non-standard units" and "comparison", which is not for fun but for helping students become aware of the necessity of standard units.

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3. Major findings

3.2. Implications from students' test results

(Continued)

- In the questions where the post-test results are even worse than the pre-test, more students preferred the options other than the expected one although they have chosen the expected answer in the pre-test. It is highly likely that the lessons in TTCs have NOT been consistent with the ways of instruction that the new math textbooks expect. This was possibly caused by instructors' misunderstanding or their misleading instructions because the trainees' "preferable" idea (=consistent with the new textbook) for teaching and learning have been changed through the lessons of Teaching Math 2.

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4. Recommendations

For sustainable lesson improvement in TTCs, it is recommended that:

1. TTC instructors are required to continuously develop their knowledge and skills about teaching and learning compliant with the new math textbooks.

- ➔ For this, they need to make a further study on the new textbooks, such as the connection between the contents, the intention behind the given activities, before the lessons on teaching methodology (Teaching Math 2). More collaboration and cooperation would be necessary between TTCs and RIES.

2. TTC management staff should develop a mechanism for internal quality assurance (IQA) system in each TTC so that the lesson are systematically monitored, assessed and improved.

- ➔ For this, TTC Director, Deputy Director and Teacher Development Office, need to work together to develop an IQA system, and check if trainees have achieved the expected outcomes based not only on feedback from instructors and trainees, but also on statistical evidence.

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Reference

[Reference]



2. Analysis of the TM test results

Test results: TTCs in the northern & central regions

Q#	LPB			KK			BK			DKX		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
(1)	14.3%	100.0%	85.7%	92.0%	100.0%	8.0%	93.8%	100.0%	6.3%	100.0%	83.3%	-16.7%
(2)	78.6%	100.0%	21.4%	28.0%	43.8%	15.8%	93.8%	81.3%	-12.5%	28.6%	50.0%	21.4%
(3)	21.4%	14.3%	-7.1%	24.0%	43.8%	19.8%	62.5%	81.3%	18.8%	57.1%	100.0%	42.9%
(4)	14.3%	7.1%	-7.1%	12.0%	6.3%	-5.8%	12.5%	6.3%	-6.3%	42.9%	16.7%	-26.2%
(5)	7.1%	0.0%	-7.1%	8.0%	18.8%	10.8%	12.5%	6.3%	-6.3%	0.0%	16.7%	16.7%
(6)	0.0%	28.6%	28.6%	32.0%	31.3%	-0.8%	37.5%	87.5%	50.0%	0.0%	33.3%	33.3%
(7)	0.0%	7.1%	7.1%	8.0%	0.0%	-8.0%	25.0%	0.0%	-25.0%	14.3%	50.0%	35.7%
(8)	0.0%	0.0%	0.0%	4.0%	0.0%	-4.0%	0.0%	0.0%	0.0%	14.3%	16.7%	2.4%
(9)	100.0%	14.3%	-85.7%	68.0%	31.3%	-36.8%	81.3%	6.3%	-75.0%	57.1%	50.0%	-7.1%
(10)	92.9%	100.0%	7.1%	80.0%	81.3%	1.3%	43.8%	81.3%	37.5%	100.0%	83.3%	-16.7%
(11)	100.0%	100.0%	0.0%	36.0%	50.0%	14.0%	81.3%	100.0%	18.8%	0.0%	66.7%	66.7%
(12)	57.1%	0.0%	-57.1%	48.0%	25.0%	-23.0%	62.5%	93.8%	31.3%	14.3%	83.3%	69.0%
(13)	14.3%	64.3%	50.0%	12.0%	50.0%	38.0%	68.8%	93.8%	25.0%	28.6%	33.3%	4.8%
(14)	0.0%	0.0%	0.0%	20.0%	18.8%	-1.3%	62.5%	6.3%	-56.3%	28.6%	16.7%	-11.9%
(15)	50.0%	64.3%	14.3%	28.0%	56.3%	28.3%	56.3%	75.0%	18.8%	42.9%	16.7%	-26.2%
(16)	0.0%	57.1%	57.1%	24.0%	43.8%	19.8%	25.0%	100.0%	75.0%	0.0%	16.7%	16.7%
All Qs	34.4%	41.1%	6.7%	32.8%	37.5%	4.7%	51.2%	57.4%	6.3%	33.0%	45.8%	12.8%

2. Analysis of the TM test results

Test results: TTCs in the southern region

Q#	SVK			PKS			SLV		
	Pre	Post	Diff	Pre	Post	Diff	Pre	Post	Diff
(1)	76.9%	100.0%	23.1%	83.9%	96.8%	12.9%	95.2%	90.5%	-4.8%
(2)	69.2%	92.9%	23.6%	61.3%	96.8%	35.5%	66.7%	90.5%	23.8%
(3)	7.7%	14.3%	6.6%	29.0%	74.2%	45.2%	4.8%	71.4%	66.7%
(4)	0.0%	7.1%	7.1%	9.7%	90.3%	80.6%	4.8%	85.7%	81.0%
(5)	7.7%	14.3%	6.6%	12.9%	0.0%	-12.9%	19.0%	90.5%	71.4%
(6)	15.4%	0.0%	-15.4%	9.7%	6.5%	-3.2%	19.0%	85.7%	66.7%
(7)	7.7%	35.7%	28.0%	25.8%	0.0%	-25.8%	9.5%	90.5%	81.0%
(8)	7.7%	0.0%	-7.7%	0.0%	67.7%	67.7%	0.0%	95.2%	95.2%
(9)	53.8%	64.3%	10.4%	77.4%	9.7%	-67.7%	52.4%	90.5%	38.1%
(10)	69.2%	78.6%	9.3%	77.4%	96.8%	19.4%	52.4%	85.7%	33.3%
(11)	61.5%	71.4%	9.9%	64.5%	93.5%	29.0%	52.4%	95.2%	42.9%
(12)	30.8%	35.7%	4.9%	19.4%	90.3%	71.0%	28.6%	95.2%	66.7%
(13)	23.1%	7.1%	-15.9%	38.7%	9.7%	-29.0%	33.3%	0.0%	-33.3%
(14)	15.4%	21.4%	6.0%	19.4%	6.5%	-12.9%	0.0%	95.2%	95.2%
(15)	61.5%	50.0%	-11.5%	51.6%	93.5%	41.9%	33.3%	9.5%	-23.8%
(16)	7.7%	14.3%	6.6%	29.0%	3.2%	-25.8%	4.8%	95.2%	90.5%
All Qs	32.2%	37.9%	5.7%	38.1%	52.2%	14.1%	29.8%	79.2%	49.4%

