Papua New Guinea
Department of Education

The Independent State of Papua New Guinea

The Project for Improving the Quality of Mathematics and Science Education

Project Completion Report

December 2019

Japan International Cooperation Agency(JICA)

IC Net Limited
PADECO Co., Ltd.

HM
JR
19-059

MAP

Ref. United Nations, Map No. 4104 Rev.1, January 2004

< Exchange rate as of November 2019 >
USD 1.00 = JPY (¥) 108.928000
PGK 1.00 = JPY 32.632300

Photographs of Project Activities

Activities related to overall management of the Project

Textbook development rooms

JCC meeting

Training in Japan: 'Training on Strengthening National Textbook Development in PNG'

Third Country Training: 'Technical Exchange with Myanmar on Primary-Level Mathematics and Science Textbook Development'

Discussion on national textbook policy

Foreign Ministers of Japan and PNG observed the new textbooks at the APEC.

Activities related to Output 1

Meeting of the Development of Strategies Working Group

Presentation of the strategies and plans for the introduction of new textbooks

Steering Committee

Presentation for necessary budget at DNPM

Activities related to Output 2

Discussion on defining procedures of development of textbooks and teacher's manuals

Analysing curricula and develop a structure of contents/units to be taught

In house training for subject contents

Developing the first draft of textbooks

Photo taking for textbooks

The first draft of textbooks and teacher's manuals

Activities related to Output 3

Training to pilot school teachers

Validation workshop using micro-teaching

Training in subject knowledge to pilot school teachers

Students of pilot schools studying by draft textbooks

Monitoring of lessons in pilot schools

Validation workshop with pilot school teachers

Distribution of science kits for pilot schools

Approval process of textbooks at Curriculum Panel

Approval process of textbooks at the Subject Advisory Committee

Approval process of textbooks at the Board of Study

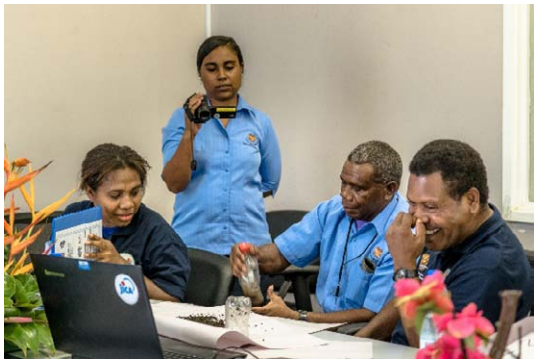
Meeting on the baseline survey

Research on academic performance in the end-line survey

Activities related to Output 4

Monitoring using a lesson observation sheet

Workshop on the development of an orientation kit



Trial of training using a draft orientation kit

Training video shooting at ELD

List of Abbreviations

Abbreviation	Term in Full
APEC	Asian Pacific Economic Cooperation Conference
BL	Baseline (survey)
CDD	Curriculum Development Division
CREATE	Project for Curriculum Reform at Primary Level of Basic Education in Myanmar
DNPM	Department of National Planning & Monitoring
DAC	Development Assistance Committee
DFAT	Department of Foreign Affairs and Trade (of Australia)
DoE	Department of Education
DoT	Department of Treasury
DTP	Desk Top Publishing
EL	End-line (survey)
ELD	E-Learning Division
EQUITV	Project for the Enhancing Quality in Teaching through TV
FAS	First Assistant Secretary
FD	Financial Division
GESD	General Education Service Division
GPE	Global Partnership for Education
HROD	Human Resource and Organizational Division
ID	Inspection Division
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JOCV	Japan Overseas Cooperation Volunteers
MSD	Measurement Service Division
NCD	National Capital District
NCSF	National Curriculum Standards Framework
NDoE	National Department of Education (=DoE)
NEP	National Education Plan
NGO	Non-Governmental Organisation
NIST	National In-Service Training
OBE	Outcomes Based Education
ODA	Official Development Assistance
PD	Procurement Division
PDM	Project Design Matrix
PDoE	Provincial Division of Education
PEO	Provincial Education Office
PGK	Papua New Guinea Kina

Abbreviation	Term in Full
PISA	Programme for International Student Assessment
PIST	Provincial In-Service Training
PNG	Independent State of Papua New Guinea
PNGEI	Papua New Guinea Education Institute
PPD	Policy and Planning Division
PTC	Primary Teachers College
QUIS-ME	Project for Improving the Quality of Mathematics and Science Education
SAC	Subject Advisory Committee
SBC	Standards Based Curriculum
SBE	Standards Based Education
SEOC	Senior Education Officers Conference
SD	Standard Division
SDGs	Sustainable Development Goals
SNS	Social Network Service
STEM	Science, Technology, Engineering and Mathematics
TBW	Textbook Writer
TED	Teacher Education Division
TIMMS	Trends in International Mathematics and Science Study
TOT	Training of Trainers
TSC	Teaching Service Commission
TMT	Top Management Team
WALS	World Association of Lesson Studies
WG	Working Group

Table of Contents

I. Basic Information of the Project

The basic Information of the Project is described as follows. The details of the Project design such as activities and inputs are described in the latter parts of this report.

(1) Country

Independent State of Papua New Guinea (PNG)

(2) Title of the Project

The Project for Improving the Quality of Mathematics and Science Education in Papua New Guinea (QUIS-ME)

(3) Duration of the Project

- Planned duration: March 2016 to February 2019 (3 years)
- Actual duration: March 2016 to November 2019 (3 years and 9 months)

Reasons for changes: As the development of the textbooks and teacher's manuals proceeded, the necessary amount of photographs, figures and illustrations grew bigger than expected. As a result, it took more time to convert the drafts (Microsoft Word file) into the final Desktop Publishing (DTP) versions (Adobe In-design files). Following the authorisation process for the textbooks and teacher's manuals, the DoE requested to proofread the final DTP versions, which required more time than had been planned. The measures were discussed and the Record of Discussion (R/D) was revised in June 2019. The Project period was extended for nine months to the end of November 2019.

(4) Background

PNG is geographically diverse and consists mainly of 700 islands of rugged terrain. Most primary and secondary schools in PNG are small, rural and remote. Because of these geographical constraints, education services do not reach all the rural areas. School infrastructure and resources are limited, and the number of teachers and the quality of education are insufficient. In 1993, the Department of Education in PNG (DoE) began educational reforms to improve educational access and quality. It changed the school-year system for basic education from six years to nine years. As of November 2019, children study continuously up to Grade 8 as described in Table I-1. The DoE also changed the curriculum framework; it shifted from the subject of English to that of ethnic language and from mathematics to cultural mathematics[1] to improve access to basic education. However, the net enrolment rate for primary education remained at 52.9%[2] in 2007, and only half of school-aged children were enrolled in schools.

[1] It includes the original concept of numbers in traditional culture of PNG.
[2] Source: JICA (2012) Baseline Data Collection Survey for Basic Education Sector in Papua New Guinea

Table I-1: Schooling year system of basic education in PNG since 1993

Stage	Primary Education									Secondary Education			
School type	Elementary			Primary						Middle			
Grade	Pre	E1	E2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12
Age	6	7	8	9	10	11	12	13	14	15	16	17	18

Target grade of the Project

To address the issues of access to education in PNG, the O'Neill government adopted education reform as a top-priority policy on its agenda and has promoted tuition-free education since 2011. Primary, secondary, technical and vocational education and training and distance learning became entirely tuition-free by the end of 2015. Access to education improved drastically as a result of this policy reform. The net-enrolment rate for basic education reached 78.5%[3] in 2012 and continues to improve even now. However, new issues have arisen, such as an increase in the budget necessary for the DoE, the need to strengthen management's capacity to handle an enlarged budget, a shortage of teachers, classrooms, equipment and learning materials, and the difficulty of the required outputs for teacher training.

The DoE introduced Outcomes-Based Education (OBE) to improve the quality of education. However, its implementation was not disseminated well at the school level because of limited awareness, teacher training, and distribution of resource materials on OBE. Although there were learning achievement goals, no national OBE textbooks, teacher's manuals, lesson plans, or reference resource materials were made available. Those that were developed in other countries were not distributed promptly in PNG. Therefore, teachers had to plan and prepare lessons for all units on their own, and they faced difficulties in finding opportunities to prepare and teach classes according to OBE. The quality of the lessons was inconsistent, and the learning achievement of students declined, especially in mathematics, science and English. Because of these problems, the OBE received criticism nationwide, and the cabinet decided to terminate it in 2008. The PNG government officially ordered the DoE to terminate OBE in 2011. The DoE decided to introduce a new curriculum called 'Standards-Based Curriculum' (SBC) in 2014. Thus began the development of the new curriculum. The Japan International Cooperation Agency (JICA) sent a detailed planning survey team to PNG in April and May 2015, and the Record of Discussions on 'The Project for Improving the Quality of Mathematics and Science Education' was signed in December 2015. The Project began in March 2016.

(5) Overall Goal and Project Purpose

The Overall Goal of the Project is 'The Textbooks and Teachers Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used'. To achieve the Overall Goal, the Project Purpose is set as 'National DoE is ready to distribute the Textbooks and Teachers Manuals of Mathematics and Science nationwide'. The outputs and activities of the Project are planned to

[3] Source: JICA (2014), Baseline Data Collection Survey for Basic Education Sector in Papua New Guinea

achieve the Project Purpose. Figure I-1 shows the outline of the Project.

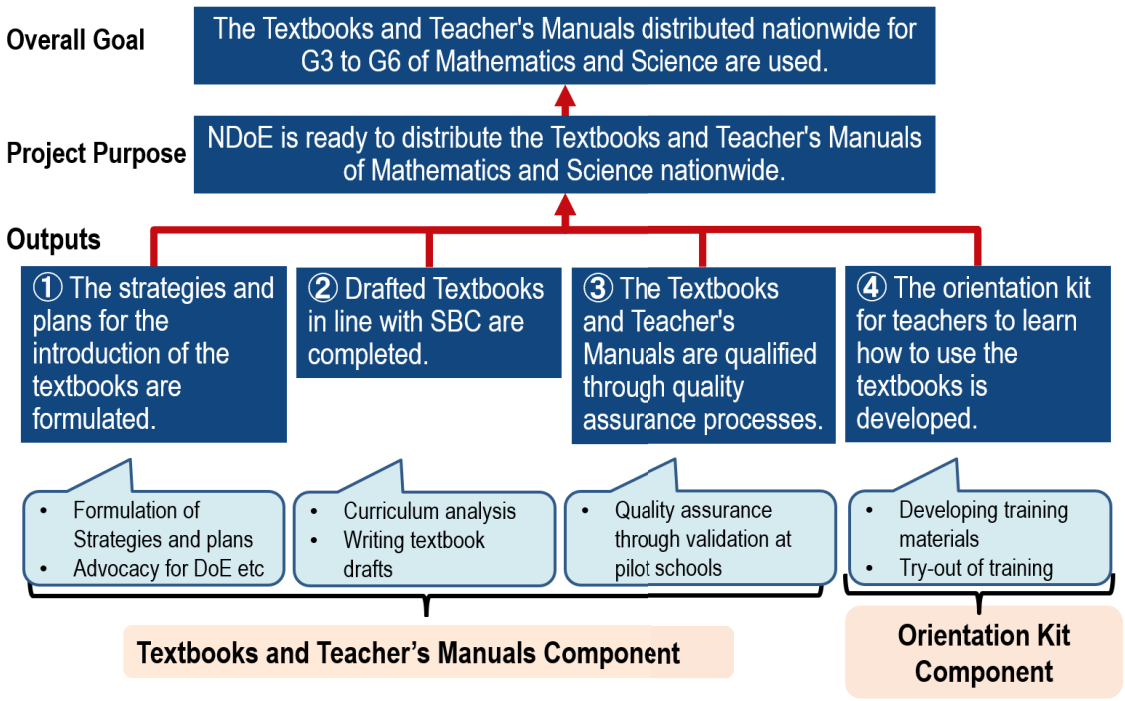


Figure I-1. Outline of the Project

The table I-2 shows the detailed structure of the Project including the activities in each output.

Table I-2. Detailed structure of the Project

Aims	
Overall Goal	The Textbooks and Teachers Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used.
Project Purpose	NDoE is ready to distribute the Textbooks and Teachers Manuals of Mathematics and Science nationwide.
Outputs and Activities	
Output 1	The strategies and plans for the introduction of the Textbooks are formulated.
Activities for Output 1	1-1 Form a working group amongst CDD, TED, ELD, ID and MSD. 1-2 Formulate the following strategies and plans with budget plans for the introduction of the Textbooks: (a) the strategy for the printing and distribution of the Textbooks; (b) the strategy for the teacher education on the Textbook use; (c) the strategy for the introduction of the Textbooks to education colleges; (d) the strategy for the raising of awareness and monitoring on the Textbook use; and

	(e) the strategy for the reform of assessment tools in line with SBC. 1-3 Organize periodical meetings for WG. 1-4 Coordinate the Steering Committee. 1-5 Provide technical support to secure the budget for printing and distribution in line with the strategy (a). 1-6 Provide technical support to secure the budget for teacher education in line with the strategy (b).
Output 2	Drafted Textbooks in line with SBC are completed.
Activities for Output 2	2-1 Define procedures of development of textbooks and teachers manuals. 2-2 Analyze curricula and develop a structure of contents/units to be taught. 2-3 Draft the Textbooks of Grade 3 to 6.
Output 3	The Textbooks and Teachers Manuals with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.
Activities for Output 3	3-1 Select and appoint pilot schools and teachers. 3-2 Obtain feedback from teachers on the first drafts (first quality assurance). 3-3 Revise the first drafts based on the feedback from the first quality assurance. 3-4 Examine the second drafts through continuous tryouts of lessons at pilot schools (second quality assurance). 3-5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance). 3-6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5. 3-7 Edit and proofread them for completion. 3-8 Conduct baseline and endline surveys including the pilot schools at appropriate timings.
Output 4	The orientation kit for teachers to learn how to use the textbooks is developed.
Activities for Output 4	4-1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson. 4-2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers. 4-3 Try out the observation sheet in the process of the quality assurance （Activity 3-5), and finalize it. 4-4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3. 4-5 Try out the materials for modification. 4-6 Finalize the orientation kit including the observation sheet.

(6) Implementing Agency

The implementation agency of the Project are as follows.

- Counterpart Organisation: Curriculum Development Division (CDD) in DoE.
- Related Agencies: Teacher Education Division (TED), Inspection Division (ID), E-Learning Division (ELD), Measurement and Service Division (MSD), National Capital District (NCD) Education Service, Provincial Education Office (PEO)
- Japanese side: JICA

The JCC consisted of representatives of Japan and PNG and included Top Management Team (TMT) members of the DoE. It was the highest decision-making body of the Project and met once or twice a year. Under the JCC, the Steering Committee, chaired by the Vice Project Director, First Assistant Secretary (FAS) of Curriculum & Measurement, met quarterly and discussed detailed project plans, progress monitoring and future strategies. At the day-to-day level, four working groups (WG) were formed. The Strategy Development WG oversaw the formation of the strategies and plans to introduce textbooks; the Science and Mathematics WGs oversaw the development of textbooks and teacher's manuals; and the Dissemination WG was in charge of printing, distributing, training and raising awareness of the new textbooks.

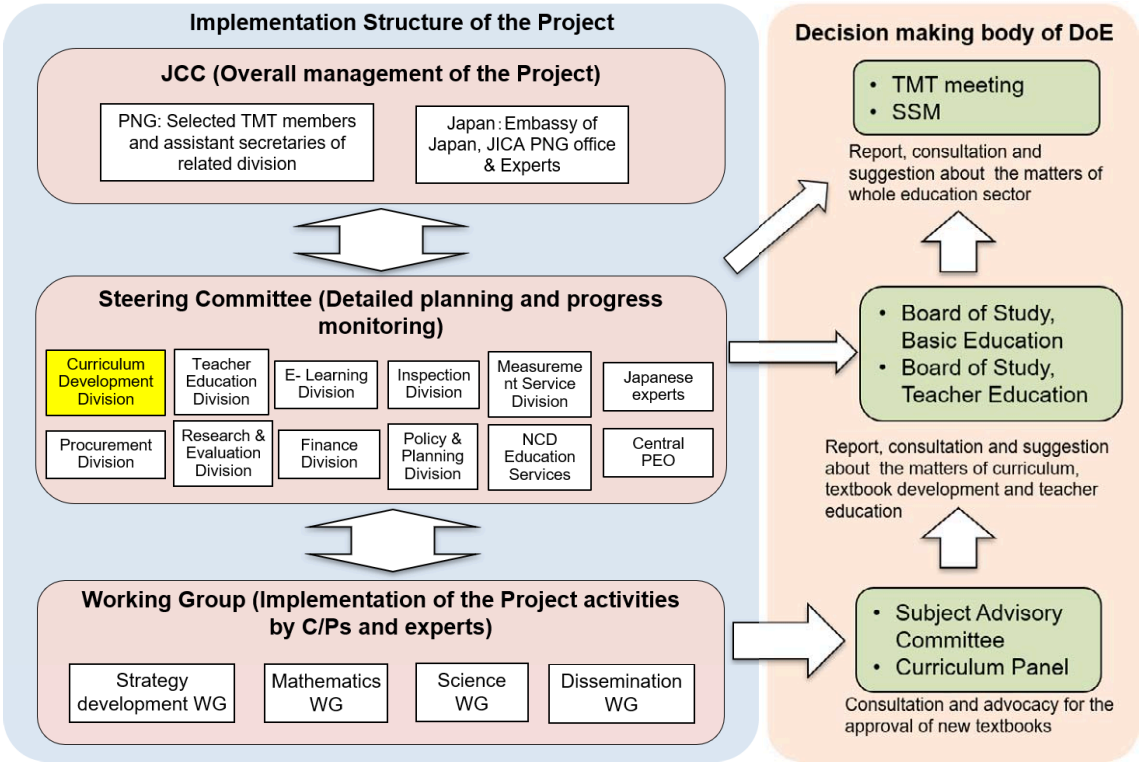


Figure I-2 Implementation Structure

(7) Numbers of beneficiaries

The numbers of beneficiaries of the Project are as follows.

- Direct beneficiaries: 80 Counterparts (C/Ps) such as Textbook Writers (TBW) selected from

primary school teachers and lecturers in PNG, Staff of Curriculum Development Division[4]

- Final beneficiaries: About 170,000 primary school teachers (About 5,000 teachers for Grade 3, 4,000 teachers for Grade 4, 4,000 teachers for Grade 5, 4,000 teachers for Grade 6)[5], About 675, 000 primary school students (About 195,000 for Grade 3, 178,000 for Grade 4, 160,000 for Grade 5, 143,000 for Grade 6)[6]

[4] Refer to "II-1-2. Input by the PNG side" for details.
[5] This number is only for government schools. Source: Department of Education (2014)
[6] This number is only for government schools. Source: Department of Education (2014)

II. Results and achievements of the project

II-1. Results of the Project

The results of inputs and activities planned in the Project Design Matrix (PDM) are described in this section.

II-1-1. Input by the Japanese side

(1) Cost of input by the Japanese side

The overall operational cost on the Japanese side during the Project period was Papua New Guinea Kina (PGK) 2,350,528. Table II-1 shows the yearly operational amount used in PNG.

Table II-1. Expenditure of operational cost

Year	Duration	Expenditure (PGK)
1st year	March 2016–August 2016	282,987
	September 2016–February 2017	223,022
2nd year	March 2017–August 2017	349,797
	September 2017–February 2018	416,071
3rd year	March 2018–August 2018	400,972
	September 2018–February 2019	309,761
4th year	March 2019–November 2019	367,918
	Total	2,350,528

(2) Dispatch of Japanese experts

At the beginning of the Project period, the plan was to dispatch 11 Japanese experts, but in total, 12 experts were finally sent. Only one expert on 'Textbook Development' was originally planned to be sent to PNG, but then the position was divided into two expert roles in Textbook Development (Science) and Textbook Development (Mathematics). The dispatch periods were originally 131 Man/Month (M/M), but it increased to 134.17 M/M. There were additional activities for the Project, such as participating in 'Country-Focused Training: Improvement of Quality of Teaching Materials', a third-country training session titled 'Technical Exchange with Myanmar on Primary-Level Mathematics and Science Textbook Development', photography for the textbooks and training pilot teachers on subject knowledge. In conclusion, the amount of input was almost as planned. Annex 1 shows the detailed periods of expert dispatch.

Table II-2. Dispatch of Japanese experts

Name	Position	Roles	Duration (M/M)
Mr. Akinori Ito, MPS	Chief Adviser/ Education plan 1	1. Develop the work plan and manage progress of the Project. 2. Compile each report and support the quality assurance of the outputs and products	25.40 MM

Name	Position	Roles	Duration (M/M)
		3. Conduct consultation and discussions with JICA and the PNG government. 4. Organise management meetings such as JCC. 5. Organise training in Japan, study tours, and public relations, and work with JICA long-term experts. 6. Formulate the strategies and plans for introducing new textbooks. 7. Serve as officer in charge of developing textbooks and teacher's manuals. 8. Serve as officer in charge of baseline/end-line (BL/EL) surveys.	
Mr. Chiko Yamaoka	Senior Adviser/ Education plan 2	1. Develop the work plan and manage progress of the Project. 2. Compile each report and support the quality assurance of the outputs and products. 3. Formulate the strategies and plans for introducing new textbooks. 4. Organize third-country training titled 'Technical Exchange with Myanmar on Primary-Level Mathematics and Science Textbook Development'. 5. Serve as officer in charge of developing an orientation kit development.	12.62 MM
Ms. Masako Tsuzuki	Education Policy/ Donor coordination	1. Study the education sector in PNG and donor coordination. 2. Support formulation of the national textbook policy.	3.55 MM
Mr. Satoshi Kusaka	Chief Subject Specialist (Mathematics)	1. Provide advice on development of math textbooks and teacher's manuals as chief math subject specialist. 2. Develop the orientation kit on math. 3. Support BL/EL surveys.	14.03 MM
Dr. Masami Isoda	Subject Specialist (Mathematics)	1. Provide advice on development of math textbooks and teacher's manuals with regard to academic views.	5.0 MM
Mr. Ryuichi Sugiyama	Chief Subject Specialist (Science)	1. Manage progress of development of textbooks and teacher's manuals and their quality assurance. 2. Support BL/EL surveys.	7.23 MM
Mr. Kenichi Jibutsu	Subject Specialist (Science) 1	1. Provide advice on development of science textbooks and teacher's manuals as chief science subject specialist. 2. Develop the orientation kit on science. 3. Support BL/EL surveys.	13.70 MM
Dr. Masakazu Kita	Subject Specialist (Science) 2	1. Provide advice on development of science textbooks and teacher's manuals with regard to academic views. 2. Develop the orientation kit on science.	1.57 MM

Name	Position	Roles	Duration (M/M)
Mr. Katsuaki Serizawa	Specialists of textbook development (Mathematics)	1. Provide advice on development of math textbooks and teacher's manuals as editor. 2. Collect information on textbook printing.	11.7 MM
Mr. Susumu Komazawa	Specialists of textbook development (Science)	1. Provide advice on development of science textbooks and teacher's manuals as editor. 2. Collect information on textbook printing.	12.77 MM
Dr. Kotaro Kijima	Project coordinator 1/ Training plan 1/ Textbook development (Science)	1. Manage the project office in PNG with regard to such aspects as project staff, funds, equipment, and coordination. 2. Manage training funds and assist training sessions. 3. Support editing of science textbooks. 4. Support BL/EL surveys.	20.07 MM
Ms. Kyoko Yamada	Project Coordinator 2/ Training Plan 2/ Textbook Development (Mathematics)	1. Manage the project office in PNG with regard to such aspects as project staff, funds, equipment, and coordination. 2. Manage training funds and assist training sessions. 3. Support editing of mathematics textbooks. 4. Support BL/EL surveys.	7.07 MM
Total			134.71 MM

(3) Training in Japan/ Third-country training

During the Project period, the Project organised a training session in Japan and a third country. Table II-3 presents an outline of those training sessions. In addition, 11 counterparts (C/Ps) joined from the two countries for a focused training session in Japan, which was organised by JICA. The details of the participants in those training sessions are described in Annex 1.

Table II-3. Outline of training in Japan/ third-country training

Type	Name of training course	# of participants	Main training contents	Duration
Training in Japan	Training on Strengthening National Textbook Development in PNG	6	1) Legal framework, 2) Process, and 3) Role of government for textbook development in Japan	12–27 July 2017
Third-country training	Technical Exchange with Myanmar on Primary-Level Mathematics and Science Textbook Development	8	Technical exchange on textbook development with the CREATE project[7] in Myanmar, observation of primary schools and Education colleges	16–27 August 2017

[7] Project for Curriculum Reform at Primary Level of Basic Education in Myanmar

JICA country-focused training (Japan)	Improvement of Quality of Teaching Materials	11	Training on the development of textbooks and teacher's manuals	October–December 2016; October–December 2017
JICA country-focused training (Japan)	Improvement of Quality of Teaching Materials (Executives)	3	Training on the Japanese education system and features of textbooks, lesson study and observation of primary schools	November 2016
	Total	28		

(4) Equipment

The Project provided equipment, which in total cost PGK 335,040 Table II-4 lists the equipment items provided. The details of the equipment are in Annex 1.

Table II-4. List of equipment

#	Name of equipment	Quantity	Procurement Cost (PGK)
1	Project Vehicle	1	114,632.38
2	Photocopy machine	2	61,752.65
3	Computers	21 laptops[8] and 3 desktops	45,283.38 23,752.54
4	Portable generator	1	2,281.97
5	Air conditioner	5	9,325.88
6	Data projector	2	3,738.38
7	Flat-screen TV (Wide-screen)	2	8,652.47
8	Digital camera and lens	2	38,114.26
9	Digital microscope	1	3,383.15
10	Editing software	4 licenses x 3 years	24,122.94
	Total		335,040.00

(5) Additional expenditure from JICA PNG Office

The additional expenditure from the JICA PNG Office was PGK 114,632.38, and it was used for the procurement of the Project vehicle described above.

II-1-2. Input by the PNG side

(1) Assignment of C/Ps

The Project Director, Vice Project Director, Project Manager, and WG members, including CDD curriculum officers, ELD officers, and Textbook Writers (TBWs) were assigned as planned. The

[8] One computer could not be fixed and is out of operation because of damage on the mother board.

TBWs worked as full-time C/Ps and significantly contributed to the Project. Eight TBWs were originally planned to be invited from various regions of the country; however, 12 of them were selected and assigned from around NCD because of limited accommodation at the DoE. Other C/Ps worked part-time and contributed to the Project in meetings and workshops. The assigned C/Ps are summarised in the table below.

Table II-5. Assignment of C/Ps

Title in the Project	#	Position in DoE	Period	Remarks
Project Director (Chairman of JCC)	1	Deputy Secretary, Schools & Education Standards	March 2016– November 2019	The person in charge was replaced in January 2017 because of the restructuring of DoE.
Vice Project Director (Chairman of Steering Committee)	1	First Assistant Secretary, Curriculum & Measurement	March 2016– November 2019	The person in charge was replaced in January 2017 because of the restructuring of DoE.
Project Manager	1	Assistant Secretary, CDD	March 2016– November 2019	
Textbook Writers (TBWs)	12	Teachers of Teaching Service Commission (TSC)	April 2016– November 2019	TBWs are full-time C/Ps. There are 6 TBWs for math and 6 for science. Four of the 12 were added in November 2016.
Strategy development WG	16	Officers of related 13 divisions in DoE	July 2016 – November 2019	Part-time C/Ps; 6 officers of CDD were added to the WG.
Mathematics WG	9	Curriculum Officers of CDD, TBWs	April 2016 – November 2019	Part-time C/Ps; 6 TBWs were added to the WG.
Science WG	9	Curriculum Officers of CDD, TBWs	April 2016– November 2019	Part-time C/Ps; 6 TBWs were added to the WG.
Dissemination WG	20	Officers of CDD, TED, ELD, PEO and TBWs	November 2016– November 2019	Part-time C/Ps; 11 members were added to the WB.
Pilot teachers	33[9]	Teachers from pilot schools	February 2017– December 2018	Participated in validation activities using draft textbooks.

[9] Initially, 33 pilot teachers took part in the validation of Grade 3 and 4 materials. However, out of the 32, 19 qualified ones were selected for the validation of Grade 5 and 6 materials.

Title in the Project	#	Position in DoE	Period	Remarks
Curriculum Panel	12	Executives and senior officers of CDD	June 2017– November 2019	Oversees the proofreading and authorization process; 5 members were added to the panel.
Total	80	(except additional posts)		

(2) Facilities and equipment

More facilities and equipment were provided than had been originally planned because the Project's needs changed along with its activities.

Table II-6. Facilities and equipment provided by the PNG side

Name	Planned #	Allocated #	Remarks
Project Office	1	1	
Rooms for TBWs	0	2	Mathematics and Science
Photocopy machine	0	1	For printing textbooks and teacher's manuals

(3) Other inputs from the PNG side

Along with room in the CDD, the DoE covered the water and electricity consumption for the Project office. The DoE also provided the traveling allowances for the C/Ps, and part of the conference and workshop fees. The operational cost for the Project was not approved in 2016 or 2017. Therefore, Project activities that required local trips were limited. However, the operational costs for 2018 and 2019 were secured, and the implementation of the Project activities during those years went smoothly. Table II-7 shows the yearly operational cost of the Project on the PNG side.

Table II-7. Operational cost from the PNG side

Year	Main budget items	Amount (PGK)
2016	None	0
2017	None	0
2018	Photocopy machine, meeting and workshop fee, traveling and daily allowance of C/Ps.	2,000,000
2019	Meeting and workshop fee, traveling and daily allowance of C/Ps, printing the orientation kit, Science apparatus, office expenditure, textbook development of elementary mathematics	5,000,000[10]
	Total	7,000,000

[10] The amount in 2019 is the budgeted amount, not the disbursed one.

II-1-3 Progress of Activities

Project activities took 9 months longer than planned because the finalisation of the textbooks and teacher's manuals took more time than expected, as shown in the section 'I. Basic Information on the Project (3) Duration of the Project'. Other activities went mostly as planned.

The achievements of each activity and changes in their implementation are described as follows. Meanwhile, the detailed period of each activity is described in 'Annex 1-5. Plan of Operation'.

Common Activities for Outputs

The achievements of common output activities are as follows.

【Common 1】Preparation, explanation and consultation on the draft of Work Plan (March to April 2016)

The basic policies, methods, and plans for the Project activities were summarised in a Work Plan draft in consultation with JICA. The Work Plan was finalised through discussions and revisions of the draft with the CDD C/Ps at the Steering Committee in March 2016 and the TMT of the DoE in April of the same year.

【Common 2】Preparing the Monitoring Sheet (March and September, each year)

The Project members prepared monitoring sheets twice a year with the C/Ps. They summarised the achievement status for the Project's purpose, the progress of outputs, and recommendations for further improvement. The progress reports were shared and discussed between the Steering Committee and JCC, and plans were changed when necessary.

【Common 3】Conducting the Joint Coordinating Committee (August 2016, September 2017, March and August 2018, and November 2019)

The Project organised five JCC meetings, and they had decision-making authority for overall project management. The meetings took place for the committee to report on plans and progress, confirm the achievement of outputs, and discuss measures for challenging issues, using the monitoring sheets mentioned above. The meeting outlines are shown in the table below.

Table II-8. Outline of the JCC meeting

Name of the meeting	Date	Main agenda
1st JCC meeting	11th August 2016	Introduction of Project framework, Progress Report, discussion on the strategy and plans to introduce new textbooks, discussion on issues and measures
2nd JCC meeting	13th September 2017	Confirmation of actions taken, Progress Report, report on training in japan and third country, report on orientation kit, discussion on issues and measures
3rd JCC meeting	23rd March 2018	Confirmation of actions taken, Progress Report, discussion on revision of PDM, report on end-line survey, discussion on issues and measures

Name of the meeting	Date	Main agenda
4th JCC meeting	31st August 2018	Confirmation of actions taken, presentation of progress report, discussion on the revised strategy and plans, discussion on textbook policy, report on revised orientation kit, discussion on revision of PDM, discussion on issues and measures
5th JCC meeting	25th November 2019	Confirmation of actions taken, Presentation of project completion report, report on the textbook distribution by DoE, discussion on the recommendation and way forward

【Common 4】Conducting public relations

Public relations were tailored for each type of stakeholder to help them understand the objectives, activities and impacts of the Project, as shown below.

Table II-9. Achievements of awareness raising and public relations

Media	Purpose and method	Target	Remarks
Website and SNS[11] of the Project (Japanese and English)	The purpose, activities and progress of the Project have been shown two times in the websites of the DoE and JICA. Activities have continuously been shown through the Facebook pages of the Project and JICA PNG Office.	Stakeholders in PNG, educators in Japan and the world, the general public	All year
Radio and TV (English, Pidgin)	Introduced the Project activities through radio and TV news by inviting radio and TV stations to major workshops and meetings.	Stakeholders, teachers, children, and parents in PNG	at events
Newspaper (English, Pidgin)	Introduced the Project activities through articles in newspapers by inviting journalists to major workshops and meetings.	Stakeholders, teachers, children, and parents in PNG	at events
Promotion video	Introduced new textbooks through websites and broadcasting by four one-minute promotion videos created by the Project.	PNG stakeholders related to education and the general public in Japan and abroad	All year
Logo, banner and brochure (English)	The purpose, outputs, and activities of the Project have been shown through the Project logo, banner, and brochure created by the Project.	Government organizations of PNG, donors, provincial education offices, and schools	All year
Project T-shirt (English)	Used a Project-created T-shirt to promote the Project on the occasions of activities and school visits	PNG government officials and schools	All year

【Common 5】Supporting JICA advisory missions (August 2016, May 2017, August 2018)

In August 2016, May 2017, and August 2018, the JICA advisory mission confirmed the progress of Project operations and discussed measures for challenges with the Project and DoE.

[11] social networking service

【Common 6】Conducting the training in Japan (January 2017)

Project stakeholders in the DoE had not received much training on policies on national textbooks and the textbook development process in the private sector. Therefore, a course called 'Training on Strengthening National Textbook Development in Papua New Guinea' was conducted for them. The course focused on on-the-job training at the textbook companies from which the Project's textbook development experts were dispatched. The trainees learned about the legislation and editing of national textbooks by facilities in Japan.

Table II-10. Outline of the training in Japan

A) Training name: Training on Strengthening National Textbook Development in Papua New Guinea
B) Duration: 12–17 July 2017
C) Participants: 6 officials (1 DoE Senior Officer, 4 CDD officials, and 1 TED official)
D) Purpose: To be able to explain necessary frameworks to be made by the DoE for the development of textbooks and teacher's manuals in PNG.
E) Main Contents:
1) To learn policies, development, printing, procurement, distribution and frameworks of training courses and monitoring to introduce proper national textbooks in PNG, which is a role of the administration. (University of Tsukuba, Ministry of Education, Culture, Sports, Science and Technology, Japan Textbook Research Center, etc.)
2) To learn the development process of textbooks through lectures and on-the-job training. (Gakko Tosho Co., Ltd, and Uchida Yoko Co., Ltd, etc.)
3) To learn the processes of printing and binding. (Gakko Tosho Co., Toppan Printing Co., Ltd., Tosho Printing Co., Ltd, etc.)

【Common 7】Conducting activities for sharing and learning experiences with other countries (August 2017)

In August 2017, representatives from the Project visited the 'Project for Curriculum Reform at the Primary Level of Basic Education in Myanmar' (CREATE Project). It was a prior JICA project to implement textbook development and share knowledge and experiences between the countries on the development of textbooks and teacher's manuals, as follows.

Table II-11. Overview of sharing and learning experiences with Myanmar

A) Training name: Technical exchange with Myanmar on textbook development for mathematics and science at the primary level
B) Duration: 16-27 August 2017
C) Participants: 8 officials (1 CDD curriculum officer and 7 TBWs)
D) Purpose:
1. To learn know-how and experiences regarding the concepts and process of textbook developments, the contents of newly developed textbooks and teacher's manuals that take

into consideration the current use of textbooks, teachers' abilities, and curricula of education colleges in Myanmar.
2. To share the knowledge and experiences regarding textbook development in PNG with textbook writers in Myanmar and consider ideas for revising textbooks.
3. To use the acquired knowledge for the development of textbooks in PNG.

E) Main Contents:

To visit a Thai public primary school, the Myanmar CREATE project office, primary schools in Myanmar and Yankin Education College; to exchange ideas and develop textbooks with the Mathematics and Science group of the Myanmar CREATE project; to summarize the training; and to make plans for activities upon return to PNG.

Meanwhile, planned technology exchanges with Bangladesh and Laos and participation in the World Association of Lesson Studies (WALS) were cancelled because of the security situations in the partner countries and problems in the timing of Project operation plans.

【Common 8】Activities related to Education Policy/Donor Coordination (As needed)

The directions of policies and budgets and the SBC-related donor coordination significantly impacted the position of the new textbooks that were being developed by the Project with regard to sustainability. Therefore, the Education Policy/Donor Coordination advisor for the Project visited Senior Officers of the DoE and other donor organisations, gathered information, directed the Project, and strategized in cooperation with the JICA Education Policy Advisor.

Based on the activities above, the following undertakings were achieved. At the beginning of the Project, the introduction of the SBC was mentioned in 'the National Education Plan (NEP) 2015–2019', although the framework and plans for the introduction were unclear. The CDD, in cooperation with the Education Policy Advisor, developed 'the SBC position paper' (June 2017) and clarified the introduction plan. 'The strategies and plans for the introduction of the textbooks', which was determined by the Project, were made to align with the plan. In addition, the SBC frameworks were decided in 'the National Curriculum Standards Framework (NCSF)' in 2018, and the position of the new textbooks was based on the frameworks.

Moreover, workshops were held to reach a consensus on the position of the new textbooks in the SBC. They helped to raise awareness that the new textbooks are the only national textbooks approved by the DoE for mathematics and science from G3 to G6 to replace the Teacher's Guides, which continue to be used. Coming to a consensus is important for enhancing the sustainability of the new textbooks. Thus, the DoE decided to issue a Secretary Circular on the use of the new national textbooks to related organisations simultaneously with the distribution of the textbooks.

Activities for Output 1: The strategies and plans for the introduction of the textbooks are formulated

The main activity involved in Output 1 is supporting the formation of strategies and plans for the distribution and introduction of textbooks and teacher's manuals for mathematics and science from G3 to G6 in the SBC nationwide. The purpose of Output 1 is to develop the ability of the DoE to plan the budget and detailed activities for the textbooks and teacher's manuals to improve comprehensively the quality of the whole educational field of PNG. The entire long-term plan is divided into several stages, and the following activities were conducted accordingly.

【1-1】 Form a working group amongst CDD, TED, ELD, ID and MSD (March to November 2016)

In the beginning, the strategies and plans for the introduction of the textbooks were to be made by the Steering Committees. However, based on the discussion at the Steering Committees in 2016, a Strategy Development WG, composed of representatives from the CDD, ID, ELD, TED, MSD, PD (Procurement Division) and Financial Division (FD), was formed in July 2017 to develop the strategies and plans.

In addition, a 'Mathematics WG' and a 'Science WG' for developing the textbooks and a 'Dissemination WG' for developing the training materials for the dissemination of the textbooks were formed in April and November 2016, respectively. See 'Table II-5: Assignment of C/Ps' in the section 'II-1-2. Input from the PNG side' for detailed information on the WGs.

【1-2】 Formulate the following strategies[12] and plans with budget plans for the introduction of the Textbooks (May to August 2016 and revised as needed)

The first draft of 'Strategies and plans for the introduction of the textbooks and teacher's manuals', which includes the overall budget estimation, was developed by the Dissemination WG in July 2016 and was discussed, revised and approved at the JCC in August 2016. The strategies and plans were revised into a second edition and reflected the new cost estimates for printing and distribution, types of training for using the orientation kit, and lessons learned from training in Japan and Myanmar in November 2017. Moreover, a final adjustment was made to the draft in a consultation workshop with the Senior Officers and Assistant Secretaries from the DoE in August 2018. Plans for policies on the development and revision of national textbooks were added to the third edition in February 2019. Finally, the strategies and plants were submitted to the Board of Study and endorsed by the Board o Study in November. 2019.

[12] (a) The strategy for the printing and distribution of the Textbooks, (b) The strategy of the teacher education on the Textbook use, (c) The strategy for the introduction of the Textbooks to education colleges, (d) The strategy for the raising of awareness and monitoring on the Textbook use; and (e) The strategy for the reform of assessment tools in line with SBC.

All necessary content was covered in the formation of the strategies and plans, as shown in Table II-9. The plans also included each implementation structure (responsible organisations, human resources), schedule, and budget. The strategies and plans were shared with the Senior Officers of the DoE, Department of National Planning & Monitoring (DNPM), Department of Treasury (DoT) and were used as a reference for budget allocation on the PNG side for the latter half of the Project.

Table II-12: Outline of the strategies and plans for the introduction of the textbooks

	Item	Outline
1	Development of policy documents related to the position of national textbooks	Plans of the development of policy papers for the position of national textbooks, which is the item newly added after the discussion.
2	Development of textbooks and teacher's manuals	Plans of developing textbooks and teacher's manuals matching with school environment in PNG.
3	Improvement of methods of learning assessment in line with new textbooks	Recommendations and plans related to assessment such as development of test item banks in line with contents of new textbooks and teacher's manuals.
4	Printing and distribution of new textbooks	Printing and distribution of developed textbooks and methods of confirmation of receiving the materials etc.
5	In-service teacher training for using new textbooks	Plans of an implementation of school-based in-service orientation training for the introduction of new textbooks.
6	Improvement of lessons in the Primary Teachers Colleges (PTC) for using new textbooks	Recommendations for assessment such as revision of curriculum in PTC after the introduction of new textbooks.
7	Improvement of monitoring system in line with new textbooks	Recommendations for supervision system such as monitoring schools by school inspectors after the introduction of new textbooks.
8	Actions for continuous revision of textbooks	Formulation of structure for an implementation and monitoring of strategies and plans for an introduction of developed textbooks and teacher's manuals, institutionalization of work and human resources related to the development of textbooks, and plans and recommendations for the budget allocation, which are the items added after the discussion.

【1-3】 Organize periodical meetings for WG (March 2016 to November 2019 as needed)

The WG meetings took place regularly and were based on the needs that arose with revisions to the strategies and plans for the introduction of the textbooks, as mentioned above, that occurred as Project activities progressed. At the meetings, the strategies and plans were changed with flexibility as necessary.

【1-4】 Coordinate the Steering Committee (March 2016 to November 2019, in every quarter)

The Steering Committee, chaired by the FAS of Curriculum & Measurement and composed of representatives from the CDD, ID, ELD, TED, MSD, PD and FD, met quarterly and discussed progress and countermeasures for issues with the Project and agendas of JCCs. The Steering Committee met thirteen times in total during the Project period, which contributed to a smooth confirmation with the PNG side of the Project implementation.

【1-5】 Provide technical support to secure the budget for printing and distribution in line with the strategy (a) (August 2016 to November 2019, as needed)

The PNG government urgently needs to print, distribute and implement the orientation training for the new textbooks and teacher's manuals after they are developed to achieve the Overall Goal, which is for 'the textbooks and teacher's manuals to be distributed and used nationwide for G3 to G6 in mathematics and science'. It is necessary for the PNG government to allocate a budget for the activities; therefore, the Project has advocated for it at the DoE, DNPM, and DoT.

Concretely speaking, the Project, in cooperation with the JICA Education Policy Advisor, supported the DoE in preparing budget request documents for the following year from every February based on the budget estimation in the 'Strategies and plans for the introduction of the textbooks'. The Project and DoE Senior Officers explained the importance of disseminating the textbooks to the DoT and DNPM and invited them to the JCC meetings to deepen their understanding.

As a result, although no local budget for the Project was allocated in 2016, the budget of five million PGK was allocated to the Project and two million PGK earmarked for the development of materials, apart from the recurring budget, in 2019. The same budget is to be allocated until 2023 as part of the five-year plan.

In addition, the printing and distribution of the textbooks and teachers' manuals by a Japanese grant is planned, and the Project is providing references and information as necessary.

【1-6】 Provide technical support to secure the budget for teacher education in line with the strategy (b) (August 2016 to November 2019, as needed)

Materials for school-based training have been printed and distributed following the 900,000 PGK that was allocated for the 2019 budget for printing and distribution, as stated above.

Output 2: Activities related to "Drafted Textbooks in line with SBC are completed"

Figure II-1 summarises the activities related to Output 2. The details of the activities and experiences of Output 2 are described separately for mathematics and science, as necessary.

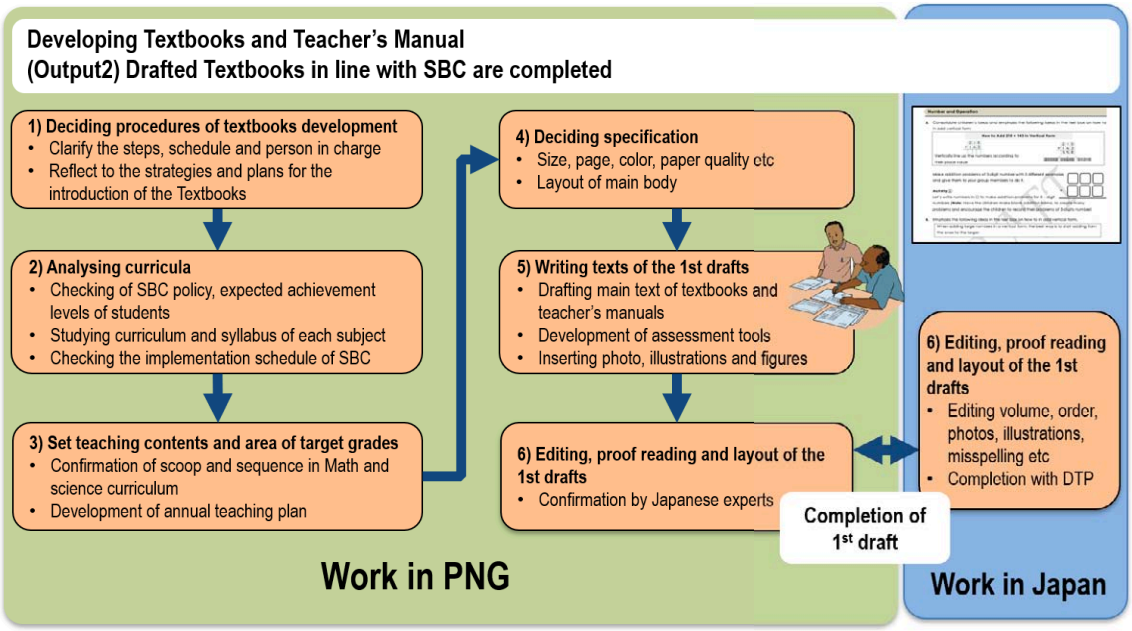


Figure II-1. Procedure of Developing Draft Textbooks and Teacher's Manuals

【2-1】Define procedures of development of textbooks and teachers manuals (March to August 2016)

The procedures for the development of textbooks and teacher's manuals can be categorised roughly into the following steps: 1) determining the procedures for textbook development; 2) analysing curricula; 3) setting the teaching content and areas for target grades; 4) deciding specifications; 5) writing the text of the drafts; 6) validating the drafts; 7) Modifying the drafts; 8) editing, proofreading and finalising the layout. Some of these steps are common in both mathematics and science, and some are subject specific. The Science and Mathematics WGs collaborated to implement these steps. The details of the first step, 1) determining the procedures for textbook development, are described below.