In this report, SLV TTC will be separately examined where aggregated data would lead to a misleading conclusion.

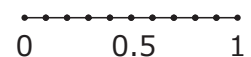
2. Analysis of the TM test results

[Q5. Concept of decimal numbers]

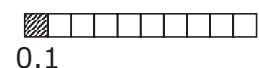
You are going to give the first lesson on decimal numbers to Grade 3 students that introduces the idea of a tenth digit. Among the following ways of teaching, which one is most similar to your approach?

Q	All (except SLV)		
	Pre	Post	Diff
(5)	9.4%	7.2%	-2.2%

A) Begin the lesson by drawing a line segment with marks as shown on the right, and have students count those marks as 0, 0.1, 0.2, ..., 0.9 and 1.



B) Begin the lesson by defining 0.1 by dividing a large rectangle into 10 equal parts as shown on the right, so that students can visually recognize it.



C) Begin the lesson by showing some examples of the use of a tenth digit in our daily life, such as the volume of liquid and the length of an object as an introduction.

D) Begin the lesson by letting students know the definition of decimal numbers and make sure that all the students can correctly recite it.

2. Analysis of the TM test results

[Q7. Concept of fractions]

You introduce the concept of fractions to Grade 3 students. Among the following ways of teaching, which one is most similar to your approach?

Q	All (except SLV)		
	Pre	Post	Diff
(7)	15.1%	9.3%	-5.8%

- A) Use real objects to define fractions, for example, $\frac{2}{5}$ as “2 out of 5 marbles”.
- B) Introduce a fraction through examples available around students, such as “ $\frac{1}{3}$ meters” and “ $\frac{2}{5}$ liters”.
- C) Draw a line segment and divide it into several parts to define fractions.
- D) Make sure that all the students can correctly recite the definition of fractions.

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2. Analysis of the TM test results

[Q9. Concept of measurement]

You introduce the concept of length and volume to Grade 2 students.

Among the following ways of teaching, which one is most similar to your approach?

Q	All (except SLV)		
	Pre	Post	Diff
(9)	74.5%	23.7%	-50.8%

- A) Concentrate on the direct comparison of two objects.
- B) Give much time for students to compare a variety of objects directly and indirectly.
- C) Introduce a standard unit of measurement after the activities to realise the limitations in measuring length and volume without using a common unit.
- D) Avoid talking about why we need standard units because it is difficult for students.

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2. Analysis of the TM test results

[Q14. Concept of area]

You introduce the concept of area to Grade 4 students. Among the following ways of teaching, which one is most similar to your approach?

Q	All (except SLV)		
	Pre	Post	Diff
(14)	23.6%	10.3%	-13.3%

- A) Introduce the formula for the area of rectangles first, and then use it to find the area of various rectangles.
- B) Introduce a variety of units first (e.g., 1mm^2 , 1cm^2 , 1m^2 , 1km^2), and then have students memorize the relationship between those units.
- C) Introduce the concept of area by conducting groupwork to find the way to compare the difference between 2 rectangles of different shape for an hour.
- D) Introduce and make students recognize how large a unit square (e.g., $1\text{cm} \times 1\text{cm}$) is, and then use it to measure the area of rectangles.

Appendix 8

Result of Lesson Video Analysis

G1 videos (Teachers without follow-up)		Savannakhet (Pilot School)	Vientiane (Pilot School)	Luangnamtha (G1 Survey School)
Textbook Page/Video Shooting Date		Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)	Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)	Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)
Criteria for each step of math class	Subdivided Criteria			
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question	2	4	4
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation	2	4	4
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself	1	2	4
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work	1	2	4
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step	1	2	4
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc.	1	2	4
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong	1	2	2
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period -Teacher lets students open the textbook and confirm today's point	1	3	2
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and gives advices individually as necessary	0	2	0
	(2)Then teacher checks the answer. - Teacher checks the answer with all the students together or individually.	1	2	0
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.)	0	0	0

G1 videos (Teachers without follow-up)		Savannakhet (Pilot School)	Vientiane (Pilot School)	Luangnamtha (G1 Survey School)
Textbook Page/Video Shooting Date		Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)	Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)	Textbook - P. 72 Dec. 2020 (1st semester of 3rd year after new G1 textbook was introduced)
Criteria for each step of math class	Subdivided Criteria			
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.)	0	0	0
Additional Criteria				
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)		0	4	4
2. Teacher had concrete plans for use of blackboard before the class.		1	2	3
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.		0	3	4
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)		1	2	2
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.		1	3	2
	Total	14	39	43
	-The teacher does not understand the aim of the lesson. -The teacher did not prepare the materials for the students and repeatedly copied the textbook contents on the blackboard and had the students copy the blackboard writing and then read the contents. -The teacher did not know how to proceed with the lesson after 30 minutes, and started to practice subtraction. -The teacher did not know how to check the answers and was inefficient in his teaching.		-The content of the lesson is presented in the form of a diagram and magnets (semi-concrete objects), but they are only used as instructional materials, and there are no activities using semi-concrete objects for the children. -There is some instruction on the number system and how to read numbers over 10. -The teaching of the number system beyond 10 and how to read it is well done, especially in the teaching of how to read "11" in Lao which was additional. -On the other hand, there is no careful instruction on the notation system. -The lesson ended without a summary of the lesson.	- In the first half of the class, the students were able to approach the content of the lesson with the help of the posters and the materials prepared for the students. -On the other hand, in the second half of the lesson, the students stuck to the number "13," the theme of the lesson, and the flow of the lesson came to a halt. -The class ended without a summary.

G1 videos (Teachers with follow-up)		Vientiane (Pilot School)	Luangnamtha (Pilot School)	Savannakhet (Pilot School)	Salavan (Pilot School)
Textbook Page/Video Shooting Date		Textbook - P. 58 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 60 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 60 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 69 Feb. 2023 (2nd semester of 5th year after G1 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria				
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question	5	4	3.5	2.5
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation	4	4	3	2.5
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself	3.5	4.5	3.5	3
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work	3.3	5	3.5	2.5
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step	4	4.5	4	3.5
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc.	4	5	4	3.5
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong	4	4.5	3.5	2.5
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period	4	4	3.5	2
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and gives advices individually as necessary	3.5	5	4	2.5
	(2) Then teacher checks the answer. - Teacher checks the answer with all the students together or individually.	4.5	4	4	2.5

G1 videos (Teachers with follow-up)		Vientiane (Pilot School)	Luangnamtha (Pilot School)	Savannakhet (Pilot School)	Salavan (Pilot School)
Textbook Page/Video Shooting Date		Textbook - P. 58 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 60 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 60 Nov. 2022 (1st semester of 5th year after G1 textbook being introduced)	Textbook - P. 69 Feb. 2023 (2nd semester of 5th year after G1 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria				
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.)	2	2	2	2
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.)	2	2	2	2
Additional Criteria					
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)		2	4	2	1.5
2. Teacher had concrete plans for use of blackboard before the class.		4.5	4.5	4	3
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.		3.5	4	3.5	2
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)		3	4.5	2.5	3
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.		3	5	2	4
Total		59.8	70.5	54.5	44.5
		- The teacher prepared appropriate teaching tools and presented the tasks while moving them around, and used plastic bottle caps as learning materials. - The five steps are also well established. -However, the teacher himself was so preoccupied with what he had to do that he hardly paid attention to the children in the entire class. -The students themselves are restless and the class proceeds in a noisy atmosphere. -The students' writing on the board should be larger. -There is a "loudness of voice" poster in the classroom, and it is possible that the size of the letters is also being taught. JICA volunteer was very much involved in the preparation of this class. -It is possible that only half of what was supposed to be taught in this lesson (only one of the two pages) was covered in this lesson, and the teacher may not have been aware of this. This indicates the current situation in which teachers may not know the pages to be covered in the lesson period without due to not looking at the teacher's guide.	- Regarding the board writing at the beginning, teacher reads it out loud and tries to get the children to write at the same speed. This is a result of the training. - The teacher is trying to observe the students by walking around the classroom and checking their work at every stage of the lesson. - It was very good that the Objective of the lesson was posted at the beginning of the lesson, but it was regrettable that it was for the teacher, "Make the students understand...". This will be the theme of the next training. - After a while of individual solving, the teacher showed a model using a plastic bottle cap and asked the students to move the cap while repeating the action with words. After that, each student proceeded to solve the problem on his/her own. - Plenty of time is given for careful walking around the classroom and checking students' understanding. -Students write the answers in their notebooks. -Teacher makes sure to distinguish between the equation and the answer when writing on the board. - After students write on the blackboard, they are encouraged to turn their bodies to the whole class and listen to the opinions of the other students. (This is an extremely good example.) - The pointer should only be used on the blackboard, not pointing at the students or at the desk. -The exercises should also be written in the notebook. -The teacher may not have given proper instruction regarding the two types of equations that were given during the answer sheets. -Summaries are done orally by the teacher, which is unavoidable at the G1 level.	- Understands how to teach the lesson according to the 5 steps. - The lesson flow is slow. Too much time is taken up at the start of class and the review. -The presentation of the task is done with cards, and the idea of having the bottle cap appear when the picture of a cat is unfolded is good, but unfortunately, it is too small to be seen. -Underlining "what we know" in the problem written on the board is an achievement of the training. -The teacher moves the bottle caps around and explains, but would like to see the students do the activity. -The teacher does not understand that the problem is about finding the part from the whole, and is teaching the calculation $5 - 3 = 2$. -The teacher's motivation is evident, but the lesson is inconsistent with the students' condition. -Step 5 summary scene was not shown in the video, but since 60 minutes had already passed, it was judged that the lesson ended there.	- Trying to teach using cards with the 5-steps. - The teacher's Objective is posted for the children. The teacher is trying to teach the students to find 8-3=5 from the diagram from the introduction to the middle of the lesson, which is wrong in the first place. (Teachers need to change their mindset.) -The teacher's explanations and simultaneous instruction using insufficient diagrams that students may not be able to see clearly (color copies of diagrams from textbooks, could be used with some enlargement) that students may not be able to see clearly are lengthy and do not allow for individual activities. -The method of having 8 students come to the front to show the activity is commendable, but the way it is used is regrettable. - The teacher is walking around and checking students' understanding during the 18 minute individual-solving time but is always talking. -The child does not appear to be writing the problem about 8-3. (Not confirmed by video.) No presentation by the student. -The teacher is summarizing, but it is unclear what she is summarizing in the first place.