1) Selection of TBWs

Before the development of the drafted textbooks and teacher's manuals, the Project selected TBWs. The applicants were gathered through a public notice in the DoE and from recommendations from the DoE and Project. The applicants were examined via a paper test on the English language and subject knowledge and interviews. As a result, the Project selected model teachers from the Enhancing Quality in Teaching through TV (EQUITV) Project, the former JICA technical cooperation Project, who had experience in material development, and secondary school teachers who had higher subject knowledge and English skills. The selected 12 TBWs[13] were as follows.

[13] One TBW resigned during the Project period and a replacement was selected.

Table II-13. List of TBWs

Name	Sex	Former position	Subject	Remarks
1. Ms. Michelle Pala	F	Media Centre, ELD	Maths	Model teacher
4. Mrs. Pisah Thomas	F	Wordstrip Primary School	Maths	
3. Ms. Hilda Tcpungu	F	St. Peter Primary School	Maths	
4. Mr. Nick Nolpi	M	Evedahana Primary School	Maths	Resigned
5. Ms. Ileen Palan	F	Gordon Secondary School	Maths	Secondary school teacher
6. Mr. Armstrong Rupa	M	Media Centre, ELD	Maths	Model teacher
7. Gibson Jack	M	Gordon Secondary School	Maths	Secondary school teacher
8. Mr. Michael Kwadogi	M	Media Centre, ELD	Science	Model teacher
9. Ms. Sandra Uramani	F	St. Therese Primary School	Science	EQUITV C/P
10. Mrs. Brenda Kautu	F	Bavoroko Primary School	Science	
11. Mr. Jimmy Pulpulis	M	Former Curriculum officer	Science	Curriculum Officer
12. Mrs. Raphaella Barau OA	F	St. Peter Primary School	Science	
13. Ms. Aalia Nissar	F	Ekivaki Primary School	Science	

2) Deciding the fundamental concepts of development

Representatives from the Project discussed the procedures for the development of textbooks and teacher's manuals with CDD Executives, Curriculum Officers and TBWs. The Japanese experts held workshops several times and gave input to the C/Ps on the standard Japanese ways to develop textbooks and the features of textbooks and teacher's manuals. The DoE methods for validating and authorising were also discussed in detail. Then, the details of the fundamental concepts, procedures and schedules for textbook development were decided. The results of the discussion were reflected in the description included in the 'Strategies and plans for the introduction of new textbooks', which were drafted and modified according to the agreement between the PNG and Japanese sides. The aims of the national textbooks, such as 'Our Textbooks Support the Visions of Standards-Based Education (SBE) - Achievement of high quality and competitive education', were also discussed with the C/Ps. The fundamental concepts of textbook development in each subject are described as follows.

<Mathematics>

i) Learning to use the prior knowledge

The content of mathematics is systematic and has strong continuity. New knowledge is built on prior knowledge. The Project regards prior knowledge and related learning content from grade to grade as important for mathematics, and it is clearly described in the teacher's manuals.

ii) Conceptual understanding through the problem solving approach

The textbooks do no use the ordinary teaching style (i.e., the teacher teaches the definitions or formulas, and students solve problems by using them). The textbooks are structured to help

students find the definitions or formulas by themselves so that they thoroughly understand the meaning of the content as they learn it.

iii) Mastering skills through exercises

To master the learning content, it is necessary to practice with exercises. The textbooks include enough exercises for students to be able to practice when they do their homework.

iv) User-friendly textbooks and teacher's manuals

The following points figured into the development of the textbooks and teacher's manuals to make them appropriate for teachers and students in PNG. To motivate students to learn, familiar content, illustrations and photographs that are related to daily life in PNG are prepared for the textbooks and teacher's manuals. The TBWs and CDD Curriculum Officers carefully check the words and expressions in the textbooks. The teacher's manuals explain most of the basic content of each subject to meet each teacher's subject knowledge level.

v) Considering the diversity of students (Advanced and supplementary content)

Advanced and supplementary content is included in the textbooks and teacher's manuals so that teachers can teach according to the interests and learning styles of the students at various levels. The motivations for and deep understanding of mathematics are enhanced with interesting mathematics stories about PNG and the world; for instance, stories about counting numbers using body parts in PNG and reading Roman numerals are included.

<Science>

i) Learning content that deepens the understanding of the rich natural environment of PNG

To deepen the understanding of the rich natural environment of PNG through learning, the content of the textbooks and teachers' manuals involves animals, plants, and natural environments from PNG[14] as much as possible. The national standard yearly overview is developed with consideration of the seasons and localities of PNG. Some content can be learnt only at specific timings or places by observing natural environments.

ii) The problem-solving approach

To help children to master the scientific method and develop science process skills, which are necessary to problem-solving with the scientific approach, each lesson is designed according to the following steps: 1) wonder or question, 2) research, 3) findings, and 4) summary.

iii) Consideration for children's development stages

By considering children's development stages, the learning content can focus more on the observation of phenomena in G3, qualitative comparison of phenomena in G4-5 and

[14] The DoE strongly requested the use of materials of PNG in textbooks, because teachers and students in the country should be familiar with and enjoy using textbooks as the first national ones.

quantitative comparison and analysis of phenomena in G5-6. Thus, scientific thinking skills can be strengthened step by step.

iv) User-friendly textbooks and teacher's manuals

The textbooks use many photographs and illustrations to foster the attitude of evidence-based learning through the observation of natural phenomena, help students understand that content comes from not only reading sentences but also looking at visuals, which can prevent misunderstandings due to a lack of language skills, and encourage students to love science. The safety instructions are described in the teachers' manuals because some experiments could pose risks to students.

v) Teaching materials and apparatuses for science experiments

The textbooks and teachers' manuals describe experiments that can be conducted using materials available in PNG. However, some experiments using basic science apparatuses must be taught to foster problem-solving and scientific thinking skills. The Project suggests that the DoE procure and distribute at least the minimally required science apparatuses to each school.

vi) Considering the diversity of students (Advanced and supplementary content)

The textbooks and teachers' manuals are developed to encourage teachers to cover various interests according to the different learning levels of students. The motivation and deep understanding of science are enhanced with the provision of interesting science stories from PNG and around the world, such as a map of where animals live in PNG and science columns in the textbooks.

3) Deciding the specifications of the textbooks and teacher's materials

The Project experts discussed with their C/Ps the specifications of the textbooks and teacher's manuals include layout, size, and types of papers and referred to Japanese textbooks as examples. The C/Ps determined the common components of teacher's manuals for mathematics and science, such as lesson objectives, viewpoints on assessment, lesson flows, and examples of blackboard writing. The appropriate C/Ps discussed the details of the necessary content, structure and understanding of the textbook development for each subject. The outlines of the specifications for each textbook and teacher's manual are shown in the table below.

Table II-14. Specifications of textbooks and teacher's materials

	Mathematics	Science
Textbooks	Numbers of pages change in each lesson. Lessons of the problem-solving approach apply flow of 'Task', 'Ideas from children', 'Summary', and 'Exercise'. One or two pages of exercises are included at the end of each unit.	Each lesson consists of two-sided two pages.[15] 'Title', 'Key questions', and 'Reacher activities' are in the 1st page. 'Results', 'Summary', and 'Try it/Challenge' are in the 2nd page.
Teacher's manuals	Each lesson consists of spread two pages. 'Lesson Flow' and 'Blackboard Plan' are in the right page. Other contents are in the left page. The following are the contents of each lesson. ① Unit objectives (only first page of unit) ② Sub unit objectives (only first page of sub unit) ③ Lesson objectives ④ Prior knowledge ⑤ Preparation ⑥ Assessment ⑦ Teacher's Note ⑧ Lesson Flow ⑨ Black Board Plan ⑩ Copy of textbook pages with answers and points of instruction	Each lesson consists of spread two pages. Copy of textbook pages is in the middle. 'Lesson flow' is on both sides. 'Blackboard Plan' is on the right side, other contents on the left side. The following are the contents of each lesson. ① Unit objectives (only first page of unit) ② Sub unit objectives (only first page of sub unit) ③ Sequence of contents (only first page of unit) ④ Preparation ⑤ Lesson objectives ⑥ Assessment ⑦ Teacher's Note ⑧ Lesson Flow ⑨ Black Board Plan ⑩ Copy of textbook pages

4) Steps of textbook development

The working groups for each subject discussed and established their workflow for textbook development. The details of the steps of the textbook development for each subject are as follows.

<Mathematics>

1) The Japanese experts lectured on the subject's content to the TBWs.
2) The TBWs developed draft textbooks and teachers' manuals on the allocated lessons.

[15] At the beginning, two facing pages were the layout for a lesson. However, during the pilot lessons, children were seen reading the results and summary of research activities from the beginning of the lesson, and they did not predict the results of activities properly. Thus, the layout of a lesson was changed.

3) The Japanese experts checked the draft textbooks and teachers' manuals and instructed the TBWs on how to modify them.
4) The TBWs modified the drafts and resubmitted them to the Japanese experts.

<Science>

The Japanese Science Subject Specialists mainly drafted the textbooks because subject-specific knowledge was needed to secure scientific accuracy. The TBWs mainly drafted the teachers' manuals because the appropriate expressions and teaching methods were needed to reflect the development stages of children in PNG. The drafted textbooks and teachers' manuals were reviewed by both groups, which improved the quality. The steps are as follows.

1) The Japanese experts drafted the content of each lesson.[16]
2) The TBWs reviewed the draft textbooks and developed the teacher's manuals and exercises.
3) The Japanese experts reviewed the teacher's manuals and exercises.

【2-2】Analyse curricula and develop a structure of contents/units to teach (March–December 2016)

The DoE's development of NCSF, syllabi and teacher's guides was delayed, and so the Project developed the textbooks and teacher's manuals simultaneously. Normally, a curriculum framework is formed first, and then syllabi are developed in line with the framework. Finally, textbooks are developed to maintain consistency among them. The inconsistency of the content among these texts was a concern at the beginning. However, in the end, the Project was able to develop consistent curriculum and materials effectively[17] by maintaining close communication with the CDD and Japanese experts, who were able to exchange input about concrete learning content. The concrete process for analysing the curriculum in each subject is described below.

<Mathematics>

First, the Japanese experts analysed the content of the draft NCSF and syllabi for the lower primary classes (G3-5) and developed the draft units and sub-units for each grade. Then, the unit structure of the textbooks and teacher's manuals for each grade were revised in a workshop for the Mathematics WG. The necessary periods for each unit were set as tentative and to be finalised after the validation process at the pilot schools. The syllabi for the lower primary grades were not finalised as described above, because the content of the textbooks needs to reflect the situation of PNG while also reaching global standards.

As described in the section on the fundamental concepts of textbook development, the learning content of mathematics is systematic and has strong continuity. Learning new content is based on

[16] The drafts were reviewed among Science Subject Specialists.
[17] Note: It requires superior project management abilities and trust with C/Ps. If there is miscommunication, a step must be repeated, and schedule management is difficult. Curriculum frameworks and syllabi of other subjects were not completed because of lack of concrete learning contents.

prior knowledge. Therefore, the Mathematics Working Group reached an agreement to involve certain review periods of content from G1 and G2 as prior knowledge in the G3 textbook.

One period of G3 and G4 is 30 minutes, and that of G5 and G6 is 40 minutes in mathematics. Regarding G3 and G4, some lessons apply a problem-solving approach, which requires more time. For instance, the first lesson in the unit or sub-unit was set as a 60-minute double periods lesson. Other lessons were set as 30-minute single period lessons. Regarding G5 and G6, all lessons were set as 40-minute single periods. The number of lessons in each grade is described in the table below.

Table II-15. Number of lessons in Mathematics

Grade	G3	G4	G5	G6
Number of lessons	141	144	139	117[18]

<Science>

Unlike mathematics, there is no global standard curriculum for science. The contents of science is more specific to geographical region. The science curriculum in Japan does not apply directly to PNG, especially with regard to biology and earth science. At the beginning of the Project, the curriculum for PNG was incomplete, and there were no detailed documents to guide the development of textbooks according to 'fundamental concepts' as formed in Activity 2-1. Therefore, the Project began by supporting the CDD curriculum officers in their development of a curriculum and syllabus for science. The Japanese experts and curriculum officers listed the learning content on slips of paper, examined the areas, scopes and sequences of the learning content and re-arranged the order after taking into consideration the relationships within each grade and among the grades and subjects, duplication and continuity of learning content and developmental stages of learners. The Project also compared and analysed the syllabi of countries that are highly ranked in international academic performance research, such as the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMMS). Then, the Project summarised the common areas of study and sequences of content from around the world.

The Japanese experts simultaneously joined the discussion on forming the curriculum framework and confirmed the concept of scholastic ability in PNG, subject objectives and lesson periods for each grade. Just as in mathematics, one period of G3 and G4 is 30 minutes and that of G5 and G6 is 40 minutes in science. One of the key concepts of science education is problem-solving. It requires enough time for students to engage in research activities, and experiments require time for preparation and cleaning up afterwards. The Science Working Group agreed to develop

[18] The number of lessons in Grade 6 is reduced by about 20 periods from Grade 5, because more periods for review and exercises are required to make students master the contents in Grade 6, which are more difficult than Grade 5 and require more time to teach.

learning content so that all lessons had double periods in all grades, and they adjusted the allocation of lessons in each grade, as follows.

Table II-16. Number of lessons in science

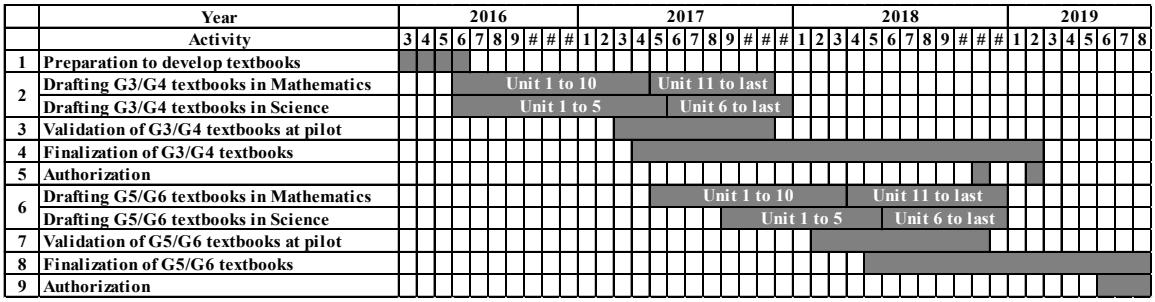
Grade	G3	G4	G5	G6
Number of lessons	94	97	89	79[19]

As described above, the Project considered many aspects, continually discussed the learning content for each unit, and made adjustments to the curriculum as a whole. As a result, the science curriculum at the lower primary level was developed. The overall curriculum is consistent from the elementary level to the secondary level, and it meets global standards. The results of the science curriculum analysis were shared with stakeholders from the DoE at the workshop on textbook development for primary education. The curriculum analysis methods with slips of paper were also applied to the development of curriculum for other subjects. The C/Ps who mastered the method for this activity provided leadership at the CDD.

【2-3】Draft the Textbooks of Grade 3 to 6 (July 2016 to August 2018)

After considering the schedule for the validation process at pilot schools, textbook development began with Grade 3. The drafting of the textbooks and teacher's manuals was conducted as described in the schedule below.

Table II-17. Schedule from writing textbooks and teacher's manuals to their authorization



The drafting steps of each subject are as follows.

<Mathematics>

Based on Japanese textbooks and teacher's manuals, the first drafts of the PNG textbooks and teacher's manuals were developed in the following steps.

① Japanese expert advice for the C/Ps

At the beginning of the Project, the Japanese experts lectured the C/Ps on how to improve the subject knowledge and teaching skills of the TBWs and curriculum officers. They used the English version of the Japanese textbooks every Tuesday and Thursday. However, this process

[19] Just as in mathematics, the number of lessons in Grade 6 was reduced from Grade 5 to make students master the contents properly.

began to delay the development of the first draft. Therefore, after half a year, the Japanese experts changed the system so that they could directly advise and give input to the C/Ps who were in charge of each lesson.

② Review and modification of textbooks by Gakko-Tosho
The C/Ps and Japanese experts reviewed textbooks by Gakko-Tosho,[20] discussed and determined the content, including the English expressions, photographs, and illustrations that needed to be changed, deleted, or added. The photographs to be used were taken several times in collaboration with the pilot schools. The illustrations were drawn by a CDD designer.

③ Writing explanations for textbook content in the teacher's manuals
Explanations, such as exercise answers, types, and intentions, were added to the content of the draft textbooks.

④ Writing other parts of the teacher's manuals
Lesson objectives, prior knowledge, preparation, assessment, lesson flows, and blackboard plans were developed.

<Science>

Science in PNG has three strands: life, physical science, and earth and space. The Project allocated two TBWs to each strand. The Project also developed textbooks and teacher's manuals simultaneously to complete the tasks effectively within the limited Project timeframe.

① Expert review of the learning content and drafting of the textbooks
Based on the results of the curriculum analysis, the Japanese experts studied the learning content and drafted the textbooks. After starting the content study, they found several errors in the draft science syllabi. At that time, the Project discussed with the curriculum officers of science and coordinated adjustments in the content of the syllabi and textbooks so that they would be consistent with each other.
There was limited information with which to study the natural environment of PNG, such as pictorial books and the available apparatuses for experiments and observation. Therefore, 'Study materials', including the rehearsal of experiments, took more time, and textbook development was more difficult than anticipated. However, the three science subject specialists had extensive experience working in developing countries, which they used to complete the draft textbooks and covered all strands.

② Collection of photographs and illustrations
The fundamental concepts encourage the use of PNG materials and nature as much as possible in textbooks. Therefore, many new photographs and illustrations needed to be collected. The experts reviewed the draft textbooks and categorised the photographs and illustrations as: 1) Need to be taken or drawn, 2) Can be provided by Gakko-Tosho, or 3) Need to be purchased. The Project also requested that related parties in PNG and Japan Overseas Cooperation Volunteers (JOCV) ask for photographs of PNG. Seasonal and regional photographs were

[20] Gakko-Tosho is a Japanese textbook publishing firm that joined the Project as a member of the expert team. The firm granted the Project a permission to use the textbooks and teacher's manuals to which it has copyrights.

planned to be taken according to a schedule, and CDD designers were asked to draw the illustrations.

③ TBW Study of Lesson Flow and drafting of teacher's manuals

As textbooks were drafted, the TBWs drafted the teacher's manuals, following a fixed format. In the beginning, the TBWs did not understand the concept of a teacher's manual. They did not have enough experience in developing that type of material. Therefore, the Japanese experts continuously trained them in workshops and tried to improve their knowledge and skills in developing teacher's manuals and science lessons. The Japanese experts also supported and advised individual TBWs to improve their writing skills.

Activities for Output 3: The Textbooks and Teachers Manuals are qualified through quality assurance processes

Figure II-2 summarises the activities related to Output 3. The detailed activities and experiences of Mathematics and Science are described separately as necessary.

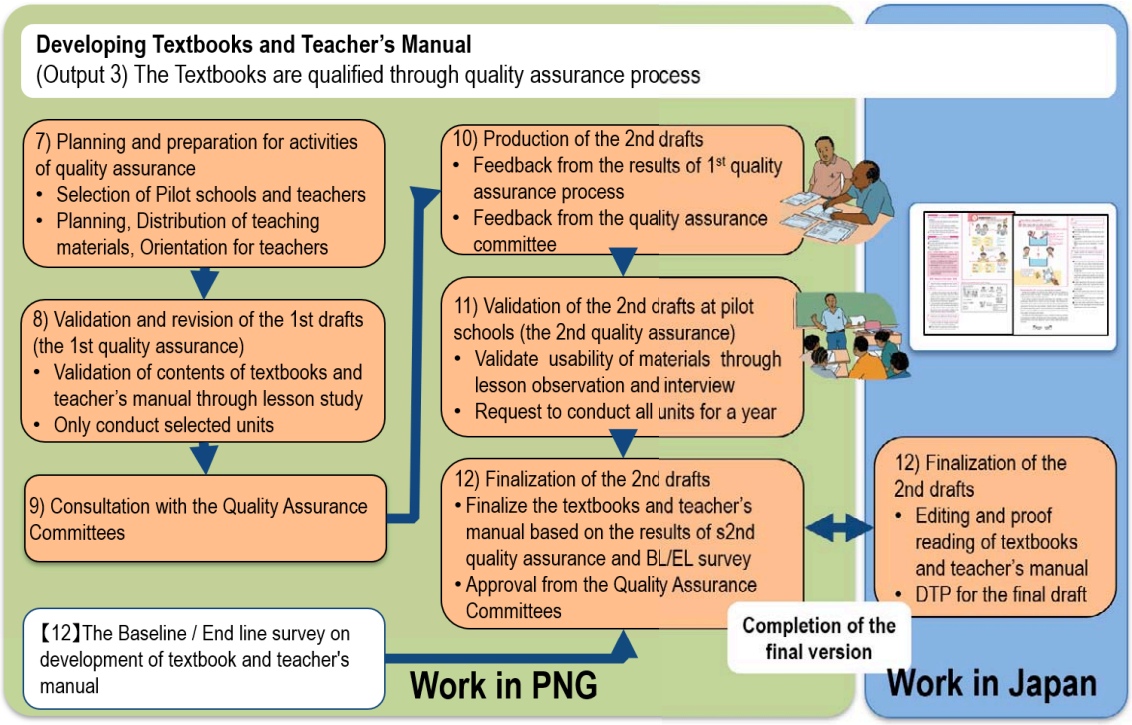


Figure II-2. Procedure of finalization of textbooks and teacher's manuals

【3-1】Select and appoint pilot schools[21] and teachers. (July 2016, December 2016 to Mach 2017, January 2018)

The Project and the Steering Committee discussed and decided on the processes for selecting pilot schools. The pilot schools were selected from the NCD and Central province near Port Moresby

[21] 10 schools near NCD and central province

in accessible, safe areas so that regular visits every month would be easier. The specific schools were selected in a discussion with Provincial Education Advisors. Ultimately, ten schools were selected. A meeting with the pilot school head teachers was conducted, and pilot teachers and classes were selected in February 2017, which was when the quality assurance stage began. After that, the pilot schools and teachers who showed lower motivation were omitted in 2018.

【3-2】Obtain feedback from teachers on the first drafts (first quality assurance) (August 2016 to August 2018)

Experts checked all the content in the first draft of the textbooks and teacher's manuals that were developed by the Mathematics and Science WGs. In addition, the Mathematics and Science WGs selected one lesson from each unit in the first draft of the textbooks and teacher's manuals and had a microteaching[22] session together to validate the content. Moreover, the Science WG conducted actual experiments as much as possible to validate the science content so that they could revise the textbooks and teacher's manuals accordingly.

【3-3】Revise the first drafts based on the feedback from the first quality assurance (August 2016 to August 2018)

The Mathematics and Science WGs revised the first drafts of the textbooks and teacher's manuals based on the issues identified in the activities above.

<Mathematics>

① Confirmation and Revision of Content by the Japanese Experts

The Japanese experts confirmed the drafts that were developed by the TBWs and revised them as necessary. At first, the Japanese experts pointed out issues to be revised, the TBWs revised them, and then the experts confirmed the drafts again. However, because the development was delayed, a different method was eventually followed so that either the Japanese experts and TBWs could revise together or the experts alone could revise, and the TBWs could confirm the changes.

② Development of Textbook and Teacher's Manual Data

At first, the experts generated data for the textbooks and teacher's manuals using in-design (DTP software). However, in the latter half of the Project, the experts instructed the C/Ps on how to use the in-design software. Then, the experts and C/Ps generated the data for the textbooks and teacher's manuals together for the development of G5 and G6.

<Science>

① Reviewing each other's work

The TBWs and experts reviewed the drafts of the textbooks and teacher's manuals that were made by each other. The experts drafted the textbooks, and the TBWs reviewed them; they wrote the

[22] The TBW in charge of writing a respective lesson played the role of teacher and the other TBWs played the role of students and conducted a short model lesson to validate the flow and relevance of the lesson.

teacher's manuals, and the experts reviewed them. The experts and TBWs reviewed and confirmed the feedback and revised their drafts based on it. Moreover, the experts reviewed each other's work as well and confirmed the content repeatedly. The issues that were identified by conducting the experiments played an important role in the revision of the content of the textbooks and teachers' manuals.

② Development of Textbook and Teacher's Manual Data

Complicated figures and illustrations are needed to show how to make observations of science experiments. Therefore, the first draft was developed using Word (documentation software), and the final data were developed with in-design by the editing team.

【3-4】Examine the second drafts through continuous try-outs of lessons at pilot schools (Secondary quality assurance) (February 2017 to November 2018)

The secondary quality assurance of textbooks and teachers' manuals was conducted by pilot teachers from each grade, TBWs, curriculum officers, and experts together. The pilot teachers at the pilot schools conducted lessons with the second draft of the textbooks and teacher's manuals for G3 and G4 from the end of February to the end of November 2017 and for G5 and G6 from February through November 2018. The Mathematics and Science WGs visited the pilot schools during the periods above and validated the content. Details are listed below.

【3-5】Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (Secondary quality assurance) (February 2017 to November 2018)

<In 2017 (G3 and G4) >

Regarding the quality assurance of G3 and G4, the Mathematics and Science WGs monitored the lessons of the pilot teachers from all pilot schools for seven days each, six times between March and November 2017, as the schedule below shows.

Table II-18. Schedule for lesson observation at pilot school

Mathematics and Science Joint Monitoring
1st: 3–21 March 2017
2nd: 24 April–3 May 2017
3rd: 24 May 24–2 June 2017
4th: 26 July 26–2 August 2017
5th: 1–11 October 2017
6th: 21–28 November 2017

The observation sheets that were developed in Output 4 were used for initial lesson observations. After the C/Ps understood the point of the lesson observations, then their ideas for revisions were written directly in the textbooks and teacher's manuals. The C/Ps and pilot teachers discussed

things to be revised after the lesson observations. Photos were taken of all the blackboard plans during the observed lessons, and they were used to revise the teachers' manuals.

As the quality assurance at the pilot schools progressed, workshops on quality assurance feedback were held a total of six times, and all pilot teachers were regularly invited to attend. The workshop participants discussed the records of the pilot teachers' lessons as documented in the lesson observation sheets and records of the regular monitoring of the Project. All lessons were validated, and the necessary revisions reflected in the teaching manuals. However, some lessons were not validated properly owing to the following problems. Several pilot teachers made mistakes in teaching because of their limited understanding of the content. There were also misprints in the textbooks and teacher's manuals, which hindered the quality assurance of lessons from always going smoothly.

The issues that derived from the ability of the pilot teachers were highlighted more than the issues with the textbooks and teachers' manuals in the monitoring of 2017. The issues regarding teaching methods were as stated above. Several problems arose at the beginning of the quality assurance period; for example, many pilot teachers did not read the teacher's manuals in advance and conducted their lessons according to their own methods, only using the textbooks.[23] In addition, after asking questions to their students in many of the lessons, the pilot teachers stopped explaining when a student presented the right answer. They did not explain the reasons for the mistakes or other solutions. As countermeasures to these problems, microteaching workshops on quality assurance were conducted for a week. They validated the remaining 30 lessons in G3 and G4 until the end of November 2017. The relevance of the 30 lessons was validated through microteaching. The pilot teachers and WG members role-played as teachers and students, respectively.

Table II-19. List of workshops on the secondary quality assurance for G 3 and G4

Workshop Outline	Schedule in 2017
Workshop on Quality Assurance Feedback Place: 1 day per grade (Mathematics and Science together)	1st: 23–24 March 2nd: 4–5 May 3rd: 1–2 June 4th: 3–4 August 5th: 12–13 October 6th: 28–29 November
Microteaching Workshop on Quality Assurance	10–16 December

[23] In some cases, because pilot teachers were teaching completely wrong contents, the experts told them to stop the lessons and conducted follow-up lessons for the students.

<In 2018 (G5 and G6) >

Because the DoE prepared the C/P budget for the Project, the secondary quality assurance for the textbooks and teacher's manuals in 2018 was conducted on the same content from the quality assurance workshop that used microteaching in December 2017, as the schedule below shows. In 2018, only half of the lessons for G3 and G4 were monitored; however, all lessons were validated for G5 and G6 in the microteaching workshops.

Table II-20. List of workshop on the secondary quality assurance for G 5 and G6

Workshop Outline	Mathematics in 2018	Science in 2018
Microteaching Workshop on Quality Assurance	1st: 7–14 April 2nd: 27 May 27–1 June 3rd: 18–24 June 4th: 19–24 August	1st: 7–14 April 2nd: 18–24 June 3rd: 16–22 September

The actual steps of the microteaching workshops on quality assurance are as follows. First, the textbooks and teachers' manuals are distributed. Then, lessons are decided for the pilot teachers, followed by the teachers' preparation for the lessons the night before the workshop. On the day of the workshop, the lessons are taught to participants who play the role of students and discuss things to be revised in the textbooks and teachers' manuals after the lessons. This process enabled the TBWs to confirm the flow of each lesson directly, revise misprints in the textbooks and teacher's manuals, reflect frequent mistakes by the teachers in the teachers' notes and develop practical blackboard plans based on actual blackboard plans. Almost all the revisions related to the content were completed at this stage. Therefore, only minor revisions to the content were needed for the finalisation, which needed to happen before the final proofreading, editing and composition. It was completed ahead of schedule, which was useful because the development of illustrations, editing and composition required a large amount of time. In addition, the pilot teachers were able to confirm the accuracy of their subject knowledge and expected teaching methods with the TBWs and experts after the microteaching lessons, which effectively acted as in-service teacher training. The pilot teachers were ready to properly conduct lessons for quality assurance, and the reliability of achievement measurement with monitoring and end-line surveys also increased.

Many of the reasons why the quality assurance did not succeed at first were attributed to the pilot teachers' low level of practical skills. For example, triangle rulers, compasses and protractors were not used properly during the unit on diagrams in mathematics. Many teachers could not read the scales for measuring cylinders during science lessons. Some teachers had difficulty reading figures, tables and graphs. Therefore, the pilot teachers were (re)trained on practical skills during the workshops on quality assurance. Teaching and method skills were written in the teacher's manuals as much as possible, though it was difficult for the teacher's manuals to cover all of the skills that were lacking. Therefore, it was planned that quality assurance through microteaching

would happen before the pilot school phase of quality assurance.

【3-6】 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5 (April 2017 to October 2019)

The Mathematics and Science WGs finally confirmed and revised the textbooks and teacher's manuals under the supervision of the experts. They confirmed all lessons and content and revised them as necessary. The revisions took place during individual consultations, in-house workshops, and one-week intensive workshops.[24] Curriculum officers attended the intensive workshops at any cost, despite being very busy with their routine work.

Table II-21. List of workshops on the finalization textbooks and teacher's manuals

Workshop Outline	G3 and G4 Mathematics and Science in 2018	G5 and G6 Mathematics and Science in 2019
Dates	1st: 8–14 July 2nd: 23–29 September 3rd: 14–20 October	1st: 30 June 30–14 July 2nd: 11–24 August 3rd: 18 September–2 October 4th: 17–26 October 5th: 9- 17 November

The issues that deserve mention from each subject are as follows.

<Mathematics>

The TBWs and experts confirmed the ways to write about lesson flows and consistency in the terminology and between unit purposes and syllabi. They also read all the revised drafts and further revised minor mistakes again and again. They made sure the descriptions of lesson flows made sense. They checked that tasks to be done, teachers' questions and students' expected reactions flowed naturally so that teachers could understand the expected flow of each lesson.

<Science>

The TBWs and experts reviewed each other's work. For example, the TBWs reviewed the second drafts, which were originally revised by the experts, based on the results of the quality assurance. Then, the experts considered the TBWs' feedback and revised the texts again. Likewise, the experts reviewed the second drafts that had been revised by the TBWs, and then, the TBWs confirmed the experts' feedback and revised the texts accordingly. Ultimately, the mathematics layouts were similar to those that had been used originally. However, science textbooks are structured according to the processes of exploring activities (lesson flows). Therefore, comments were given to make it easier to contrast the textbook content with the lesson flows. The layouts changed according to the findings from the secondary quality assurance.

[24] The C/Ps stayed at a hotel for a week and worked on the workshops until late hours at night.

【3-7】Edit and proofread them for completion (July 2017 to November2019)

Activities for editing and proofreading

The final draft of the data for each unit was completed and sent to the editing team, which was composed of the experts who oversaw textbook development and the C/Ps who oversaw editing. Together, they proofread, edited, and composed (DTP work) the texts. The editing team confirmed the volumes, orders, photos, illustrations, and misprints, and gave feedback to the TBWs when issues were identified. Regarding the designs (colours and fonts) of the textbooks and teachers' manuals, a Japanese designer made several drafts, and the final decision was made in discussion with the C/Ps.

A proper balance was considered so that the illustrations and photos were selected from each area in PNG. Fairness was sought with regard to cultures and ethnicities that differ from one area to another. Photos that had species that are distinct to PNG and showed rural environments were included. They were provided by a JICA environmental protection project, Japan Overseas Cooperation Volunteers (JOCV) who oversaw mathematics and science, Non-Governmental Organisations (NGOs), and photographers living in PNG. Moreover, a gender balance was also sought for the characters portrayed in the textbooks.

As stated earlier, although the experts alone used the DTP software, in the beginning, for mathematics, they were able to transfer their skills to the TBWs. In the end, the designer, TBWs and experts were able to divide the work beginning in September 2017. The TBWs were able to make simple revisions after the Project ended. Because the TBWs and CDD officials who oversaw editing were very capable of proofreading in English, it became easier for the teachers and students in PNG to understand English.

Activities for approval processes

After the completion of the editing and proofreading, the DoE conducted its approval processes. First, the Curriculum Panel at the DoE checked all the pages of the final drafts of the textbooks and teacher's manuals and indicated places for modifications. The Curriculum Panel focused on the accuracy of the editing and proofreading. The main modification points concerned whether the content followed the syllabus, the accuracy of the descriptions, the appropriateness of the vocabulary and sentences for the target grade, misspellings, the consistency in the wording, the accuracy of symbols, the appropriateness of the photographs and illustrations, and the appropriateness of the page arrangements. The details of the textbooks and teacher's manuals were checked. The Mathematics and Science WGs modified the materials according to the instructions from the Curriculum Panel and resubmitted them. This process occurred several times, and the final approval was given at the end. The points of modifications were summarised, and the proofreading was complete. As a result, the ability of the C/Ps to proofread improved.

The Curriculum Panel's approval process was not efficient for Grades 3 and 4. While the drafts of the textbooks and teacher's manuals were confirmed in advance, all the proofreading and

detailed check-ups were conducted on the final draft. To resolve this inefficiency, members of the Curriculum Panel were invited to the finalisation workshops on the materials four times, and they confirmed the content in advance. The Curriculum Panel members were able to instruct the points of modification in advance and confirm the materials for Grades 5 and 6 more efficiently.

Change in the Curriculum Panel

The function of the Curriculum Panel is to keep the high quality of materials developed by the CDD such as syllabus and teacher's guides, but discussions in the panel were not very active before 2017. However, after the curriculum director of the CDD, with the support of JICA, studied in the master's degree programme of Naruto University of Education in Japan, he started revising the function of the Curriculum Panel in April 2017. The managers and senior officers of the CDD joined as the members of the Curriculum Panel, and they started the serious discussion to maintain the quality of materials high.

The Curriculum Panel checked the textbooks and teacher's manuals of the QUIS-ME project several times, and accumulated experiences in proofreading and revisions. For example, to approve a textbook, the Curriculum Panel took five days to check a draft and then spent three days to approve the revised version.

The approval process took more time than expected for the Project, but it contributed significantly to organizational strengthening of the DoE as the quality of the Curriculum Panel improved. The C/Ps who attended the meetings above also improved their skills on presentation and modification of textbooks. Thus, it was a good opportunity of capacity building for textbook development.

The textbooks and teacher's manuals that were approved by the Curriculum Panel were submitted to the Subject Advisory Committee. They were given to the Board of Study for final approval. The final approval of the textbooks and teacher's manuals by the Subject Advisory Committee was obtained in October 2018 for Grades 3 and 4 and in November 2019 for Grades 5 and 6. The final approval of the textbooks and teacher's manuals by the Board of Study was obtained in May 2019 for Grades 3 and 4 and in November 2019 for Grades 5 and 6.

Table II-22. Meetings for the approval of textbooks and teacher's manuals

Meeting type	Grade 3 and 4 (Mathematics and Science)	Grade 5 and 6 (Mathematics and Science)
Curriculum Panel	April 2017 June 2018 September 2018 January 2019 February 2019 April 2019 (Both Mathematics and Science)	June 2019 (Math) July 2019 (Math) August 2019 (Math) September 2019 (Science) October 2019 (Math/Science) November 2019 (Math/Science)

Subject Advisory Committee	October 2018	November 2019
Board of Study	May 2019	November 2019

【3-8】Conduct baseline and end-line surveys including the pilot schools at appropriate times (February and November 2017, February 2018, and February to March 2019)

Regarding the Baseline (BL) and End-line (EL) surveys, the Project conducted the first survey for G3 and G4 in 2017 and the second survey for G5 and G6 in 2018. The effectiveness of the new textbooks and teacher's manuals was confirmed by observing the Before/After and With/Without comparison results as part of the BL/EL surveys. The Project also conducted a conscious survey of the current conditions and awareness of mathematics among target teachers and students. Figure II-3 presents an outline of the survey timing and target grades.

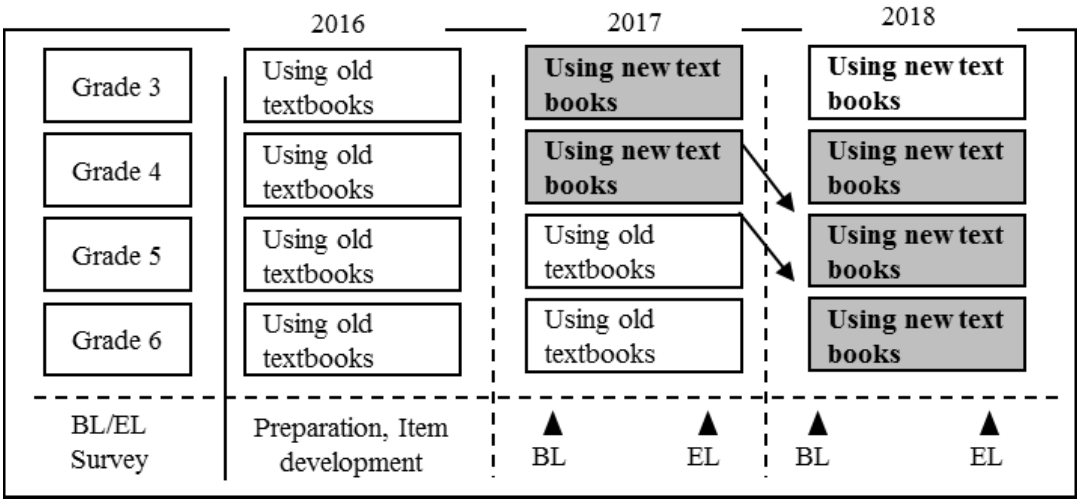


Figure II-3. Usage of new textbooks in plot schools and schedule of BL/EL survey

Ten pilot schools and three non-pilot schools in the NCD and Central province were selected as targets of the survey. The BL survey was conducted before the new textbook drafts were used in the pilot schools, and the EL survey was conducted after they began to be used. Concretely, the BL and EL surveys were conducted in February 2017 and November 2017, respectively, for the first survey. The EL survey was conducted at the end of November 2017 because the implementation of quality assurance lessons at the pilot schools had been delayed. However, many students did not come to school at that time, because it was the end of the semester. Therefore, the number of valid responses was less than that received in the BL survey. In turn, the EL survey was conducted at the beginning of November 2018 for the second survey. Written comprehension tests were used to evaluate target grade content in mathematics and science for the survey. The things that had been learned up to the previous grade were questioned in the BL survey, and content that was newly learned with new textbooks was questioned in the EL survey.

The scores were standardised for comparison because the level of difficulty differed between the BL and EL.

The results of the BL/EL surveys showed positive impacts on academic achievements for students and teachers due to the new textbooks and teacher's manuals. See the overview of the test results in 'Section III-1. Reviews based on the Evaluation Criteria by Development Assistance Committee (DAC), (4) Impact'. In addition, the surveys showed areas for further revision in the new textbooks and teacher's manuals; for instance, some items that the students did not understand were revised.

Output 4: Activities related to "The strategies and plans for the introduction of the Textbooks are formulated"

To introduce and use the textbooks and teacher's manuals at all school levels, all teachers must understand that training on the use of the materials is important. As for the activities involved in Output 4, the Project developed an orientation kit with training materials to help in-service teachers to understand how to use the materials. It was closely related to the activities from Outputs 2 and 3. The outline of activities from Output 4 is indicated in the figure below.

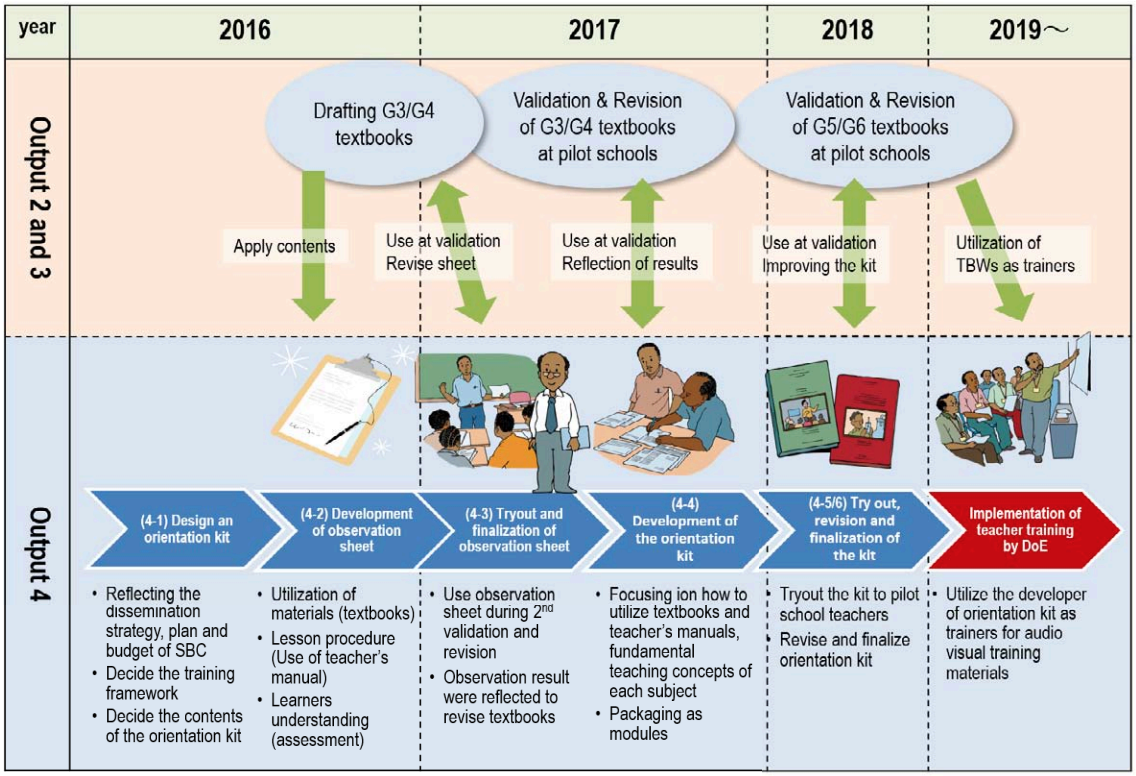


Figure II-4. Outline of the orientation kit development

【4-1】Design an orientation kit with which teachers learn how to use the textbooks in lesson (March and August 2016, revised as necessary)

The training for teachers to learn how to use the textbooks is planned to be led by the DoE along with the developed orientation kit after the Project period ends. To develop the orientation kit, the Project assisted in making the framework and training strategy at the beginning. In consultation with the DoE, the Project experts made detailed plans for the training framework and strategy in the activities of Output 1; they are listed in the section on how 'The strategies and plans for the introduction of the Textbooks are formulated'.

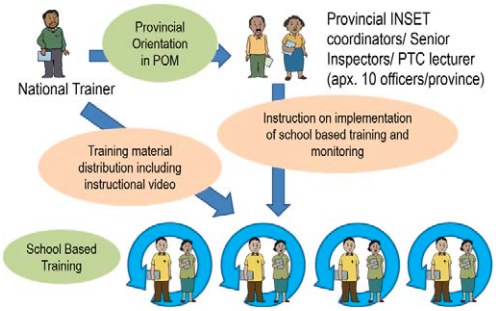


Figure. II-5 Image of training system

Initially, a cascade type of training arrangement was planned in order to reach the 3,500 target schools nationwide. However, the DoE did not allocate a Project local budget in 2016–2017, and JCC members involved in the Project had concerns about the lack of budget set aside for training. The JCC suggested the Project leaders change the training system in 2017. Thus, the training concept was changed from the costly cascade type to a reasonable school-based type.[25] The summary of the training on the introduction of the new textbooks is described below.