G2 videos (Teachers without follow-up)		Salavan (non-pilot/survey school)	Savannakhet (Pilot School)	Savannakhet (non-pilot/survey school)
Textbook Page/Video Shooting Date		P. 53-54 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 53 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 99 Dec. 2020 (1st semester of 2nd year after G2 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria			
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question	2	4	4
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation	2	3	4
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself	2	2	3
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work	2	2	3
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step	0	2	1
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc.	0	2	2

G2 videos (Teachers without follow-up)		Salavan (non-pilot/survey school)	Savannakhet (Pilot School)	Savannakhet (non-pilot/survey school)
Textbook Page/Video Shooting Date		P. 53-54 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 53 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 99 Dec. 2020 (1st semester of 2nd year after G2 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria			
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong	2	2	2
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period -Teacher lets students open the textbook and confirm today's point	2	2	4
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and gives advice individually as necessary	0	2	1
	(2)Then teacher checks the answer. - Teacher checks the answer with all the students together or individually.	0	1	2
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.)	0	0	2
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.)	0	2	1
Additional Criteria				

G2 videos (Teachers without follow-up)		Salavan (non-pilot/survey school)	Savannakhet (Pilot School)	Savannakhet (non-pilot/survey school)
Textbook Page/Video Shooting Date		P. 53-54 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 53 Nov. 2019 (1st semester of 1st year of G2 textbook being introduced)	P. 99 Dec. 2020 (1st semester of 2nd year after G2 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria			
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)		2	3	3
2. Teacher had concrete plans for use of blackboard before the class.		2	3	3
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.		3	2	2
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)		2	3	2
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.		3	3	2
Total		24	38	41
		-Materials are available for presentation, group activities, and explanation, but they are not being used effectively. - The students do not seem to understand the meaning of group activities (equivalent to individual solving). -Teachers is trying to do their best, but they are falling short. -Discipline and class control are not working well.	- Presentation of problem is appropriate using materials, and children understands the problem. -Students are asked to copy what is explained on the board into their notebooks and are given a combination of tasks (following the old instructional method). -Straws are provided as learning materials, but they are not used effectively. -Does not notice the children's incorrect answers on the blackboard and is unable to correct them.	-Puts students in groups for the lesson. -The problem is Three digits -Two digits with borrowing, and the students are made to use straws => inappropriate at this stage. -The purpose of the lesson is to use materials. -One answer sheet and materials are provided for each group =>One or two people working. This is a pattern that hinders group learning. -Comparisons can be made on the blackboard. -The lesson flow is in line with the textbook.

G2 videos (Teachers with follow-up)	Luangnamtha (Pilot School)	Vientiane (Pilot School)	Salavan (Pilot School)
Textbook Page/Video Shooting Date	Multi-grade G2: P.93 G3: P.87 Feb. 2023 (2nd semester of 4th year after G2 textbook being introduced)	P. 91 Dec. 2022 (1st semester of 4th year after G2 textbook being introduced)	P. 76-77 Feb. 2023 (2nd semester of 4th year after G2 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria		
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question 4	5	2
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation 4	5	2
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself 5	5	3
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work 5	5	3
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step 5	4.5	3.5
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc. 5	5	3.5
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong 2	4.5	2
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period - Teacher lets students open the textbook and confirm today's point 2	5	2.5
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and gives advices individually, as necessary. 4	3.5	2
	(2) Then teacher checks the answer. - Teacher checks the answer with all the students together or individually. 0	4.5	3
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.) 1	2	2
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.) 1	1	1
Additional Criteria			
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)	3	5	3.5
2. Teacher had concrete plans for use of blackboard before the class.	5	5	4
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.	3	5	2.5
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)	3	4	2

G2 videos (Teachers with follow-up)		Luangnamtha (Pilot School)	Vientiane (Pilot School)	Salavan (Pilot School)
Textbook Page/Video Shooting Date		Multi-grade G2: P.93 G3: P.87 Feb. 2023 (2nd semester of 4th year after G2 textbook being introduced)	P. 91 Dec. 2022 (1st semester of 4th year after G2 textbook being introduced)	P. 76-77 Feb. 2023 (2nd semester of 4th year after G2 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria			
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.		2	3	1
Total		54	72	42.5
		<ul style="list-style-type: none"> -Is able to follow the steps of problem-solving learning even though the class is a multi-grade class. -The students are made aware of the steps by pasting the cards for each step on the blackboard. -Plenty of time for individual-solving and practice. -The teachers' individual instruction is done well. -On the other hand, students have not developed the skill of presenting their work when comparing and contrasting. -The teacher does not provide precise guidance, so important points may go unaddressed. -The A4 worksheets used for both individual-solving and practice are too small to be attached to the board and difficult to use with the notebooks. This needs to be considered. -After the exercise, the worksheets are collected without checking the correct answers, but how are they handled afterwards? - When promoting problem-solving learning in a multi-grade lesson, if both grades start with understanding the problem, there will be a time gap, so it may be necessary to devise a way to have one of the grades students do the practice from the previous period during problem solving. 	<ul style="list-style-type: none"> -They have a good understanding of problem-solving lessons. -Thanks to the short (2 minute) review time, the students were able to cover material that was directly related to the main lesson, -The careful understanding of the subject matter, -The creation of the Teaching and Learning Material for the comparison and discussion. The results of the training program, such as note-taking, techniques for understanding the problem, and moving the materials around, were effective. -The number of exercises could have been reduced and the time allocation could have been improved. 	<ul style="list-style-type: none"> -The teacher understands the flow of problem-solving lessons. -The effectiveness of the lesson was questionable in that the most important part of the lesson, the map, was provided as an attachment in the form of an A4 paper copy. -The teacher read aloud the problem sentences and explanations more than necessary, and the students copied them into their notebooks, which was like a dictation for Lao language class. -The content equivalent to individual-solving was done in groups, but it was not effective. -The paper size for the comparison study was A4, which is not large enough, and the students did not have presentation skills. -The flow of the textbooks is unnatural and inefficient, as the students are given the textbooks after writing the problems of the exercises on the board and having the students copy them. If the textbooks were handed out first, there would be no need to write the questions. 70 minutes is too much time.