Table II-23. Summary of introduction training of new textbooks

Item	Summary
Period	- 3.5 days during NIST[26]/PIST[27] week, or - Continue 7 weeks to conduct half-day training per week at convenient timing
Training approach	School-based training (DoE sends the orientation kit including training video materials to all schools, and Provincial Education Office monitors the training in each school)
Purpose	1. Trainees understand contents of textbooks and teacher's manuals 2. Trainees can plan, implement and assess lessons appropriately with the use of new textbooks and teacher's manuals
Trainer	Three to four (3-4) trainers at each school (Trainers can use the training video materials to train contents to other teachers)
Trainee	All teachers in the school

【4-2】 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers (November 2016, March 2017)

[25] The DoE wishes to conduct cascade-type training for Trainers of Training (TOT) if a sufficient budget is secured. Current school-based training uses TOT only for self-learning through video materials, which has limits in having trainees master all the training content. If the DoE can implement TOT as cascade training, it is recommended that the DoE hire qualified trainers.
[26] National In-Service Training
[27] Provincial In-Service Training

The Project experts drafted a lesson observation sheet for teachers to check how the textbook was used. They referred to the observation sheet developed in a JICA project for another country and drafted the National Teacher's Standards Framework of PNG. The observation sheet focuses on 'Identifying the points for improvement in the textbooks and teacher's manuals in the validation process'. It does not focus on 'Evaluating the competencies of teachers'. The observation sheet involves 18 observation points, which are categorised into four main criteria: 1) student's learning, 2) appropriate lesson design, 3) teaching methodology and delivery, and 4) teaching materials. Each observation point has a rubric table with ratings by performance indicators on a scale from 1 to 3: (1) good, (2) satisfactory, and (3) needs improvement. The observation sheet contains columns for taking notes on the observation results and comments for improvement in each observation point for the improvement of draft textbooks and teacher's manuals. The explanation of the points listed on the observation sheet and how to use the observation sheet are summarised in a booklet called 'The Guidelines for the Lesson Observation Sheet for Utilising the New Standard-Based Curriculum Textbooks'.

【4-3】Try out the observation sheet in the process of the quality assurance (Activity 3-5), and finalize it (February to March 2017)

During the orientation of pilot teachers on the validation process of the national textbooks and teacher's manuals, the practice to fill in the lesson observation sheet was included. The Project aimed to ask pilot teachers to fill in these sheets after teaching by using the textbooks and teacher's manuals as a part of the feedback process on validation. The submission rate of feedback from pilot teachers through lesson observation sheet was, however, not high because of the complexity of observation points and their habit of reporting on the document itself. For these reasons, the observation sheet was used by only TBWs and curriculum officers for monitoring pilot schools until they fully understood the points of lesson observation. Their records were used for improving the textbooks and teacher's manuals. In addition, the lesson observation sheet which is included in the orientation kit, is a simplified version of those used by C/P. Ordinary teachers use the simplified observation sheets to assess whether the lesson follows the important points in teacher's manuals.

【4-4】Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3 (July 2017 to March 2018)

The Project had developed the orientation kit since late 2017 and is based on the framework which was discussed in activity 4-1 and utilizing feedback and experiences obtained from lesson observation of trials.

The following points were considered for the development of the orientation kit.

1) Various options for training contents

The Project anticipated that some schools may not be able to conduct full scale teacher training for 3.5 days, as described in the training categories A and B in Figure II-25, immediately before the utilisation of textbooks and teacher's manuals. To address this, the contents of the orientation kit were categorised into three types. The first category of the contents, Category A, is 'Must be trained before using textbooks and teacher's manuals', such as how to use textbooks and teacher's manuals. The second category, Category B, is 'Can be trained together with utilisation of textbooks and teacher's manuals in class', such as teaching methodologies of each subject, educational assessment, and planning continuous professional development at school level. The last category, Category C, is TOT. The training program is designed such that training could be provided for the modules of the first category, within half a day. The finalised list of training modules is as follows:

Table II-24. List of training modules

Category	Unit	Period	Modules
Category A: Teacher Training (Quick Start)	1. Introduction of national textbooks and teacher's manuals	0.5 day	1-1. Training Orientation 1-2. Concept of new National Textbooks and Teacher's Manuals 1-3. Features and contents of National Textbooks and Teacher's Manuals (Science) 1-4. Features and contents of National Textbooks and Teacher's Manuals (Mathematics)
Category B: Teacher Training (Full Scale)	2. Standards Based Curriculum and national textbooks	0.5 day	2-1. Standards Based Curriculum and National Textbooks 2-2. Linkage between SBC syllabus and Textbooks in Mathematics and Science
	3. Utilisation of national textbooks and teacher's manuals (Science)	0.5 day	3-1. Lessons design in Teachers Manuals (Science) 3-2. Students way of learning from National Textbooks (Science) 3-3. Teaching methodology and delivery (Science)
		0.5 day	3-4. Preparation of Micro-teaching (Science) 3-5. Practice of lesson through Micro-teaching (Science)
	3. Utilisation of national textbooks and teacher's manuals (Math)	0.5 day	3-6. Lessons design in Teachers Manuals (Mathematics) 3-7. Students way of learning from National textbooks (Mathematics) 3-8. Teaching methodology and delivery (Mathematics)
		0.5 day	3-9. Preparation of Micro-teaching (Mathematics) 3-10. Practice of lesson through Micro-teaching (Mathematics)
	4. Way Forward	0.5 day	4-1. Develop plans for school based training 4-2. Frequently asked questions

Category C: Training of Trainers	5. Orientation for organisers	0.5 day	5-1. Role of Provincial Officers (Only for province) 5-2. Roles of School Trainers (Only for schools by video lesson) 5-3. Course Management (by video lesson)

2) Training linked to the future

During the introductory training of new textbooks, the DoE should introduce not only structure of textbooks and teacher's manuals, but also insist on improving the teachers' ability of teaching lessons, which was observed as a weakness during the lesson observation try-out, by using new textbooks and teacher's manuals. For this reason, the modules in the orientation kit are designed so that the teachers can learn about teaching methodologies, have access to teaching materials, understand the assessment method in each subject, and others. The teachers can practice these points through the lesson micro-teaching as per teacher's manuals, which were also effective in the validation process in Output 3. The training module is designed to provide the continuous opportunity to improve teacher's abilities. At the end of the training, teachers are asked to plan the continuous school-based training by using teacher's manuals.

3) Use of audio visual materials

As described in activity 4-1, TOT may not be conducted because of financial constraints; therefore, the trainers of school-based training need assistance in conducting the training easily. The Project had not only developed printing materials for trainers and trainees but also added training videos as audio visual material. In these videos, national trainers from DoE, developers of each training module, explain and give instructions on their respective module, in the video. PNG has successful experience and environment for using audio visual materials such as TV and DVD compared to other developing countries because of the outcomes of the former JICA EQUITV project. The teachers are expected to understand how to teach with new textbooks and teacher's manuals correctly by observing the video lessons which illustrate how to use new textbooks. The table below shows the composition of the orientation kit.

Figure II-6. Children think the way to compare the areas of triangles (From lesson video)

Table II-25. Composition of orientation kit

Material	Contents	Remarks
Training materials for Trainers	• Lesson plans, slides of each training module • Copy of training materials for participants	To be provided to each school by printing materials (or data in DVD) in 2020

Training materials for Participants	• Text to explain contents of each module • Worksheet, assessment, etc.	10 booklets to be distributed to each school in 2020
Audio visual materials (DVD)	• Data for trainers such as power point slide and video shown in the modules • Video materials of all modules described by national trainers	To be provided to each school

4) Accumulation of knowledge from related divisions

Seven TBWs and four curriculum officers for Science and Mathematics joined for the orientation kit's development. Therefore, the important points of each subject were covered in the training modules and the national textbooks and teacher's manuals were effectively used as training materials. Three officers from TED also joined the working group and the implementation of the training could be conducted smoothly under their supervision. Two officers from ELD contributed to shooting and editing videos for the audio visual materials. In addition, inspectors of NCD and pilot teachers suggested improvements as representatives of the field level.

【4-5】Try out the materials for modification (March 2018)

In March 2018, the Project conducted the training on a trial basis by using the draft orientation kit, and modified the kit based on the findings during the trial. Prior to the trial, the content of the orientation kit was reviewed by all working group members, and the writers of each module trained the pilot teachers. While there are a few points for improvement such as page numbers, design, and user-friendliness, pilot teachers highly evaluated the training contents, materials, and trainers' skills. The questionnaires after the trial also showed that understanding of contents in each module was generally high, except for some differences among trainees.

【4-6】 Finalize the orientation kit including the observation sheet (March 2018 to November 2019)

The finalisation workshop for the orientation kit was conducted in August 2018, and the dissemination working group members modified the orientation kit by incorporating the findings from the try-out and advices from JCC and Steering Committee. The orientation kit was mostly finalised during the workshop by adjusting the order of modules, adding the Index, and Message from Secretary. Then, the proofreading was done by the head of the editing section in CDD, and it was completed in February 2019. The training video materials were developed by using the finalised materials from December 2018 to November 2019.

II-1-4. List of training sessions, seminars, and workshops

Important training sessions, seminars, and workshops conducted by the Project and their participants and timing are listed below.

Table II-26. Major training sessions, seminars, and workshops

	Main activity	Main participants	Participants (Man/Day)	Timing
1	Project kick off & Work Plan meeting	Executives of DoE, TBW, CDD officers	37	Mar. 2016
2	Workshop on "Producing the Best Textbook for PNG"	Math and Science Working Group	106	Mar. -Apr. 2016
3	Curriculum Analysis Workshop	Math and Science WG	64	May–Jun. 2016
4	Textbook development workshop 1	Math and Science WG	113	Jun. – Jul. 2016
5	Strategy development WG Workshop 1	Strategy Development WG	30	Jul. 2016
6	Project introduction seminar for DNPM	Executives of DoE and DNPM	14	Aug. 2016
7	Textbook development workshop 2	Math and Science WG	40	Aug. 2016
8	Strategy development WG Workshops2	Strategy Development WG	9	Aug. 2016
9	Workshop on developing the lesson observation sheet	Dissemination WG	16	Nov. 2016
10	Seminar on Training in Naruto University of Education	TBW, CDD officers	32	Dec. 2016
11	Orientation Meeting for Pilot school Head teachers	Head teachers of pilot schools	22	Feb. 2017
12	Training for Pilot Teachers	Pilot teachers	200	Feb. 2017
13	Textbook Validation Workshop (G3 and G4) 1	Math and Science WG, Pilot teachers	66	Apr. 2017
14	Textbook development workshop 3	Math and Science WG	37	Apr. 2017
15	Monitoring feedback workshop 1	Math and Science WG, Pilot teachers	36	Apr. 2017
16	Textbook Validation Workshop (G3 and G4) 2	Math and Science WG, Pilot teachers	46	May 2017
17	Monitoring feedback workshop 2	Math and Science WG, Pilot teachers	49	May 2017
18	Workshop on developing orientation kit	Math and Science WG, Pilot teachers	9	July 2017
19	Monitoring feedback workshop 3	Math and Science WG, Pilot teachers	17	Aug. 2017
20	Textbook Validation Workshop (G3 and G4) 3	Math and Science WG, Pilot teachers	37	Aug. 2017
21	Monitoring feedback workshop 4	Math and Science WG, Pilot teachers	76	Oct. 2017
22	Textbook Validation Workshop (G3 and G4) 4	Math and Science WG, Pilot teachers	111	Oct. 2017
23	End-line survey workshop	TBW, CDD Officers	34	Nov. 2017

	Main activity	Main participants	Participants (Man/Day)	Timing
24	Textbook Validation Workshop (G3 and G4) 5	Math and Science WG, Pilot teachers	99	Nov. 2017
25	Policy Development Workshop 1	CDD officers	4	Nov. 2017
26	Textbook Validation Workshop (G5 and G6) 1	Math and Science WG, Pilot teachers	225	Dec. 2017
27	Workshop on Lesson Study for STEM[28] Education	TBW, CDD officers	147	Feb 2018
28	Baseline survey workshop	TBW, CDD officers	21	Mar. 2018
29	Pilot training utilizing the draft orientation kit	Dissemination WG, Pilot teachers	185	Mar. 2018
30	Workshop on revising the orientation kit 1	Dissemination WG	24	Mar. 2018
31	Policy Development Workshop 2	CDD officers	7	Mar. 2018
32	Baseline survey feedback workshop	TBW, CDD officers	92	Apr. 2018
33	Textbook Validation Workshop (G5 and G6) 2	Math and Science WG, Pilot teachers	270	Apr. 2018
34	Textbook development workshop 4	Math and Science WG	42	May. 2018
35	Textbook Validation Workshop (G5 and G6) 3	Math and Science WG, Pilot teachers	130	July. 2018
36	Workshop on revising the orientation kit 2	Dissemination WG	160	Aug. 2018
37	Policy Development Workshop 3	CDD officers	9	Aug. 2018
38	Awareness Meeting on Strategies and Plan to introduce national textbooks	Executives of DoE, Strategy Development WG	38	Aug. 2018
39	Textbook Validation Workshop (G5 and G6) 4	Math and Science WG, Pilot teachers	130	Aug. 2018
40	Monitoring feedback workshop 5	Math and Science WG, Pilot teachers	48	Sep. 2018
41	Validation Workshop (G5 and G6) 5	Math and Science WG, Pilot teachers	180	Sep. 2018
42	The Finalization Workshop (G3 and G4) 1	Math and Science WG, Pilot teachers	155	Sep. 2018
43	The Finalization Workshop (G3 and G4) 2	Math and Science WG, Pilot teachers	175	Nov. 2018
44	End-line survey feedback workshop	TBW, CDD officers	92	Nov. 2018
45	End-line survey feedback workshop for teachers	TBW, CDD officers	47	Nov. 2018
46	Policy Development Workshop 4	CDD officers	4	Feb. 2019
47	The Finalization, Editing and Proofreading Workshop (G3 and G4) 1	TBW, CDD officers	21	Mar. 2019

[28] Science, Technology, Engineering and Mathematics

	Main activity	Main participants	Participants (Man/Day)	Timing
48	The Finalization, Editing and Proofreading Workshop (G3 and G4) 2	TBW, CDD officers	78	Apr. 2019
49	The Finalization Workshop (G5 and G6 Science) 1	Science WG	35	May. 2019
50	The Finalization Workshop (G5 and G6 Mathematics) 1	Mathematics WG	9	Jul.2019
51	The Finalization Workshop (G5 and G6 Science) 2	Science WG	25	Jul. 2019
52	The Finalization Workshop (G5 and G6 Math and Science) 1	TBW, CDD officers	280	Jul. 2019
53	The Finalization Workshop (G5 and G6 Math and Science) 2	TBW, CDD officers	266	Aug. 2019
54	The Finalization Workshop (G5 and G6 Math and Science) 3	TBW, CDD officers	280	Sep. 2019
55	The Finalization Workshop (G5 and G6 Math and Science) 4	TBW, CDD officers	250	Oct. 2019
56	The Finalization Workshop (G5 and G6 Math and Science) 5	TBW, CDD officers	165	Nov.2019
Total numbers of participants (Man/Day)			4,894	

II-1-5. List of Project outputs

The Project developed the following documents and books as technical assistance outputs, through the activities mentioned above. These outputs were submitted to JICA and the DoE.

Table II-27. List of Project Outputs

Output	Expected user	Outline
The strategies and plans for the introduction of new textbooks	Executive officers of DoE	The planning documents that summarize the strategies and activities of each division in DoE to disseminate the national textbooks of Science and Mathematics
The national textbooks	Students in primary school (G3 to G6)	2 subjects: Mathematics and Science 4 Grades from G3 to G6 8 books in total
The national teacher's manuals	Teachers in primary school	2 subjects: Mathematics and Science 4 Grades from G3 to G6 8 books in total
The orientation kit	Trainers such as provincial inspectors; Trainers at school	The training material to learn how to use the national textbooks and teacher's manuals. It includes training materials for teachers, trainer's guides, and electronic data of training video.

The work plan, monitoring sheets and the Project completion reports are listed in Annex 2.

II-2. Achievements of the Project

II-2-1 Outputs and indicators

(1) Output 1: The strategies and plans for the introduction of the textbooks are formulated

The results of the activities related to output 1 showed that all its indicators have been achieved.

Table II-28. Achievement of Output 1

Indicator (Achievement level)	Achievement
1-1. The strategies including (a)-(e)[29] specified in Activity 1-2 are submitted. (Achievement Level: 100%)	• In 2016, a draft strategy and plan were formulated and approved at the JCC. • The strategy and plan were revised in 2017 reflecting the new cost estimate of printing and distribution, types of training for using the orientation kit, and lessons learned from training in Japan and Myanmar. • The strategy and plan were revised in the third edition by adding the formulation of the national textbook policy. • In November 2019, they were finalized and approved in the steering committee by reflecting the comments in March 2018 from the steering committee and JCC members such as identifying the activities related to achieve the Overall Goal of the Project and other activities.

(2) Output 2: Drafted Textbooks in line with SBC are completed

The results of the activities related to Output 2 showed that all its indicators have been achieved.

Table II-29. Achievement of Output 2

Indicator (Achievement level)	Achievement
Drafted Textbooks of G3-G6 are completed. (Achievement Level: 100%)	• Annual teaching plans for Mathematics and Science were developed based on the draft syllabi in 2016. • Based on the annual teaching plans, the draft textbooks and teacher's manuals of G3 and G4 were developed between March and October 2017, and those of G5 and G6 were developed between March and October 2018. All of these drafts were submitted to the steering committee.

(3) Output 3: The Textbooks and Teacher's Manuals are qualified through quality assurance processes

The results of the activities related to Output 3 showed that all its indicators have been achieved.

[29] (a) The strategy for the printing and distribution of the Textbooks, (b) The strategy of the teacher education on the Textbook use, (c) The strategy for the introduction of the Textbooks to education colleges, (d) The strategy for the raising of awareness and monitoring on the Textbook use, and (e) The strategy for the reform of assessment tools in line with SBC.

Table II-30. Achievement of Output 3

Indicator (Achievement level)	Achievement
Quality assurance records are complied Feedback from the quality assurance process was reflected in the final drafts. (Achievement Level: 100%)	• The experts and TBWs read the first-draft textbooks intensively, conducted micro-teaching a few times, and revised the textbooks to produce the second-draft versions. • The validation of G3 and G4 at 10 pilot schools was conducted throughout 2017, and that of G5 and G6 was conducted throughout 2018. The feedback from pilot teachers and monitoring results of TBWs was recorded and used for revising textbooks and teacher's manuals. • Since 2018, the 'Validation Workshop', in which pilot teachers validate the lessons in textbooks through micro-teaching, has been conducted. Through the workshop, the pilot teachers gain a deeper understanding of the contents of the textbooks and teacher's manuals to conduct validation and can give feedback more efficiently. • The textbooks and teacher's manuals were checked and revised through the 'textbook finalization workshop'. The curriculum officers and TBWs attended the workshop for a week for Grade 3 and 4 materials and two weeks for Grade 5 and 6 materials. Then, the final drafts were developed based on the records of revision points discussed in the workshop.

(4) Output 4: The orientation kit for teachers to learn how to use the textbooks is developed

The results of the activities related to Output 4 showed that all its indicators have been achieved.

Table II-31. Achievement of Output 4

Indicator (Achievement level)	Achievement
Orientation kit is developed (Achievement Level: 100%)	• From July 2017 to March 2018, the orientation kit was developed in line with the training strategy and plan, lesson observation sheet, draft textbooks, and teacher's manuals. • The orientation kit was tried out through the training to pilot teachers in March 2018 and was revised based on the findings from the trial. It was also revised in line with the comments in the third JCC in March 2019. • Based on the revised kit, training videos were shot and edited from December 2018 to March 2019 to be used during school-based training. • The orientation kit and training videos were finalized by referring the official proof reading by CDD editors and changes of textbooks and teacher's manuals. • In November 2019, the orientation kit was approved by the steering committee for printing.

II-2-2. Achievement of the Project purpose

Project Purpose: NDoE is ready to distribute the Textbooks and Teachers Manuals of Mathematics and Science nationwide.

The Project conducted the activities to submit the drafted textbooks and teacher's manuals to the board of study in DoE, to secure the budget for printing and distribution, and to develop the orientation kit to introduce the national textbooks and teacher's manuals in Science and Mathematics. The Vice Project Director from the DoE and the chief advisor from JICA presented the plans and strategies for the printing and distribution to senior officers of the DoE at the Senior Officers Conference (SEOC) in 2018 and 2019. The indicators were achieved, as described in the table below.

Table II-32. Achievement of the Project Purpose

<table>
<tr><th>Indicator (Achievement level)</th><th>Achievement</th></tr>
<tr><td>1. The Textbooks are submitted for approval.
(Achievement Level: 100%)</td><td>・ Since April 2017, the draft textbooks have been submitted to the curriculum panel of the quality assurance committee in the CDD, and the textbooks and teacher's manuals have been revised based on their comments.
・ Subsequently, the textbooks and teacher's manuals were submitted to the Subject Advisory Committee (SAC) and the Board of Study. The final versions of textbooks and teacher's manuals, in which all the contents are fixed except the design for DTP, have been approved by the above authorities on the following occasions.
<table>
<tr><th>Approval process</th><th>Final version of G3, G4</th><th>Final version of G5, G6</th></tr>
<tr><td>Curriculum panel</td><td>April 2017
June 2018
September 2018
January 2019
February 2019
April 2019
(Both Science and Math were submitted same time)</td><td>June 2019 (Math)
July 2019 (Math)
August 2019 (Math)
September 2019 (Science)
October 2019 (Math/Science)
November 2019 (Math/Science)</td></tr>
<tr><td>SAC</td><td>October 2018</td><td>November 2019</td></tr>
<tr><td>Board of Study</td><td>May 2019</td><td>November 2019</td></tr>
</table>
</td></tr>
<tr><td>2. Budget for printing is secured.
(Achievement Level: 100%)</td><td>• Since August 2016, the Project has continued the advocacy to secure the budget for the DNPM. The Project also has supported the document preparation of the DoE for the required budget.
• The related policy documents, such as the SBC position paper and the strategies and plans for the introduction of the textbooks, specified the necessary budget for printing. By using this information, the Project and the DoE have continued to advocate budgeting for related parties such as DNPM.</td></tr>
</table>

	• The DoE requests for 2019 were approved as '10 million PGK for curriculum development', '5 million PGK for local cost of the QUIS-ME Project', and '2 million PGK for materials development'. These costs are to be budgeted continuously by 2023 as part of the five-year plan in DoE. • The Japanese government plans to support 'Nationwide distribution of the SBC national textbooks and teacher's manuals at primary level' by providing grants as part of economic/ social development plan of PNG. As a result, the budget to print and distribute textbooks to be lent to all students[30] in PNG was secured.
3. Training strategy, programme, and orientation kit are completed. (Achievement Level: 100%)	• A training strategy was developed and described as a section of 'the strategies and plans for the introduction of the textbooks'. • In 2017, as a result of discussions between JICA and the DoE, the training design was discussed and modified from cascade-type training to school-based one. The modification was approved at the 2nd JCC in September 2017 and reflected in the strategy above. • The training program and orientation kits (Module procedure, handout, and PowerPoint presentation) were drafted from July 2017. They were finalized through a validation workshop in March 2018, reflecting comments from stakeholders. The revision was done by March 2019. The Curriculum Panel instructed the Project to finalize the orientation kit by reflecting the changes in textbooks and teacher's manuals that appeared during the approval process in September 2019. The Project followed the instructions and finalized the kit by November 2019. • The cooperation with ELD led to the development of the orientation video.

II-3. History of PDM modification

The PDM has been modified thrice during the Project period. The date of modification and reasons are shown in the table below. The revised versions of the PDM are attached as Annex 5.

Table II-33. History of PDM modification

#	Date	Reason for modification
1	23rd March 2018	• The Project period was extended by 2 months, because it became clear that finalization, editing, and proof reading of textbooks and teacher's manuals in G5 and G6 would take longer than planned, according to the experiences of those tasks in G3 and G4. • To confirm the impact of the new textbooks, the Baseline and End-Line Surveys on development of the textbooks and teachers manuals were added as an activity of Output 3. • Minor modification of terms in line with the organizational changes of the DoE (for example, SD (Standard Division) renamed as ID (Inspection Division)) was done.

[30] The textbooks are returned and kept at school at the end of the year, and same textbooks are to be lent to new students in next year.

2	28th January 2019	• The Project period was extended by 5.5 months. It became clear that the conversion of photographs, diagrams, and illustrations from draft documents (Word file with rough images) to DTP documents (in-design file with final images that solved all copyright issues) of textbooks and teacher's manuals in G5 and G6 would take longer than planned according to the experiences of those tasks in G3 and G4. • The figure of objectively verifiable Indicators in the Overall Goal in PDM was determined in the fourth JCC. As a result, the following figures were suggested for incorporation into the PDM. (1) 84% of the primary schools in PNG have received the textbooks and teacher's manuals. (2) 90% of the teachers in PNG have received the textbooks and teacher's manuals, and have used them for lessons or lesson preparation.
3	28th June 2019	• The Project period was extended by 9 months because DoE requested the Project to add more processes for approval of textbooks and teacher's manuals to check the contents in detail.

II-4. Others

II-4-1. Results of Environmental and Social Considerations

There are no environmental and social considerations because the Project is classified as category C in the consideration area, under the JICA guidelines. The Project does not affect the environment and society in PNG. Thus, no such measures are required.

II-4-2. Results of Considerations on Gender/Peace Building/Poverty Reduction

About half of the C/Ps are women, such as the Vice Project Director, members of the Steering Committee, and the Curriculum Panel and TBWs. The implementation structure of the Project is gender balanced. The Project also considered the cultural and natural diversities in PNG, to be balanced in content and expression. For example, illustrations and photographs of students in textbooks and teacher's manuals are used by boys and girls, which were arranged to be gender balanced. No activity was conducted related to Peace Building/Poverty Reduction.

II-4-3. Other matters related to the Project

The matters related to the Project, such as other JICA projects, activities of C/Ps, donors, private sector, and NGOs are described below.

(1) Country-Focused Training 'Improvement of Quality of Teaching Materials'

The Country-Focused Short-Term and Long-Term Training for Papua New Guinea 'Improvement of Quality of Teaching Materials' is being conducted from 2014 to 2019. From October to December 2016, the C/Ps of the Project, in other words, curriculum officers from CDD and TBWs, were sent to Japan as second-batch trainers to learn from the country's experience in curriculum and textbook revision. They revised some of the textbooks and teacher's manuals based on their training. In May 2017, lecturers from Naruto University of Education visited PNG and revised the textbooks and teacher's manuals in line with the context of PNG along with trainees in the

second batch and other C/Ps. From October to December 2017, the eight C/Ps[31] of the Project visited Japan and undertook training in curriculum and textbook revision.

The collaboration with the country-focused training had positive effects on the Project. The textbooks and teacher's manuals were developed by C/Ps during their training period in Japan, and they could complete the tasks effectively. The professors at Naruto University of Education advised on the points of improvement, which contributed to ensuring the quality of the materials. Three curriculum officers from the CDD were sent as long-term trainers and they obtained their master's degrees from the university. They worked for the Project when they came back to PNG. They studied Mathematics and Science Education in Japan and had contributed significantly to the development and approval of textbooks and teacher's manuals. Specifically, one trainee worked as the curriculum director of the CDD and he showed strong leadership in the Project management.

(2) JICA Education Policy Advisor

From September 2016 to September 2018, the JICA Education Policy Advisor was assigned at the DoE headquarters. The advisor and the QUIS-ME Project have worked closely and supported the tasks of the DoE such as advocacy activities to secure the budget for printing and distribution of textbooks, teacher training, and introducing Global Partnership for Education (GPE) Fund to the DoE. For the approval of PNG's operation costs for 2019, the JICA Education Policy Advisor coordinated with the DoE and helped them submit budget proposal documents. Afterwards, the JICA advisor in DNPM and the Department of Treasury also assisted in the approval process.

(3) Japan Overseas Cooperation Volunteers (JOCVs) and other JICA projects

Using photographs of the natural environment and living things in PNG is necessary for teaching materials, especially in Science textbooks. The Project collected such photographs. However, the JOCVs, who serve as Science and Mathematics teachers, were also asked to provide photographs taken by them. The JICA Project for Biodiversity Conservation, through Implementation of the PNG Policy on Protected Areas, also provided several such photographs. The JICA Capacity Development Project for Operationalization of PNG Forest Resource Information Management System for Addressing Climate Change provided the map of the forest areas in PNG, which is used as a textbook column. This has increased the comprehensiveness and efficiency of the collection of photographs from various geographical areas.

(4) Treid Pacific

Treid Pacific is a PNG resource materials provider and printing firm that the DoE contracted to provide the development and printing services for Mathematics, Science, and English textbooks of primary schools, as a tentative measure to support schools until the QUIS-ME Project textbooks are distributed. The DoE regards these textbooks as tentative, and they will become the schools'

[31] Three curriculum officers whose conduct was found problematic were replaced.

supplementary resource materials when QUIS-ME textbooks are distributed. The DoE plans to issue a letter to explain these things to schools through a secretary circular.

However, as the Treid Pacific textbooks were developed in 2018 within a short period, they are not fully consistent with the SBC and have some incorrect descriptions. These textbooks do not have teacher's manuals. Thus, the DoE requested revision of the textbooks, and Treid Pacific requested the cost for the validation and revision. However, the contract did not include this cost. Therefore, the textbooks developed by Tried Pacific are not approved and the DoE plans to stop the distribution.

III. Results of Joint Review

III-1. Results of Review based on DAC Evaluation Criteria

(1) Relevance: Fairly High

With respect to the consistency with the developmental policy of PNG, the government is developing syllabi, teacher's guides, and textbooks for SBC, and the Project has helped the government develop teacher's manuals and textbooks for G3-G6 Mathematics and Science. In the section 'Learning', the National Education Plan 2015–2019, describes the strategy for the production of syllabi, teacher's guides, and learning materials for students. The Universal Basic Education Plan 2010–2019 also refers to the 'Provision of education materials to all elementary and primary levels' as an important action in the section 'Quality of Education Improved'. The draft of the NCSF also states that Mathematics, Science, and English are priority subjects for the introduction of the SBC. In addition, the SBC position paper, issued by the DoE in June 2017, clearly identifies the position of national textbooks and the strategies to introduce the SBC, which are in line with 'the strategies and plans for the introduction of the textbooks' formulated by the Project. Therefore, the Project has high relevance for the policy of PNG, as it was at the time of the Project's initiation.

Regarding the policy of Japan, the Project is in line with the Japanese Official Development Assistance (ODA) policy for PNG, which was announced in 2017 and stipulates the 'Improvement of quality basic education' through 'Supporting the development of textbooks in primary education' as one of its priority areas of 'Improving social services'. The Project is consistent with 'Japan's ODA Charter' revised in 2015 in which 'Quality education for all' is one of the important components of the priority policy 'A. Quality growth and poverty eradication through such growth'. The Government of Japan supports the Sustainable Development Goals (SDGs) formally adopted by all United Nations member states in 2015. Goal 4 of the SDGs is to 'Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'. When qualified new textbooks and teacher's manuals developed by the Project are distributed nationwide, equitable quality education for all primary school children in PNG will be promoted. Therefore, the Project has high relevance for the policy of Japan.

Regarding local needs, although the PNG government has been preparing to introduce the SBC, not enough materials are available for students at the school level and many teachers and students are still struggling to adopt SBC's concept in the classroom. Therefore, the schools immediately require proper textbooks and teacher's manuals on the SBC.

Regarding the Project's plans of operation and approach, it has developed textbooks from the G3 and skipped G1 and G2 because at the planning stage of the Project, the DoE had planned to

develop textbooks for the elementary school with the help of a private company in Japan.[32] Relevance could be considered high as an approach at that point. However, development of elementary school's textbooks by the DoE has been delayed, and is still underway, and the development budget has been recently allocated, in 2019. Although G3 to G6 textbooks have been distributed, students could not learn their lessons on time. The QUSI-ME project is designed to develop textbooks from Grade 3 because the DoE and the private company had planned to develop elementary textbooks. This approach to develop textbooks from the elementary school is rather more appropriate.

Therefore, relevance is high to a certain degree.

(2) Effectiveness: High

Regarding effectiveness, each target output has been achieved smoothly, during the Project period. The Project Purpose indicator, i.e. 'NDoE is ready to distribute the Textbooks and Teacher's Manuals of Mathematics and Science nationwide' has also been realised.

The textbooks and teacher's manuals are drafted and validated through the activities in Output 2 and Output 3, respectively. Consequently, the quality of the new textbooks and teacher's manuals and that of the pilot school students' academic ability have improved significantly. Thus, the Board of Study of the DoE has been able to understand the relevance of the Project activities and its effectiveness, and the necessity to maintain the quality of textbooks and teacher's manuals. As a result, they have approved the textbooks and teacher's manuals.

At the beginning, the PNG government had not allocated the operational cost for the Project in 2016 and 2017, which affected the allowances for the C/Ps' trips. However, in Output 1, the strategies and plans for the introduction of the textbooks have been formulated along with the DoE. Through this process, the DoE has been able to understand the importance of consistency among national curriculum, national textbooks and their development/revision process, teacher training, assessment, and the required amount of budget to be allocated. Moreover, in cooperation with the JICA Education Policy Advisor, the DoE Senior Officers explained the operational cost and budget estimation for printing and distributing textbooks to the DoT and DNPM, and the Project operational cost of 2 million PGK was allocated in 2018. In addition, the budget of 2019 allocated 10 million PGK for the development of curriculum, 5 million PGK for the QUIS-ME project such as printing training materials, and 2 million PGK for the development of materials, apart from the recurrent budget. Similar budget has been allocated until 2023, as the five-year plan. Thus, the PNG government's commitment to the Project is improving. Although budget allocation depends mostly on the economic condition of the PNG government, Output 1 is contributing to the effectiveness of the Project.

[32] In July 2015, the company and the DoE made the MoU on textbook development for elementary schools.

In Output 4, orientation kits for the training teachers on how to use the new textbooks and teacher's manuals and strategies and programs for teacher training were drafted. This will ensure that the new textbooks and teacher's manuals are used after distribution. The cost of printing and distributing training materials and for implementing training courses were also included in the 2019 budget.

Therefore, effectiveness is high because the Project Purpose and indicators of Outputs have been achieved.

(3) Efficiency: Moderate

Although Japan had estimated 5 hundred million yen as the total cost of the Project at the time of the ex-ante evaluation, they had increased 18% based on actual implementation. This is because the JICA Education Policy/Assistance Cooperation expert and activities and man-months of subject experts were increased at the planning stage after the ex-ante evaluation. Compared to the initial budget plans, there was a 6% increase in allocation. Thus, new activities were added, such as training in Japan and other countries and subject-knowledge training for pilot teachers. The operational cost was essentially in line with the initial plans.

Originally, the Project period was planned for 3 years; however, it was extended to 3 years and 9 months to improve quality of bound and printed textbooks and teacher's manuals as stated above.

As inputs of PNG, C/Ps and offices were prepared as planned. However, operational cost of 2016 and 2017 were not allocated causing difficulties for business trips of C/Ps. Countermeasure was taken to prevent major delays, such as conducting the Project activities in the capital to reduce the cost. Moreover, Project lobbying resulted in approval and disbursement of 2018 and 2019 operational cost by PNG, which contributed to maintaining the effectiveness.

In sum, cost and period of operation was increased to a certain degree. Although PNG's inputs were not enough in 2016 and 2017, necessary inputs were made for actual activities. Thus, the Project Purpose was achieved—around 17,000 teachers and 675,000 students at primary schools will benefit from this Project. Therefore, efficiency is considered moderate.

(4) Impact: High

The impact of the Project is judged considering the achievement of the Overall Goal and its spin-off effects. The Overall Goal is highly likely to be achieved, but additional external conditions should be met to achieve the super goal. The details are described in 'IV. For the Achievement of Overall Goal after the Project Completion'. Next, as one of the spin-off effects, an expectation of improvement of students' learning of the Super Goal is introduced below. The Project compared the academic performance of teachers and students between pilot schools and non-pilot schools

with and without using the new textbooks and teacher's manuals, respectively, through the Mathematics test.[33] While teachers and students in non-pilot schools performed better than in pilot schools in the baseline survey, after a year's teaching, their respective performance reversed to a statistically significant level. This reversal of performance in the pilot schools was a consequence of using new textbooks and teacher's manuals.

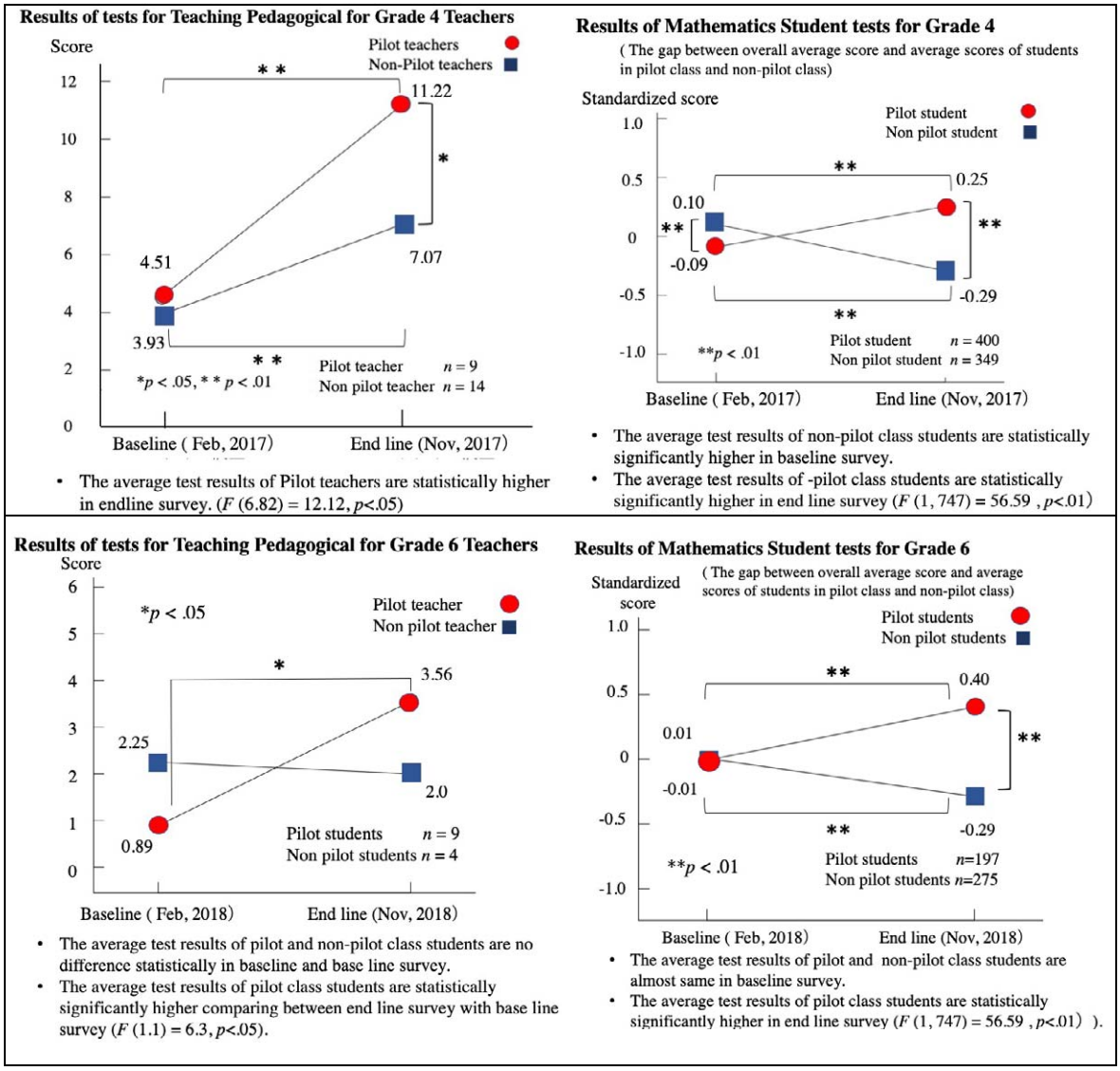


Figure III-1. Comparison of the results of math test between pilot and non-pilot schools

[33] It is difficult to make a simple comparison for Science because contents to teach differ greatly between the old and new curriculum in Grade 3 to 5.

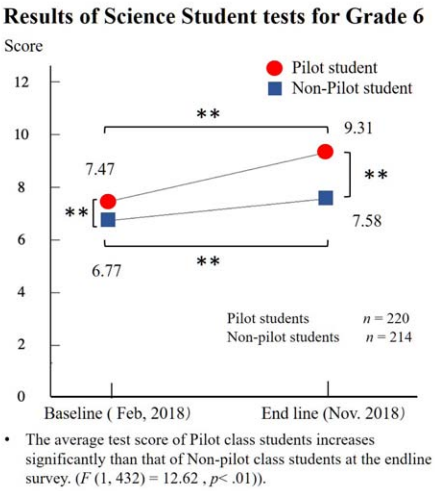


Figure III-2. Comparison of the results of science test between pilot and non-pilot schools

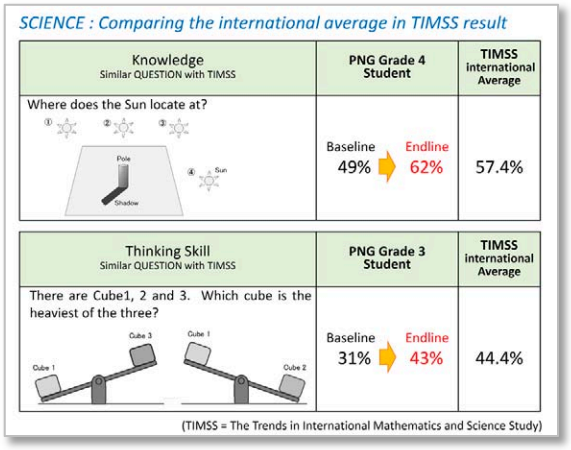


Figure III-3. Comparison of the results of science test in pilot schools

In addition, as shown in figure III-3, Science scores in the pilot schools also increased to the same level or higher than the international average of TIMSS in the end-line survey. This was a result of the continuous implementation of lessons with the new textbooks; however, these scores were a lot lower than the average in the baseline survey. This suggested that students' learning will improve if teachers implement lessons with new textbooks and teacher's manuals.

Other spin-off results were identified as follows.

- Japanese experts advised on the syllabi and NCSF, which contributed to maintaining a consistency between PNG's curriculum, textbooks, and teacher's manuals.
- In cooperation with the JICA Education Policy Advisor, the DoE developed the SBC position paper as a strategy to introduce textbooks. Other strategies advised by the Project included a reform of learning assessment; institutionalisation by following the curriculum's policy; and consistency with in-service teacher training, curriculum of the Teachers College, and monitoring.
- Some of the textbooks and orientation kits developed by the Project were used in the training during the introduction of SBC conducted by the DoE in 2017.

Thus, the above reasons raise the expectations for the future impacts.

(5) Sustainability: Moderate

From the political perspective 'the sustainability plan which includes policy and institutional reform for textbook development' was created as a chapter in 'the strategies and plans for the introduction of the textbooks' which was developed by the Project. Based on this, NCSF was revised to describe national textbooks, and higher policy recommendations about the National Textbook was made in August 2018. In addition, the DoE plans to develop the Secretary Circular

for all schools to instruct them on the introduction and use of the national textbooks and teacher's manuals. From the institutional perspective, the Project and its related agencies strategized activities and plans needed for textbooks dissemination and development. This includes five focus areas such as printing and distribution, in-service teacher training, curriculum development of the PTC, advocacy and monitoring, and learning assessment system. Additionally, it conducted activities, as stated above.

Regarding the organisational aspect, TBWs were increased from 8 members to 12 members during the Project and 3 of them were selected as members of the curriculum committee for secondary syllabus development. The CDD is planning an institutional reform in which curriculum officers of each subject form a group and are responsible for the revision of elementary, primary, and secondary education curriculum. This implies that the DoE secures consistency between primary and secondary education. The DoE is considering using at least 3 TBWs as curriculum officers in CDD and the remaining TBWs as PTC lecturers. When this is realised, the experience necessary to revise the curriculum and textbooks remains within the CDD. Thus, the dissemination of a new curriculum to the PTC students and in-service training in each province can be easier in the presence of PTC lecturers in each province. Moreover, advised by the Project, the CDD organised a publishing section where illustrators and proof-readers for textbook development and revision were assigned. Therefore, an organisational structure to continue the development and revision of textbooks and teacher's manuals has been formed.

Regarding the technical aspect, the ability of TBWs was identified as a matter of concern at the beginning of the Project. It has gradually improved through the process of revising textbooks and teacher's manuals. The TBWs understood the structure of textbooks and its important contents and were able to train the pilot school teachers accordingly. Their subject knowledge and ability to analyse lesson flow have been improved through the monitoring activities at pilot schools. Furthermore, they can discuss the textbook revisions and teacher's manuals among themselves. As a result, the quality of textbooks has improved. They can also present the textbook development methods in the Senior Officers Conference (SEOC), Steering Committee meetings, and JCC meetings. Thus, the technical aspect of sustainability has been gradually improved. However, knowledge and experiences on subjects and proper teaching methods are still limited to developing textbooks for new grades and other subjects instead of the revision of existing textbooks.

The Curriculum Panel, which is responsible for the quality of textbooks, became active and improved their functions and roles through the Project activities. They have patiently improved their discussion abilities for editing and proofreading. Consequently, they have become capable of giving clear instructions to the Japanese experts and Math and Science working group members on issues related to textbooks and points of improvement such as user friendliness and ease of understanding for the children and teachers in PNG. These experiences can be used for the upcoming revision of textbooks and development of textbooks in other subjects. C/Ps of the

Project have improved their skills on textbook development and fostered their ownership for such work. This has extremely positive implications for the sustainability of the Project.

Regarding the financial aspect, as stated above, the cost for the development of curriculum and teaching materials, and other costs that fall under PNG's wing of the QUIS-ME Project have been budgeted by the DNPM since 2018. However, the costs for 2016 and 2017 were not approved. The Project's financial sustainability is also improving gradually.

Taking these into consideration, sustainability is expected to be predictable. However, there are some uncertain elements such as the financial implications of implementing strategies and plans for the introduction of textbooks by the DoE after 2020. Therefore, sustainability is considered to be medium.

III-2. Key factors affecting implementation and outcomes

III-2-1. Contributing factors

(1) Proper allocation of C/Ps based on needs

Originally, the agreement between JICA and DoE was to allocate 8 TBWs to the Project as main counterparts. However, the requirement of manpower resulted in DoE allocating an additional 4 TBWs. All textbook writers have continued to work up until the end of the Project period. If there were vacancy, new TBWs have been hired immediately to fill in the vacancy; four TBWs were hired additionally, to fill in the shortage of planned manpower. This has contributed to the smooth development of textbooks.

(2) Securing the budget for printing and distributing the textbooks and teacher training sessions

To secure the budget for printing and distributing the textbooks and teacher training sessions, the Project has conducted advocative activities for DNPM in cooperation with the DoE. The Project and DoE have also invited the DNPM officials to the JCCs and steering committees to attain a clear understanding about the necessary budget allocation. In addition, the Project supported the DoE when they had applied and submitted the budget plan. Consequently, there has been an uninterrupted flow of budget allocation, since 2018.