G3 videos (Teachers without follow-up)		Vientiane (Pilot School)	Luangnamtha (Pilot School)	Luangnamtha (Pilot School)
Textbook Page/Video Shooting Date		Textbook - P. 30-31 Dec. 2020 (1st semester of 1st year of G3 textbook being introduced)	Textbook - P. 108 March 2021 (2nd semester of 1st year of G3 textbook being introduced)	Textbook - P. 111 March 2021 (2nd semester of 1st year of G3 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria			
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question	3	4	4
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation	3	4	4
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself	4	4	4
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work	3	4	4
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step	2	1	2
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc.	2	1	4
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong	1	4	3
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period -Teacher lets students open the textbook and confirm today's point	3	4	4

G3 videos (Teachers without follow-up)	Vientiane (Pilot School)	Luangnamtha (Pilot School)	Luangnamtha (Pilot School)
Textbook Page/Video Shooting Date	Textbook - P. 30-31 Dec. 2020 (1st semester of 1st year of G3 textbook being introduced)	Textbook - P. 108 March 2021 (2nd semester of 1st year of G3 textbook being introduced)	Textbook - P. 111 March 2021 (2nd semester of 1st year of G3 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria		
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and	0	3
	(2) Then teacher checks the answer. - Teacher checks the answer with all the students together or individually.	0	3
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.)	0	0
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.)	0	0
Additional Criteria			
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)	2	4	4
2. Teacher had concrete plans for use of blackboard before the class.	2	4	4
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.	3	3	3
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)	2	1	1
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.	2	1	1
Total	32	45	50
	Children and teachers are not engaged and lesson flow keeps pausing. Is it because of nerves or relation between the teacher and students? -The students were not able to learn the difference between quotative and partitive division unless the two problems were presented at the same time (which was not possible in this lesson). -Problem was presented as a poster. Rather than individual-solving, students answered the questions on the poster paper on the blackboard. -They distribute plastic bottle caps to the students and ask them to think about how to solve the problem, but it is questionable whether they are able to clearly distinguish the difference between the two operations. The operation should be verbalized. -The teacher used an enlarged copy of the textbook as an explanation. -Teacher kept asking Cauchalabo (Do you understand?) and may have been a painful lesson for the students. -The lesson ended after 31 minutes.	-Contents of review were unrelated to today's lesson. Mistakes with the handout etc., do not allow for easy understanding of the introduction of the lesson. - The flow of the lesson is presentation of the problem, individual-solving, comparison, to practice. -There is a diagram for explanation. -There is no summary. -The entire lesson is redundant and there is a lot of wasted time. -The class is nearly 70 minutes long, but the students are relatively concentrating.	-They spend 9 minutes on one question in the review, although they do it in a individual-solving manner. -Teacher walks around classroom and provides additional instruction. -The lesson flow of -presentation of the problem -individual-solving (additional instruction to individual students) - comparison and discussion is well done. -There is no summary. -The teacher's explanatory diagram is well done, but there are two calculation errors, which are pointed out by the students (the teacher makes excuses, but the two errors may indicate the teacher's academic ability). -The teacher omits exercises because there are two main problems in the lesson, but as in the previous lesson, wasted time could be sufficiently improved. -A summary of the class is posted.