III-2-2. Disincentive factors

(1) Securing the operational cost for the Project

PNG's operational cost for the Project was not allocated for 2016 and 2017. Therefore, it was difficult for the C/Ps to travel to the rural areas and to invite collaborators from those areas. The Project took economic countermeasures such as conducting activities around NCD and recruiting TBWs only from PNG's Central province and NCD.

(2) Delay in the development of curricula upstream

The development of NCSF and syllabi, which was supposed to be completed prior to that of the textbooks, have been delayed. Therefore, the Project had to support their development. Particularly, there were several issues in drafting the syllabi and revising the Science textbooks. This resulted in the delay of textbook development. In addition, the development of NCSF faced more delays than the syllabi. Therefore, the Project monitored Science and Mathematics NCSF carefully to ensure their consistency with the textbooks and teacher's manuals.

(3) Textbooks of elementary school (pre-school, G1 and G2) have not been developed

The DoE's announcement about the structure reform came out at a later stage. Therefore, textbooks of elementary school (pre-school, G1 and G2) could not be developed, which might delay the learning process of students at lower primary school level. The Project took a countermeasure to incorporate as many content reviews of elementary school as possible, into the G3 textbook; however, this was considered as a temporary measure. It is expected that students who used textbooks as per the new curriculum at elementary school will also be able to continue doing so at primary school.

(4) Teachers' and students' lack of subject knowledge

The baseline survey pointed towards a severe lack of subject-knowledge among teachers and students. As stated above, there are no textbooks in the elementary school. Thus, students lacking prior knowledge will encounter severe obstacles in learning new content. Similarly, teaching will also be difficult. Although countermeasures were taken, such as providing time for reviewing the new G3 textbooks and including supportive information for teachers in their manuals, fundamental measures are yet to be taken, for example, including subject-knowledge enhancement in the curriculum of teacher training program. Some of the teachers can teach only up to a certain grade because they are not aware of the learning content of others. Therefore, if all of them start teaching all the grades for several years, their understanding of the learning content will improve. This might be used as a measure to address this issue.

III-3. Evaluation on the Results of the Project Risk Management

III-3-1. Results of Risk Management

In addition to important assumptions and pre-conditions in the PDM, risks, mitigations, and the actual measures taken during the Project period are listed below.

Table III-1: Results of risk management

	Risk	Mitigation	Mitigation taken by the Project	Mitigation taken by DoE
1	C/Ps might not be continuously assigned to the Project.	Quick recruitment of C/Ps is necessary when they resign Institutionalization of C/Ps and their tasks of the Project into the CDD	The Project requested the DoE to institutionalize recruitment and increase TBWs and their tasks and positions in the CDD.	TBWs were recruited in 2017 to fill a vacancy and increase their number. The DoE created the publishing section and increased the number of proof-readers and illustrators. The DoE continues hiring TBWs as CDD officials and trainers for the PTC.
2	The budget for printing, distribution and teacher training is not disbursed.	Conduct a presentation for the DNPM to secure a budget. The Project supports the documentation of budget application by the DoE.	The Project involved DNPM officers and Senior Officers from the DoT as members of the Steering Committee, in JCC meetings, and promoted the importance of textbooks. The JICA Education Policy Advisor and the Project supported the documentation of the budget application for 2018–2019 by the DoE. With the JICA Development Advisor, the Project helped secure the budget in DNPM and DoT.	The DoE requested the budget for 2018–2019 for the Project operation. PGK 2 million and 5 million were approved for the Project operation in 2018 and 2019, respectively. In addition, PGK 2 million was allocated for the development of textbooks. These budgets are to be disbursed every year until 2023 under a five-year plan.
3	The monitoring system may not help improve classroom lessons at the primary education level.	After the distribution of new textbooks and teacher's manuals, the following three types of monitoring are necessary. 1) Were textbooks and teacher's manuals distributed to schools? 2) Was school-based training conducted?	In the chapter on monitoring in 'The strategies and plans for the introduction of the textbooks', the Project, in cooperation with the ID, described the importance of school monitoring.	In the chapter on monitoring in 'The strategies and plans for the introduction of the textbooks', the DoE, together with the Project, described the importance of school monitoring.

	Risk	Mitigation	Mitigation taken by the Project	Mitigation taken by DoE
		3) Were textbooks and teacher's manuals properly managed and used in class?		
4	Education policy on the introduction of the SBC and textbooks might not be maintained.	The education policy on the introduction of the SBC and textbooks should be carefully monitored.	In the chapter in 'The strategies and plans for the introduction of the textbooks', the Project described the plan for national textbook development, and promoted the plan to the DoE Senior Officers and other stakeholders.	The DoE plans to develop a Textbook Policy, which will stabilize the development of textbooks by applying knowledge gained from Japan.
5	The NCSF and the curricula (syllabi) for Math and Science for the junior primary level are still being finalized.	The NCSF and the curricula (syllabi) are monitored carefully.	The Project monitored the NCSF and the curricula (syllabi) and experts in charge of subjects gave advice to address the identified problems.	Discussions to maintain consistency between the NCSF and syllabi, with which national textbooks are in line, were made from 2017 to 2018, and the NCSF was revised according to the syllabi.
6	Textbooks for Math and Science for elementary schools have not been developed.	The review of elementary school content focuses on G3 textbooks. The introduction of textbooks at the elementary level is carefully monitored.	A sufficient period was taken to review the elementary school content for G3 textbooks. The Project promoted to the DoE the importance of Mathematics textbook for the elementary school and securing of budget.	PGK 2 million was allocated as the budget for developing textbooks every year from 2019 to 2023.
7	The changes of schooling system to '1-6-6"' style by consolidating elementary and primary schools	To take countermeasures if the schooling system is changed. To minimize the impact of the change in the schooling system, the Project will monitor the process of the change carefully.	Schooling system has not changed during the Project period.	The DoE is committed to maintaining the contents of curriculum even if the schooling system is changed.
8	The lack of subject matter knowledge in both teachers and students	The new textbooks have longer periods of review and more supplementary information for teachers than the previous ones.	The Project developed new textbooks and teacher's manuals as shown in the left.	None.

	Risk	Mitigation	Mitigation taken by the Project	Mitigation taken by DoE
			The Project recommended to the DoE at the fourth JCC and SEOC that the curriculum of PTC should be revised to increase the academic knowledge of students and teachers.	

III-3-2. Results of Use of Lessons Learned

The lessons learned were identified in the pre-evaluation of the Project. Based on this, the purpose of the lessons learned, and their results are listed below.

(1) Lessons learned from the Project

Budgeting, distributing, and monitoring measures needed for the nationwide distribution of teaching materials, such as textbooks, etc. which are supported by the Project are to be discussed with the DoE of PNG and donors such as Department of Foreign Affairs and Trade (DFAT) at planning stage.

(2) Use of the lessons learned from the Project

At the beginning of the Project, dissemination strategies and plans on necessary activities and post-Project completion budget were discussed with the DoE. These activities included printing, distributing, and monitoring of textbooks and teacher's manuals, and training courses. Based on these plans, the Project has assigned the DNPM and DoT with the responsibility to allocate the budget throughout the Project period.

(3) Results

Two million PGK and five million PGK were approved as the operational cost of the Project in 2018 and 2019, respectively. In addition, ten million PGK and two million PGK was allocated for the development of curriculum and teaching materials, respectively, in 2019. The funds from these budgets are expected to be disbursed every year until 2023, under the five-year plan.

III-4. Lessons Learnt

(1) Development of Long-Term Strategies to Ensure a Use and Establishment of National Textbooks and Teacher's Manuals

The Project's purpose, primarily, is to complete textbooks and teacher's manuals. However, in the first year of the Project, long-term policies and plans were implemented on in-service teacher training, structure development of monitoring and assessment, their introduction into the PTC

programs, and revision of textbooks. These policies and plans contributed towards the attainment of the Overall Goal of the Project, which was the use of textbooks and teacher's manuals distributed at schools after the completion of the Project, and the long-term improvement of education quality and students' learning in future. As a result, the DoE recognized the necessary activities; it deepened their understanding about the implementation methods and budget and helped them in planning for the budget allocation after the completion of the Project.

(2) Involvement of Related Sections and Departments in Development of Strategies and Budget from the Early Stage

The concerned sections of DoE have been involved in this Project. They have recognized their roles in developing the long-term strategies and plans, as stated above. Consequently, each division shared their views on activities and roles after the completion of the Project. Since its initiation, the Project, along with the DoE, has been assigning budget allocation to important departments such as DNPM and DoT. The Project has also been supporting the DoE in requesting for the required budget. In this way, the DoE was able to allocate the Project's budget, in its latter half, and a five-year budget disbursement plan, which starts from 2019, was approved.

(3) Advice and Support to the Development of Curriculum Upstream

When the Project develops textbooks, it is impossible to ignore a framework of syllabi and curriculum upstream. Although it was out of scope of the Project, it affects all downstream activities of textbook development. Thus, the Project has been observing the development status and it has given the necessary advice and inputs to secure a consistency between the curriculum upstream and the textbooks. This enabled it to maintain the consistency of curriculum from downstream to upstream, thereby contributing to a smooth approval of the textbooks and teacher's manuals.

(4) Effectiveness of Quality Assurance and Improvement by Microteaching

As stated in the section on activities, the Project has implemented a workshop style micro-teaching for validating and improving the textbooks developed, thus contributing to an improvement of lesson flows, activities content, and blackboard writing. Although students' responses could be seen and more information could be gained for quality assurance through monitoring lessons at pilot school, only some lessons were referenced to save time. However, microteaching helps in covering all lessons because it takes lesser time to do so, which leaves the teachers at pilot schools with enough time to prepare for lessons. Additional information including students' reactions etc. can be gained later, through feedback from the teachers at pilot schools. Therefore, quality assurance by microteaching was very effective.

IV. For the Achievement of Overall Goal after the Project Completion

IV-1. Prospects to achieve Overall Goal

Regarding the cause-and-effect relation of the PDM, the Overall Goal, 'The Textbooks and Teachers Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used ' will be achieved after the Project Purpose, 'NDoE is ready to distribute the Textbooks and Teachers Manuals of Mathematics and Science nationwide' is fulfilled. Then, the textbooks and teacher's manuals will be printed and distributed at schools, based on the Project Purpose preparations.

Important Assumptions between the Project Purpose to the Overall Goal are the following three points: 'C/Ps are continuously assigned to the Project', 'The budget for printing and distribution is disbursed and the Textbooks are printed and distributed', and 'Obtain approval without delay'. Although these Important Assumptions are appropriate, 'the budget for teacher education is disbursed and the training for school teachers is implemented' is currently set as an Important Assumption between the Overall Goal and Super Goal, and it is also recommended to be included as an Important Assumption to achieve the Overall Goal as an opportunity to learn how to use the textbooks and teacher's manuals.

(1) Indicator 1: 84% of the primary schools in PNG have received the textbooks and Teacher's Manuals.

Indicator 1 is expected to be approximately achieved, except in remote areas where distribution is difficult, because it was decided at the Asian Pacific Economic Cooperation Conference (APEC) in 2018 to print and distribute textbooks and teacher's manuals by using the Japanese grant. It might be difficult to distribute the textbooks and teacher's manuals directly for 16 % of the schools in remote areas. It will take time in to distribute these materials in these schools. For example, teachers in these remote schools receive the textbooks gradually, when they visit the district education office and carry them to school accordingly. However, it is expected that the remaining 84% of the schools, which might not have difficulties of transportation, receive the textbooks and teacher's manuals as planned.

(2) Indicator 2: 90% of the teachers in PNG have received the textbooks and Teacher's Manuals, and have used them for lessons or lesson preparation.

It might be difficult for around 10 % of the teachers at schools located in remote areas to receive and use the textbooks and teacher's manuals because of the remoteness. Thus, additional funds are necessary to distribute the materials to these schools on time, such as costs for distribution by helicopter. However, it is highly expected for the other 90 % of the teachers to receive and utilize the textbooks and teacher's manuals, because the DoE planned and budgeted the necessary teaching materials of Mathematics and Science, and sending Secretary Circular, which gives instructions on how to use the new textbooks as the national textbooks in every lesson.

As stated above, the Overall Goal is highly likely to be achieved after the distribution of textbooks and teacher's manuals. On the other hand, it is crucial that the DoE conducts a series of activities

in line with the strategies and plans of introducing textbooks for assisting the teachers in using textbooks and teacher's manuals continuously and effectively and to achieve the Super Goal, 'Students learning is improved in Mathematics and Science through lessons implemented by teachers who are able to effectively use the Textbook in accordance with the Teacher s Manuals'. For example, it is expected that the DoE conducts in-service training courses in line with the content of national textbooks and teacher's manuals, reforms learning assessment, provides a corroborative policy, incorporates them into the curriculum of the Teacher Training Program in PTC, and continuously conducts advocative activities.

IV-2. Plan and Implementation Structure of the PNG side to Achieve Overall Goal

As stated earlier, strategies and plans for introducing the textbooks are to be implemented for the achievement of the Overall Goal after the completion of the Project. Although the CDD in the DoE will continue to be the primary section, it is also important to have main stakeholders in the DoE who will be involved in implementing activities. Main stakeholders and their roles in implementing strategies and plans for introducing the textbooks are listed in Table IV-1. It is expected that the executives of the DoE, such as the Deputy Secretary, Schools & Education Standards, and First Assistant Secretary, Curriculum & Measurement, take initiatives and request collaboration with related parties, and Assistant Secretary of CDD displays adequate leadership to conduct activities for each strategy.

Table IV-1. Implementation structure for policies and plans for introducing textbooks

	Strategy	Stage	Main Organization	Sub Organization
1	Overall management	1 to 4	Secretary of Education, TMT, CDD	TED, ELD, ID, PD, PPD,[34] MSD, GESD,[35] TSC
2	Development of policy documents related to the position of national textbooks	1 to 4	CDD, PPD	PD, ID, TED, ELD
3	Development of textbooks and teacher's manuals	1	CDD	TED, ELD, ID, MSD
4	Improvement of methods of learning assessment in line with new textbooks	1	MSD, CDD	ID
5	Printing and distribution of new textbooks	2	PD, CDD,	ID, GESD, PDoE[36]
6	In-service teacher training for using new textbooks	3	TED, CDD	PDoE, ELD, ID
7	Improvement of lessons in PTC for using new textbooks	3	TED, CDD	ELD, PD
8	Improvement of monitoring system in line with new textbooks	4	R&E, ID, CDD	MSD, GESD, PDoE

[34] Policy and Planning Division
[35] General Education Service Division SEOC
[36] Provincial Division of Education

	Strategy	Stage	Main Organization	Sub Organization
9	Actions for continuous revision of textbooks	1 to 4	CDD, PPD, HROD,[37] PD	MSD

IV-3. Recommendations to the PNG Side

(1) Policy formulation

The rationale for textbook development in line with the SBC is described in several policy papers, and there is no political obstacle for preparing educational materials in line with the SBC. The SBC position paper issued in June 2017 clearly showed the position of national textbooks. The necessary policy documents are being formulated to support the description of national textbooks in the Education Act. The draft of national textbook policy developed by the DoE and Project has incorporated the knowledge and experiences gained from the training in Japan. It is expected that this draft is used when national textbook policy, including development, printing, and distribution of textbooks, is created.

The syllabi of primary schools have been finalized for printing and it is consistent with the contents of the new textbooks. However, the curriculum, except for Mathematics and Science, have not been captured in NCSF and it has not been approved yet. NCSF is expected to be finalised and distributed immediately.

(2) Technology transfer

The Project transferred the technologies for textbook development to the personnel of the CDD and other relevant divisions. The TBWs have also developed their capacities gradually through activities such as guiding science experiments in workshops and drafting textbooks with DTP software. Their capacity in project management has also improved by reporting on the progress of the Project in JCC. The trained personnel must not be replaced or transferred to other departments that are not relevant to the Project's activities.

The DoE must implement various strategies and plans for introducing the new textbooks at the primary school level. Some environments were improved in the Project period, including a formulation of a textbook policy and protection of printing of the orientation kits. However, the DoE must continue implementing other strategies with ownership to utilize national textbooks at class room level for the improvement of student's learning.

Many primary school teachers in PNG do not have enough knowledge on the subject or about using teaching aids for Mathematics and Science, which is a major challenge for education in PNG. As described in the activities of Output 2 in this report, many pilot teachers do not have enough practical skills, such as using teaching materials and apparatus and reading figures and

[37] Human Resource and Organizational Division

graphs, correctly. Similar problems will occur when new textbooks are introduced. Therefore, cooperation regarding in-service teacher training and education will be required. As a solution to this problem, the Project developed new user-friendly textbooks and teacher's manuals which will help the teachers in acquiring subject knowledge. In addition, the development and distribution of video materials that demonstrates the effective teaching methodology for each subject and use of teaching aids will be beneficial for teachers and help them in using new textbooks and teacher's manuals effectively. For future teachers, the DoE is expected to reform its structure and strengthen specialisations for subject developers at both staff and student level. The DoE should revise the curriculum of the PTC and improve teacher education by focussing on subject knowledge and use of teaching aids as described in 'the strategies and plans for the introduction of the textbooks.

(3) Organizational and institutional development

The DoE assigned 12 TBWs for the Project. After the completion of the Project, the TBWs require official posts with an appropriate status in the CDD to allow them to continue the development and revision of textbooks. Although currently the DoE plans to employ three TBWs as Curriculum Officers in CDD, it is expected that more TBWs will be employed as Curriculum Officers to use the acquired skills on textbook development during the Project period for other similar purposes in the future.

The remaining TBWs are to be assigned as lecturers in PTCs and Papua New Guinea Education Institute (PNGEI). When they are assigned in PNGEI, they are also expected to be involved in the textbook development in CDD. It is expected that the discussion among CDD and TED will decide the way in which TBWs can be used efficiently, after the Project.

It is also necessary that the C/Ps, who developed their competence through the Project activities, continue to work on monitoring and teacher training for the introduction of new textbooks after the Project.
The head of publishing (working as an English proof-reader) and designers of the CDD (Illustrators) are working on textbook development in cooperation with the Project. They are also expected to continue textbook revisions after the Project. It is recommended that a photographer is employed in the CDD.

In addition, a science laboratory is expected to be created in CDD to continue using the science apparatus bought by the Project for textbook revision. The CDD is also expected to select the science apparatus, which are used in the new textbooks, for schools so that they are distributed by the DoE.

The CDD officials are expected to visit schools to monitor the implementation status of new textbooks, periodically, as their routine job responsibility in cooperation with inspectors, after

new textbooks and teacher's manuals are distributed. During this process, the major issued identified should be recorded for the next round of textbook revisions and measures are taken, such as distributing corrigenda in case of misprints.

Moreover, it is also important for the CDD to add PR activities for textbooks and teacher's manuals, developed by them, as a part of their routine job responsibility. The curriculum officers should promote the benefits of new textbooks and teacher's manuals to the public and schools through newspapers and TV media, etc.

(4) Finance

As described above, the operational cost budget which is covered by the MoE has been approved in 2018 and 2019, and the financial aspect of sustainability has improved. The budget is expected to be uninterrupted for the future as well by continuing to advocate and conduct awareness activities for the DoT and DNPM. The financial support to Provincial DoE and district for distribution and utilisation of textbooks are expected from the NDoE.

IV-4. Monitoring Plan from the End of the Project to Ex-post Evaluation

With respect to the overall management of the Project, it is important for the Secretary of Education and TMT, supported by the National Education Board and the National Education Committee, to take an initiative to ensure that the success of the Project. The CDD should monitor the actual implementation status of 'the strategies and plans for the introduction of the textbooks' regularly, to achieve the Overall Goal. As the primary agency in charge of textbook development, the CDD is expected to share the results of monitoring and discuss issues and countermeasures in a cross-sectoral manner, regularly, such as through TMT meeting, Senior Staff Meeting, and SEOC in DoE.

ID plans to take an initiative on monitoring the introduction of the new textbooks at schools in line with 'the strategies and plans for the introduction of the textbooks'. Particularly, it is expected to record the changes experienced by the students and teachers before and after the nationwide distribution of the textbooks, in a similar way that the impact survey was conducted by the Project. It is planned that ID collects the data and the CDD compiles them.

For DoE to monitor the above, it is important that the DoE should correct the information of the textbooks and teacher's manuals distribution status achieved with the Japanese grant, and provides the information to JICA. Moreover, it is also expected that advisors, such as Education Policy Advisor, are dispatched to provide technical support to the DoE's monitoring activities.