G3+4 videos (Teachers with follow-up)		Luangnamtha (Pilot School)	Vientiane (Pilot School)	Salavan (Pilot School)	Savannakhet (Pilot School)
Textbook Page/Video Shooting Date		G4-P.74 Feb. 2023 (2nd semester of 1st year of G4 textbook being introduced)	G4-P. 74 Jan. 2023 (end of 1st semester of 1st year of G4 textbook being introduced)	G4 - P.80 Feb. 2023 (2nd semester of 1st year of G4 textbook being introduced)	G3 - P.90 Jan. 2023 (end of 1st semester of 3rd year of G3 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria				
3-1 Teacher clearly gives students the main question in the textbook, while students fully understand the meaning of the problem.	(1) Teacher clearly gives students the main question in the textbook - Teacher shows/moves pictures/objects to explain the situation - Teacher demonstrates the scene - Teacher confirms students' understanding after giving the question	4.5	2	1	4
	(2) Students fully understand the meaning of the problem. - Each student shows to have understood the problem with facial expression - Each student works on solving immediately after teachers explanation	5	2	1	4
3-2-1 Teacher gives students ample quiet time to solve the question by themselves, and each student tries to solve it with his/her knowledge already learned.	(1) Teacher gives students ample quiet time to solve the question by themselves. - Teacher has planned to give students appropriate time for their self-solving. - Teacher does not speak much so that each student can concentrate on thinking by him/herself	5	3	1.5	3
	(2) Each student tries to solve it with his/her knowledge already learned. - Each student solves the problems quietly as writing in their notebook - Each student thinks and solves together in the case of group work	5	2	1.5	3
3-2-2 Then Teacher walks around the class and checks on students quietly to know their ideas, and gives advice individually as necessary.	(1) Teacher walks around class and checks on students quietly to know their ideas. - Teacher checks students' ideas so that he/she can plan how to use students ideas appropriately and how to add explanation in the next step	5	3	1.5	3
	(2) Teacher gives advice individually as necessary. - Teacher provides additional support to students as needed, especially for those with a disability, poorer performing students, etc.	5	2	1	3
3-3 Teacher listens to students ideas and explanation with all the students. Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge.	(1) Teacher listens to students ideas and explanation with all the students. - Students present their ideas to the class students and exchange opinions with each other - Teacher leads and stimulate students' discussion to deepen their thought - Teacher doesn't deny students' incorrect ideas but let students think : 1) where it is wrong, and 2) why it is wrong	4	2	1	2
	(2) Teacher summarizes students ideas and leads them to the conclusion. And then teacher teaches new knowledge. - Teacher distinguishes what students should think/find/practice by themselves and what teacher should teach in this period. - Teacher teaches clearly what students need to understand and need to be able to do in this period -Teacher lets students open the textbook and confirm today's point	4	2	0.5	2
3-4 Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. Then teacher checks the answer.	(1) Students solve exercises which are in the textbook and related to today's problem basically in their notebooks, while teacher walks around the classroom to check on students and gives advice as necessary. - Students open the textbooks and do exercises by themselves in their notebooks, basically individually - Teacher let each student do all the related exercise in the textbook - Teacher walks around the classroom to check on students and	5	2	1	2
	(2) Then teacher checks the answer. - Teacher checks the answer with all the students together or individually.	5	4	2	0
3-5 Each student writes the summary in the notebook with support by the teacher.	(1) Each student writes the summary in the notebook with support by the teacher. - Teacher summarizes today's lesson on the board to help students review the lesson (- Teacher lets students review today's lesson and write in each notebook what each students understand.)	2	0	1	1
	(2) Teacher grasps each student's understanding by checking student's summary in the notebooks. - Teacher walks around classroom to check students' notebooks. (- Teacher lets students say what they wrote in the notebook to share the summary together.)	1	0	0	0
Additional Criteria					
1. Teacher understood what Teachers Guide meant and reflected it in the class. (The person who evaluates the lesson should also understand the meaning of the Teachers Guide.)		4.5	2	1	1.5
2. Teacher had concrete plans for use of blackboard before the class.		5	3.5	2	3
3. Teacher prepares appropriate teaching and learning materials and utilizes them properly.		4.5	3	2	3
4. Teacher had a time allocation plan for each step beforehand. (Teaching plan had time allocation on it.)		4	4	2	2
5. Lesson was finished in 45 minutes, having reached objectives of the lesson.		2	3	4	2.5
Total		70.5	39.5	24	39

G3+4 videos (Teachers with follow-up)		Luangnamtha (Pilot School)	Vientiane (Pilot School)	Salavan (Pilot School)	Savannakhet (Pilot School)
Textbook Page/Video Shooting Date		G4-P.74 Feb. 2023 (2nd semester of 1st year of G4 textbook being introduced)	G4-P. 74 Jan. 2023 (end of 1st semester of 1st year of G4 textbook being introduced)	G4 - P.80 Feb. 2023 (2nd semester of 1st year of G4 textbook being introduced)	G3 - P.90 Jan. 2023 (end of 1st semester of 3rd year of G3 textbook being introduced)
Criteria for each step of math class	Subdivided Criteria				
		<ul style="list-style-type: none"> -The teacher (and probably the students) understood the flow of problem-solving learning very well, allowing for speedy development in the steps leading up to the middle of the class. -This keeps students engaged in the class and focused on the practice in the second half of the class. -Students' presentations of ideas showed they were unused to doing so and the teacher's facilitation of the discussions could be improved. -In the exercises, all students worked on the 9 calculation problems in the textbook. -It is unfortunate that the class time was longer than it needed to be, but the class could have fit into 45 minutes if the method of checking answers in the practice was improved. -The students were not able to summarize the lesson in their own words. -The students used an A4 handout to solve problems and do exercises, but this is a problematic area in terms of effective use of notebooks to keep a record of learning. -The teacher collected the handouts at the end of the class, but unsure how the handouts will be used after the class. 	<ul style="list-style-type: none"> - Lesson is in the form of a problem-solving style lesson but there are many issues with teacher's instruction. -The teacher only writes the learning tasks and explanations on the board silently, leaving the students behind. (The content of the previous training has not been reflected.) -The students are not able to solve the problems on their own because there is no discussion in the form of group study. -The teacher is not able to deepen the lesson because comparisons are made with less necessary items during the comparison of student's ideas. -The teacher is not able to teach the important points of the lesson. -Exercises deal with only 5 out of 9 questions in the textbook. -The teacher is not able to control the class, as the students are not concentrating from the beginning of the lesson. More quality assurance of lessons is needed. 	<ul style="list-style-type: none"> - Lesson is in the form of a problem-solving style lesson but there are many issues with teacher's instruction. -Basically, a class in which prepared papers (papers with TB contents written on them) are presented silently in order and only made to be read. (The content of the training is not reflected.) -The teacher appoints students and forces them to explain on the blackboard, but there is no depth to the learning, and only a limited number of "able" students are allowed to proceed. -The teacher does not understand the purpose of the lesson or what to teach. The class lasts almost 45 minutes because there is no depth to the learning. 	<ul style="list-style-type: none"> -The video has been edited in several places and cannot be analyzed accurately. (Gray highlights in the table are deemed points) -The class is proceeding in the flow of problem-solving learning. -The students are doing the problem as individual-solving in a group. Students are discussing with each other on how to solve the 2 problems but this is acceptable. -In the comparison, the students explain their answers, but in 5 out of 6 cases, the answers are wrong, and the presentation ends without comparison or discussion, despite the abundance of material. -The teacher then demonstrates the writing operations, but does not address the key issue of whether the writing operations should be done in four or one step. This is a lack of understanding on the part of the teacher. -Only 4 out of 12 questions in the TB are done during the exercise time.

Appendix 9

Result of Experimental Lesson Survey

Results from G4 Experimental Study

Background of Study

- Initially, an annual impact survey to measure the effectiveness of the new textbooks was planned.
- Based on the results of the G1 and G2 students, the need to measure the effectiveness of the continued curriculum by grade level using a before/after comparison method was re-examined, and it was suggested that the new textbooks be used to measure the effectiveness of the learning process.

Objective of Study

- To check the situation of student's learning loss from school closures due to COVID – 19
- Confirm the extent to which the new textbooks can be used to ensure student's understanding
- Confirm the extent to which the new textbooks can be used for spiral learning
- Textbook developer will conduct actual classes, identify issues based on the implementation of the classes, and make proposals for teacher training, etc.

Study Design

- Target: G4 students in 3 pilot schools in Vientiane capital
- Target Chapter: Rules of Calculation (Chapter 5)
Area (Chapter 17)
- Study Method :
 - 1) Pre-test before conducting lessons
 - 2) Conduct lessons during 3-4 days
 - 3) Conduct post-test
 - 4) RIES math team members to teach lessons

Study Limitations

- The number of schools surveyed is limited to the Vientiane area (due to the impact of the COVID-19 behavioral restrictions, testing period, etc.) and does not reflect the situation in all of Laos.
- It is a small-scale study and the figures do not statistically describe the situation in the whole Lao PDR.
- Experimental lessons were taught by the RIES textbook development team, not by teachers in the schools surveyed, and do not represent the results of regular local classroom teaching.

Study Overview (1)

- Study Implementation Period: Sept. – Oct. 2022
 - 1) Pre-test: 2nd week of Sept.
 - 2) Lesson schedule:
 - Chapter 5 : Sept. 12th – 16th
 - Chapter 17: School I: Oct. 3rd , 4th , 12th , 13th
 - School II, III: Oct. 17th – 21st
 - 3) Post-test
 - Chapter 5: Sept. 16th
 - Chapter 17: School I: Oct. 13th
 - School II, III: Oct. 21st

Target Student Numbers by School

School	pre	post	
		Chapter 5	Chapter 17
School I (DKX Sathit)	34	32	34
School II (Phonxay)	60	56	64
A Class	30	29	33
B Class	30	27	31
School III (Sokpaluang)	44	39	44
A Class	20	15	20
B Class	24	24	24
Total	138	222	250

※ Pre-post test comparison is calculated with the results of students who took both the pre and post –tests.

Chapter 5 : Results

1. Question Composition

15 questions in total 問題は全部で15問

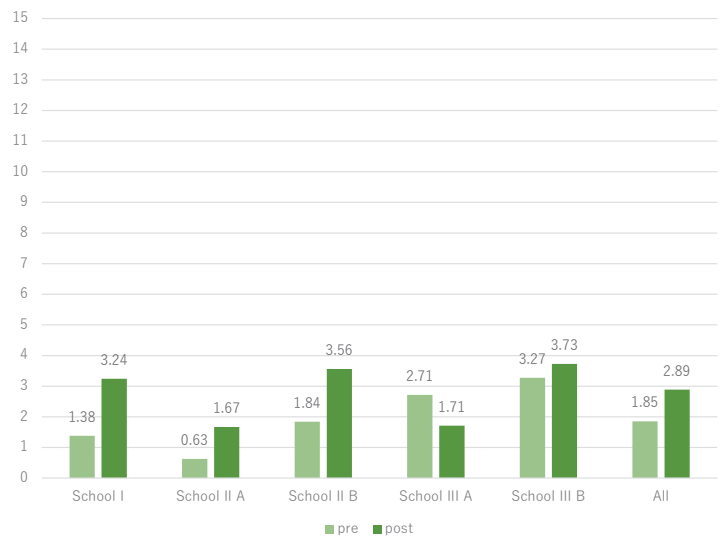
Consists of questions with varying degree of difficulty and questions to assess understanding of concepts.

2. Results

School III:

- Class B no statistically significant difference was found.
- Class A post-test result was lower than pre-test.

Results at other schools were statistically significant ($p < 0.05$).



Chapter 5: Correct Answer Rates for Pre and Post-Test *

	Pre %	Post %
$100 - (38 + 10)$	23.9%	21.9%
$48 \div (24 - 16)$	21.0%	29.7%
$140 - 25 \times 4$	13.8%	39.8%
$50 + 35 \div 5$	10.9%	36.7%
$5 \times 6 + 4 \div 2$	11.6%	27.3%
$8 \times (9 - 6) \div 3$	22.5%	28.1%
$(5 \times 6 + 4) \div 2$	5.8%	14.1%
$8 \times (9 - 6 \div 3)$	1.4%	9.4%
$(6 + 8) \times 2 = \square \times \square + \square \times \square$	3.6%	3.9%
$87 + 76 + 13$	47.8%	42.2%
$19 \times 125 \times 8$	2.2%	3.9%
In multiplication, if the multiplier becomes 10 times, the product becomes \square times.	6.5%	29.7%
In multiplication, if both the multiplicand and the multiplier becomes 10 times, respectively, the products becomes \square times.	13.0%	22.7%
$600 \div 40$ and $60 \div \square$ have the same quotient.	1.4%	5.5%
$200 \div 25$ and $\square \div 100$ have the same quotient.	0.0%	0.8%

*All students who took test.

Chapter 5: Issues and Trends

[Order of Calculation]

The old textbook intentionally showed the wrong order of calculation in questions which asked to "Correct the Mistake", and it is possible that TTC instructors, teachers, and RIES technicians understood this to be the correct method.

⇒ Correct instruction is expected to be provided in the lesson by teachers who understand the correct sequence of calculations described in the textbooks.

Example of a solution in which the sequence of calculations is well understood but the correct answer cannot be given.

(Lack of basic calculation skills)

- Lack of understanding of multiplication – times table (tries to solve but then gives up on calculating)

⇒ Affects calculations involving multiplication and division

- Unable to calculate 2 digit addition with carrying and subtraction with borrowing

⇒ Affects all calculations

Chapter 5: Issues and Trends

【Rules of Calculation (Commutative Law, Distributive Law, Associative Law)】

- The students did not understand the diagrams and the rules derived from them, even though they were taught based on the diagrams in the textbooks.

- Students do not find the rules of calculation to be useful.

(Accustomed to being taught by teachers and unwilling to think for themselves or lacking the ability to think for themselves)

Previous lack of academic ability is affecting their understanding of the laws and how to use them.

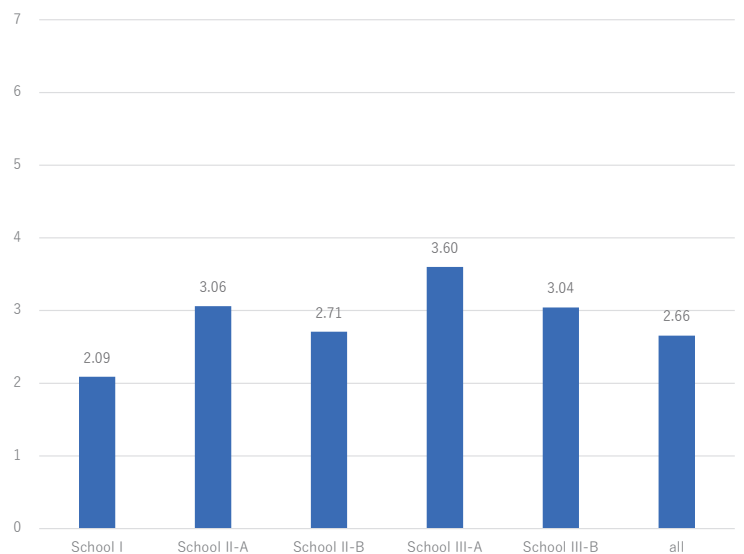
(If they have a basic understanding of numbers, they would realize the advantages of using the laws, but they are unable to do so.)

Chapter 17: Results

- Area is a new topic for all students.
- Pre-test score was 0 points in all schools.

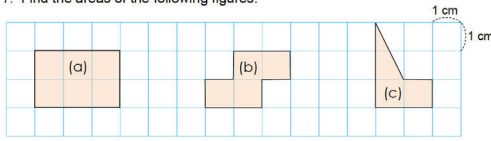
* Total of 7 questions.

Questions are increasing order of difficulty.



Chapter 17: Questions and Correct Answer Rates

7. Find the areas of the following figures.



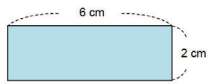
The area of (a) :

The area of (b) :

The area of (c) :

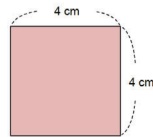
8. Find the areas of the following figures.

①



The area of ① :

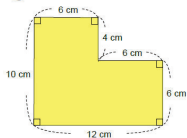
②



The area of ② :

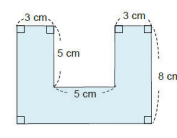
9. Find the areas of the following figures.

①



The area of ① :

②



The area of ② :

	post	%	
7-①		86	60.6%
7-②		87	61.3%
7-③		56	39.4%
8-①		70	49.3%
8-②		72	50.7%
9-①		28	19.7%
9-②		1	0.7%

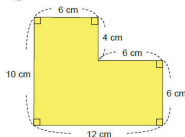
Chapter 17: Issues and Trends

<Overall>

- Students who can express the area of a figure in terms of "how many units of 1cm^2 " and answer correctly, including writing the correct unit. $\Rightarrow 60\%$
- Students who can calculate the area of squares and rectangles $\Rightarrow 50\%$
- When it comes to the area of figures combining rectangles and squares, the percentage of correct answers dropped sharply.
 - ◆ Lack of mathematical thinking skills to find the answer by dividing the figure into several parts or by filling in the missing parts.
 - ◆ Cannot reach correct answer due to simple calculation mistakes

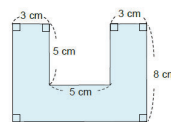
9. Find the areas of the following figures.

①



The area of ① :

②



The area of ② :

Findings from Lesson Observations (During lesson and lesson video observation)

● Were able to determine that the lessons taught by members of RIES were lessons in which the intent of the textbook was understood.

- ① Understand the objective of the lesson correctly.
- ② Based on their understanding, appropriate teaching materials and learning materials are prepared and used.
- ③ Using the teaching and learning materials, the lesson is conducted according to the textbook.

● Changes observed in students during lesson

Students who are used to being taught by the teacher are starting to show a willingness to think for themselves.

● Potential learning situations that affected the class.

- ① In some classes, students are not prepared for learning. Learning discipline is not enforced or taught.
- ② Not used to using notebook for learning.
- ③ Hesitant to think for themselves and find the answers
- ④ Lack of student's presentation skills
(volume of voice, size of writing on board, how to present blackboard writing, order of explanation)

Findings from Lesson Observations (During lesson and lesson video observation)

● Content that needs to be shared with other teachers through training and other means based on the experience of these lessons.

① Importance of understanding the Objective of the lesson in conducting the lesson

Currently, there are many classes that fail to achieve the Objective due to misunderstanding of the Objective or only superficial instruction.

② Based on ① teaching and learning materials are prepared and used appropriately.

③ Based on ② conducts the lesson according to the textbook.

Appendix 10

Plan and Actual Schedule of Operations