Annex

Annex 1. Results of the Project

- 1-1. List of dispatched experts
- 1-2. List of counterparts
- 1-3. List of participants in the training outside PNG
- 1-4. List of equipment
- 1-5. Plan of Operation

Annex 2. List of Products produced by the Project

- 2-1. List of documents and books as technical assistant outputs
- 2-2. List of reports

Annex 3. All versions of PDM

Annex 1. Result of the Project

1.1 List of dispatched experts (March 2016 ～ December 2017)

1. Work in PNG

Name (Position)	# of trip		2016 3	4	5	6	7	8	9	10	11	12	2017 1	2	3	4	5	6	7	8	9	10	11	12
Mr. Akinori Ito	Plan	11								65						##				90			50	
Chief Adviser / Education plan 1	Actual	11	3/2 3/31 (30)	4/3 4/30 (30)	5/1 5/31 (31)	6/1 6/30 (30)	7/1 7/31 (31)	8/1-8/3 8/4 - 8/31 (28)	9/1 9/30 (30)	10/1 - 10/3 10/15 - 10/31 (20)	11/1 11/2 (2)		1/16 1/31 (16)	2/1 2/28 (28)	3/1 3/26 3/27 - 3/31 (26)	4/3 4/17 4/30 (17)	5/1 5/31 (31)	6/1 6/30 (30)	7/1-7/10 7/22 - 7/31 (10)	8/1-8/4 8/14 - 8/26 8/29 - 8/31 (14)	9/1 9/2 - 9/5 9/11 - 9/30 (21)	10/1 10/31 (31)	11/1 11/30 (30)	12/1 12/15 (15)
	Plan	1																						
	Actual	1																						
Mr.ChikoYamaoka	Plan	10		22							30					40				52			30	
Deputy Chief Adviser / Education plan 2	Actual	10	3/7 3/27 (21)				7/11 7/31 (21)	8/1 8/18 (18)		10/29 10/31 (3)	11/1 11/26 (26)			2/10 2/28 (11)	3/1 3/29 (29)				7/15 7/31 (17)	8/1 8/31 (31)	9/1 9/2 (2)		11/1 11/29 (29)	
Ms. Masako Tsuzuki	Plan	7			15												15							
Education Policy / Donor coordination	Actual	7				6/27 6/30 (4)	7/1 7/10 (10)				11/23 11/30 (8)	12/1 12/7 (7)					5/10 5/24 (15)						11/8 11/22 (15)	
Mr. Satoshi Kusaka	Plan	11					21							30		49			60				45	
Chief Subject Specialist (Mathematics)	Actual	11					7/9 7/30 (22)						1/21 1/31 (11)	2/1 2/18 (18)		4/1 4/30 (30)	5/1 5/26 (20)		7/1 - 7/28 7/29 (28)	8/1 8/26 (30)		10/14 10/31 (18)	11/1 11/25 (25)	
	Plan	1																						
	Actual	1																						
Prof. Masami Isoda	Plan	12		10			8	9	14				7	6						8	6			
Subject Specialist (Mathematics)	Actual	12	3/29 3/31 (3)	4/1 4/7 (7)			7/14 7/21 (8)	8/12 8/20 (9)	9/6 9/19 (14)				1/4 1/10 (7)	2/13 2/18 (6)						8/13 8/20 (8)	9/1 - 9/6 (6)			
Mr. Ryuichi Sugiyama	Plan	6																30						
Chief Subject Specialist (Science)	Actual	6	3/29 3/31 (3)	4/1 4/27 (27)		6/14 6/30 (17)	7/1 7/3 (3)								30	4/8 4/26 (19)	5/17 5/31 (15)	6/1 6/14 (14)						
Mr. Kenichi Jibutsu	Plan	12		52				52			30					52				52			30	
Subject Specialist (Science) 1	Actual	12	3/14 3/31 (18)	4/1 4/30 (30)	5/1 5/2 (2)			8/8 8/31 (24)	9/1 9/20 (20)		11/9 11/30 (22)	12/1 12/17 (17)			3/4 3/30 (28)	4/1 4/22 (22)				8/16 8/31 (16)	9/1 9/30 (30)	10/1 - 10/4 10/11 - 10/31 (25)	11/1 11/15 (15)	
Prof. Masakazu Kita	Plan	6			8			8			8					8								
Subject Specialist (Science)2	Actual	6		4/28 4/30 (3)	5/1 5/5 (5)			8/10 8/17 (8)							3/1 3/8 (8)					8/9 8/16 (8)				
Mr. Katsuaki Serizawa	Plan	9	8				8				8				8					8			8	
Specialists of textbook development (Mathematics)	Actual	9	3/26 3/31 (6)	4/1 4/2 (2)			7/16 7/22 (8)			10/26 10/31 (6)	11/1 11/2 (2)					4/24 4/30 (5)	5/1 5/3 (3)			8/23 8/30 (8)			11/1 11/8 (8)	
Mr. Susumu Komazawa	Plan	9	8				8				8				8					8			8	
Specialists of textbook development (Science)	Actual	9	3/26 3/31 (6)	4/1 4/2 (2)				8/10 8/17 (8)			11/26 11/30 (5)	12/1 12/3 (3)			3/1 3/8 (8)					8/9 8/16 (8)			11/1 11/18 (8)	
Dr. Kotaro Kijima	Plan	15		45		30				45									72		45		45	
Project coordinator 1/ Training plan 1/ Textbook development(Science)	Actual	15	3/7 3/31 (25)	4/1 4/30 (30)	5/1 5/6 5/26 5/31 (12)	6/1 6/30 (30)	7/1 7/2-7/12 7/15-7/29 (11)		9/10 9/30 (21)	10/1 10/12 (12)			1/25 1/31 (7)	2/1 2/28 (28)	3/1 3/25 (25)				7/12 7/31 (20)	8/1 8/31 (31)	9/1 9/30 (30)		11/8 11/30 (23)	12/1 12/16 (16)
Ms. Kyoko Yamada	Plan	5						52				45						45						
Project coordinator 2/ Training plan 2/ Textbook development(Mathematics)	Actual	5					7/2 7/28 (30)	8/1 8/27 (27)		10/15 10/31 (17)	11/1 11/30 (30)	12/1 12/10 (10)					5/13 5/31 (19)	6/1 6/30 (28)					10/11 10/31 (21)	11/1 11/8 (8)	

2. Work in Japan

Name (Position)			2016 3	4	5	6	7	8	9	10	11	12	2017 1	2	3	4	5	6	7	8	9	10	11	12
Mr. Akinori Ito	Plan		5										10											
Chief Adviser / Education plan 1	Actual												1/10 1/12 (3)						7/13-14, 7/16-23 (10)					
Mr.ChikoYamaoka	Plan		5						6						5									
Deputy Chief Adviser / Education plan 2	Actual		3/5 3/6 (2)				7/6-7/8 (3)	8/15 8/23 (3)					3/30 3/31 (2)						7/13-14 (2)		9/3 (1)	10/30-31 (2)	11/30 (1)	
Ms. Masako Tsuzuki	Plan		5						6															
Education Policy / Donor coordination	Actual						7/11 (1)													8/1 8/3 (3)				
Mr. Satoshi Kusaka	Plan																							
Chief Subject Specialist (Mathematics)	Actual																							
Prof. Masami Isoda	Plan			4		2		2		2			4					2		2		2		
Subject Specialist (Mathematics)	Actual				5/2 5/5 5/18 5/26 (3.5)		7/22 (1.0)	8/9-8/11 8/30 (4.0)	9/20- 9/25 9/28 9/29 (9.0)		11/3-10, 22-26 (12.5)							2		2		2	11/8- 11/10 11/15 (5)	
Mr. Ryuichi Sugiyama	Plan				5			5								5				5				
Chief Subject Specialist (Science)	Actual			4/28 (1)	5/9 5/12 (4)	6/9 6/30 (2)	7/4-7/6 (3)									4/27, 28 (2)	5/1, 2, 9-11, 15, 16 (3)	6/16 6/19-22 (5)						
Mr. Kenichi Jibutsu	Plan																							
Subject Specialist (Science) 1	Actual																							
Prof. Masakazu Kita	Plan																							
Subject Specialist (Science)2	Actual																							
Mr. Katsuaki Serizawa	Plan			10		10		10	10		12					10		10	10	10	10	10	12	
Specialists of textbook development (Mathematics)	Actual			4/13 (1)					9/8 9/24 (1)	10/5 10/6 10/21 (2)	11/14 (0.5)	12/8 12/22 (1)	1/11, 1/13 (1.5)	2/13, 2/15-2/17 (4)	3/9 3/16 3/24 1.5	4/7 (0.5)	5/19 5/22, 24 (1.5)	6/2, 13, 16, 19, 20, 23, 30 (3.0)	7/3-7/6 7/10-7/13 (7.5)	8/1-8/4, 8/7-10, 8/14-18, 8/28 (11.5)	9/1-6, 9/11-21, 9/26-29 (8.5)	10/1-10 (9.5)	11/9 11/27-28 (2.5)	12/4 12/21 (2.5)
Mr. Susumu Komazawa	Plan			10		10		10	10		12		10			10		10	10	10	10	10	12	
Specialists of textbook development (Science)	Actual			4/13 (1)					9/8 9/15 9/25 (1.5)	10/5 10/6 10/24, 28 (2.5)	11/8, 14, 21, 22, 25, 28 (5.5)	12/19-12/22 12/26-12/28 (7)	1/11 (0.5)	2/13, 2/15-2/17, 2/23 (5)	3/9 3/14 3/24 (2)	4/10-11 ## (4.0)	5/11, 18, 19, 24, 26, 29, 30, 31 (4.5)	6/2, 6, 8, 14, 19, 20, 22, 26, 30 (8.5)	7/3-7, 7/27-28, 7/31 (8.0)	8/1, 8/4, 8/7, 8/21-25 (5.0)	9/5, 9/12-22, 9/25-29 (7)		11/9 11/13-11/17 (7)	12/4 12/14 12/25 (2.5)
Dr. Kotaro Kijima	Plan		5			10					7													
Project coordinator 1/ Training plan 1/ Textbook development(Science)	Actual										11/8- 11/13 11/14-11/15 (11)	12/5- 12/9 (5)							7/3-4 (4)					
Ms. Kyoko Yamada	Plan																							
Project coordinator 2/ Training plan 2/ Textbook development(Mathematics)	Actual																							

Legend: Actual / Plan / Work on self-funded / Trip on self-funded

1.1 List of dispatched experts (January 2018 ～ December 2019)

1. Work in PNG

Name (Position)	# of trip		2018 1	2	3	4	5	6	7	8	9	10	11	12	2019 1	2	3	4	5	6	7	8	9	10	11	12	Day Total	M/M Total
Mr. Akinori Ito	Plan	11																									723	24.10
	Actual	11																									723	24.10
Chief Adviser / Education plan 1	Plan	1																									9	0.30
	Actual	1																									9	0.30
Mr.ChikoYamaoka	Plan	10																									332	11.07
Deputy Chief Adviser / Education plan 2	Actual	10																									332	11.07
Ms. Masako Tsuzuki	Plan	7																									90	3.00
Education Policy / Donor coordination	Actual	7																									90	3.00
Mr. Satoshi Kusaka	Plan	11																									400	13.33
	Actual	11																									400	13.33
Chief Subject Specialist (Mathematics)	Plan	1																									21	0.70
	Actual	1																									21	0.70
Prof. Masami Isoda	Plan	12																									96	3.20
Subject Specialist (Mathematics)	Actual	12																									96	3.20
Mr. Ryuichi Sugiyama	Plan	6																									157	5.23
Chief Subject Specialist (Science)	Actual	6																									157	5.23
Mr. Kenichi Jibutsu	Plan	12																									411	13.70
Subject Specialist (Science) 1	Actual	12																									411	13.70
Prof. Masakazu Kita	Plan	6																									47	1.57
Subject Specialist (Science)2	Actual	6																									47	1.57
Mr. Katsuaki Serizawa	Plan	9																									72	2.40
Specialists of textbook development (Mathematics)	Actual	9																									72	2.40
Mr. Susumu Komazawa	Plan	9																									71	2.37
Specialists of textbook development (Science)	Actual	9																									71	2.37
Dr. Kotaro Kijima	Plan	15																									569	18.97
Project coordinator 1/ Training plan 1/ Textbook development(Science)	Actual	15																									569	18.97
Ms. Kyoko Yamada	Plan	5																									212	7.07
Project coordinator 2/ Training plan 2/ Textbook development(Mathematics)	Actual	5																									212	7.07
																									Subtotal	Plan	3210	107.01
																										Actual	3210	107.01

2. Work in Japan

Name (Position)			2018 1	2	3	4	5	6	7	8	9	10	11	12	2019 1	2	3	4	5	6	7	8	9	10	11	12	Day Total	M/M Total
Mr. Akinori Ito	Plan																										20	1.00
Chief Adviser / Education plan 1	Actual																										20	1.00
Mr.ChikoYamaoka	Plan																										31	1.55
Deputy Chief Adviser / Education plan 2	Actual																										31	1.55
Ms. Masako Tsuzuki	Plan																										11	0.55
Education Policy / Donor coordination	Actual																										11	0.55
Mr. Satoshi Kusaka	Plan																										0	0.00
Chief Subject Specialist (Mathematics)	Actual																										0	0.00
Prof. Masami Isoda	Plan																										36	1.80
Subject Specialist (Mathematics)	Actual																										36	1.80
Mr. Ryuichi Sugiyama	Plan																										40	2.00
Chief Subject Specialist (Science)	Actual																										40	2.00
Mr. Kenichi Jibutsu	Plan																										0	0.00
Subject Specialist (Science) 1	Actual																										0	0.00
Prof. Masakazu Kita	Plan																										0	0.00
Subject Specialist (Science)2	Actual																										0	0.00
Mr. Katsuaki Serizawa	Plan																										186	9.30
Specialists of textbook development (Mathematics)	Actual																										186	9.30
Mr. Susumu Komazawa	Plan																										208	10.40
Specialists of textbook development (Science)	Actual																										208	10.40
Dr. Kotaro Kijima	Plan																										22	1.10
Project coordinator 1/ Training plan 1/ Textbook development(Science)	Actual																										22	1.10
Ms. Kyoko Yamada	Plan																										0	0.00
Project coordinator 2/ Training plan 2/ Textbook development(Mathematics)	Actual																										0	0.00
																									Subtotal	Plan	554	27.70
																										Actual	554	27.70

Legend: Actual / Plan / Work on self-funded / Trip on self-funded

Total		
	Plan	134.71
	Actual	134.71

1-2. List of counterpart

No	Name	Position in the Project	Period
1	Mr. Walipe Wingi	Project Director	Nov. 2016 – Nov. 2019
2	Dr. Eliakim Apelis	Former Project Director	Mar. – Nov. 2016
3	Mrs. Annemarie Kona	Vice Project Director	Nov. 2016 – Nov. 2019
4	Mr. Titus Hatagen	Former Vice Project Director	Mar. – Nov. 2016
5	Mr. Steven Tandale	Project Manager	Mar. 2016 – Nov. 2019
6	Mr. Gandhi Lavaki	Main member of Steering Committee, Curriculum Panel	Apr. 2017 – Nov. 2019
7	Ms. Philippa Darius	Main member of Steering Committee, Curriculum Panel	Mar. 2016 – Nov. 2019
8	Mr. Alex Magun	Main member of Steering Committee, Curriculum Panel	Mar. 2016 – Nov. 2019
9	Mr. John Kakas	Science working group, Curriculum Panel	Mar. 2016 – Nov. 2019
10	Ms. Mary Norrie	Mathematics working group, Curriculum Panel	Mar. 2016 – Nov. 2019
11	Ms. Kila Tau	Mathematics working group	Mar. 2016 – Nov. 2019
12	Mr. James Namari	Mathematics working group	Mar. 2016 – Nov. 2019
13	Mr. Moses Koran	Science working group	Mar. 2016 – Nov. 2019
14	Mr. Emmanuel Ragu	Science working group	Mar. 2016 – Nov. 2019
15	Ms. Michelle Pala	TBW (Mathematics)	Mar. 2016 – Nov. 2019
16	Mrs. Pisah Thomas	TBW (Mathematics)	Mar. 2016 – Nov. 2019
17	Ms. Hilda Tcpungu	TBW (Mathematics)	Mar. 2016 – Nov. 2019
18	Ms. Ileen Palan	TBW (Mathematics)	Nov. 2016 – Nov. 2019
19	Mr. Armstrong Rupa	TBW (Mathematics)	Nov. 2016 – Nov. 2019
20	Mr. Gibson Jack	TBW (Mathematics)	Nov. 2016 – Nov. 2019
21	Mr. Jimmy Pulpulis	TBW (Science)	Mar. 2016 – Nov. 2019
22	Mr. Michael Kwadogi	TBW (Science)	Mar. 2016 – Nov. 2019
23	Ms. Sandra Uramani	TBW (Science)	Mar. 2016 – Nov. 2019
24	Mrs. Brenda Kautu	TBW (Science)	Mar. 2016 – Nov. 2019
25	Ms. Aalia Nissar	TBW (Science)	Dec. 2016 – Nov. 2019
26	Mrs. Raphaella Barau OA	TBW (Science)	Dec. 2016 – Nov. 2019
27	Mr. Nick Nolpi	Former TBW (Mathematics)	Mar. – Jun. 2016
28	Mr. Nopa Raki	Dissemination working group	Nov. 2016 – Nov. 2019
29	Mr. Geff Gibaru	Dissemination working group	Nov. 2016 – Nov. 2019
30	Ms. Colette Modagai	Dissemination working group	Nov. 2016 – Nov. 2019
31	Mr. Glen Benny	Dissemination working group	Nov. 2016 – Nov. 2019
32	Mr. Ray Vaka	Dissemination working group	Nov. 2016 – Nov. 2019
33	Ms. Essa Godua	Dissemination working group	Nov. 2016 – Nov. 2019
34	Mr. Fredric Kanau	Dissemination working group	Nov. 2016 – Nov. 2019
35	Ms. Elizabeth Kosi	Dissemination working group	Nov. 2016 – Nov. 2019
36	Ms. Georgin Wapar	Dissemination working group	Nov. 2016 – Nov. 2019
37	Ms. Mary Philips	Strategy development working group	Jul. 2016 – Nov. 2019
38	Ms. Sylvia Iramu	Strategy development working group	Jul. 2016 – Nov. 2019
39	Mr. John Kanjip	Strategy development working group	Jul. 2016 – Nov. 2019
40	Mr. Mea Aisi	Strategy development working group	Jul. 2016 – Nov. 2019

41	Ms. Sabati Mero	Strategy development working group	Jul. 2016 – Nov. 2019
42	Mr. Peter Lagia	Strategy development working group	Jul. 2016 – Nov. 2019
43	Mr. Brian Moni	Strategy development working group	Jul. 2016 – Nov. 2019
44	Ms. Celine Vaveataovi	Curriculum Panel	Jul. 2018 – Nov. 2019
45	Mr. Gilbert Ikupu	Curriculum Panel	Jul. 2018 – Nov. 2019
46	Mr. John Wek	Curriculum Panel	Jul. 2018 – Nov. 2019
47	Ms. Betty Bannah	Curriculum Panel	Jul. 2018 – Nov. 2019
48	Ms. Mirou Avosa	Curriculum Panel	Jul. 2018 – Nov. 2019
49	Mr. Rupuna Pikita	Curriculum Panel	Jul. 2018 – Nov. 2019
50	Ms. Clemencia Dimain	Curriculum Panel	Jul. 2018 – Nov. 2019
51	Mrs. Linda Gima Wami	Pilot Teacher, Iobuna Kouba Primary School	Feb. 2017– Nov. 2019
52	Mr. John	Pilot Teacher, Iobuna Kouba Primary School	Feb. 2017– Nov. 2019
53	Ms. Martha Dimsock	Pilot Teacher, Iobuna Kouba Primary School	Feb. 2017– Nov. 2019
54	Ms. Aiva Koia	Pilot Teacher, Koki Primary School	Feb. 2017– Nov. 2019
55	Ms. Marcia Pau	Pilot Teacher, Koki Primary School	Feb. 2017– Nov. 2019
56	Ms. Margaret Itoro	Pilot Teacher, Koki Primary School	Feb. 2017– Nov. 2019
57	Mrs. Heidi Supa (Taka)	Pilot Teacher, Koki Primary School	Feb. 2017– Nov. 2019
58	Mr. Christopher Awai	Pilot Teacher, Koki Primary School	Feb. 2017– Nov. 2019
59	Ms. Aloisia Charles	Pilot Teacher, Gaire Primary School	Feb. 2017– Nov. 2019
60	Mrs. Serah Heina Robinson	Pilot Teacher, Gaire Primary School	Feb. 2017– Nov. 2019
61	Ms. Idau Rea	Pilot Teacher, Gaire Primary School	Feb. 2017– Nov. 2019
62	Mrs. Kila V. Ymana	Pilot Teacher, Gaire Primary School	Feb. 2017– Nov. 2019
63	Ms. Lucy Paul	Pilot Teacher, Gaire Primary School	Feb. 2017– Nov. 2019
64	Ms. Sussie Wubure Kipak	Pilot Teacher, Koiari Park Primary School	Feb. 2017– Nov. 2019
65	Ms. Lee Kalinoe	Pilot Teacher, Koiari Park Primary School	Feb. 2017– Nov. 2019
66	Miss Fredah Bonifas	Pilot Teacher, Sogeri Primary School	Feb. 2017– Nov. 2019
67	Mrs Anne Afaisa Jorge	Pilot Teacher, Sogeri Primary School	Feb. 2017– Nov. 2019
68	Mrs.Boio Gurina	Pilot Teacher, Sogeri Primary School	Feb. 2017– Nov. 2019
69	Ms Anna Auhava	Pilot Teacher, St.Johns Primary School	Feb. 2017– Nov. 2019
70	Mrs Johana Wambriwari	Pilot Teacher, St.Johns Primary School	Feb. 2017– Nov. 2019
71	Ms Esther Yambukia	Pilot Teacher, St.Johns Primary School	Feb. 2017– Nov. 2019
72	Mrs Wilfreda A.Efi	Pilot Teacher, St.Johns Primary School	Feb. 2017– Nov. 2019
73	Mrs Sheila Urim Sabarei	Pilot Teacher, St.Johns Primary School	Feb. 2017– Nov. 2019
74	Ms. Glenda Blasius	Pilot Teacher, St.Peter Primary School	Feb. 2017– Nov. 2019
75	Ms. Susie Pet	Pilot Teacher, St.Peter Primary School	Feb. 2017– Nov. 2019
76	Mrs. Louisa Mamei Kaekae	Pilot Teacher, St.Peter Primary School	Feb. 2017– Nov. 2019
77	Mr. Freeman Kefoi	Pilot Teacher, St.Peter Primary School	Feb. 2017– Nov. 2019
78	Ms. Ikai Koivi	Pilot Teacher, St.Therese Primary School	Feb. 2017– Nov. 2019
79	Mr. Joel Talman	Pilot Teacher, St.Therese Primary School	Feb. 2017– Nov. 2019
80	Ms. Joan Miti	Pilot Teacher, St.Therese Primary School	Feb. 2017– Nov. 2019

1-3. List of participants in training sessions outside PNG

#	Name	Position	Training duration	Training name
1	Mrs. Annemarie Kona	Project Manager	12–27 July 2017	Training on Strengthening National Textbook Development in PNG (Training in Japan)
2	Ms. Philippa Darius	Director of curriculum (Elementary)		
3	Mr. John Kakas	Director of curriculum (Primary)		
4	Mr. Alex Magun	Director of curriculum (Secondary)		
5	Mr. Nopa Raki	Director of Teacher Education Curriculum		
6	Mr. David Gerega	DTP officer for the Project		
7	Mr. Emmanuel Ragu	Curriculum Officer	15–27 August 2017	Technical Exchange with Myanmar on Primary-Level Mathematics and Science Textbook Development (Third-country training)
8	Ms. Raphaella Barau OA	TBW		
9	Ms. Sandra Uramani	TBW		
10	Ms. A'allia Nissar	TBW		
11	Ms. Michelle Pala	TBW		
12	Mr. Armstrong Rupa	TBW		
13	Mr. Michael Kwadogi	TBW		
14	Ms. Ileeen Palan	TBW		
15	Ms. Mary Norrie	Curriculum Officer	October–December 2016; October–December 2017	Improvement of Quality of Teaching Materials (Country focused training at Naruto University of Education)
16	Mr. Jimmy Pulpulis	TBW		
17	Mrs. Pisah Thomas	TBW		
18	Ms. Hilda Tcpungu	TBW		
19	Mrs. Brenda Kautu	TBW		
20	Mr. James Namari	TBW	October–December 2016	
21	Mr. Moses Koran	TBW		
22	Mr. Fredric Kanau	TBW		
23	Ms. Ileen Palan	TBW	October–December 2017	
24	Mrs. Raphaella Barau OA	TBW		
25	Mr. Gilbert Ikupu	Curriculum Officer		
26	Mr. Baran Sori	Head of Teaching Service Commission	November 2017	Same training as the above country-focused training but for executives
27	Mr. Taitus Hatagen	Deputy Secretary		
28	Mr. Joseph Moide	First Assistant Secretary		

1-4. Equipment

Item	Specifications	#	Procurement cost		Date of procurement	Place to use
			Price	Currency		
Digital camera body 1	Sony ILCE-7RM2	1	635,990	JPY	2016/3/4	Project Office
Lens for Digital camera 1	Sony SEL90M28G	1	145,670	JPY	2016/3/4	Project Office
Lens for Digital camera 2	Sony SEL1635Z	1	155,390	JPY	2016/3/4	Project Office
Lens for Digital camera 3	Sony SEL70200G	1	154,040	JPY	2016/3/4	Project Office
Laptop computer 1	Acer P255-M-34014G50Mtss	1	2,000	PGK	2016/3/15	Project Office
Laptop computer 2	Acer P255-M-34014G50Mtss	1	2,000	PGK	2016/3/15	Project Office
Laptop computer 3	Acer P255-M-34014G50Mtss	1	2,000	PGK	2016/3/15	Project Office
Laptop computer 4	Acer P255-M-34014G50Mtss	1	2,000	PGK	2016/3/15	Project Office
Projector 1	Acer P1185 DLP HDMI Projector	1	1,590	PGK	2016/3/16	Project Office
Photocopy machine 1	Canon iR-ADV C5250 Copier	1	27,500	PGK	2016/3/23	Project Office
Projector 2	Acer P1185 DLP HDMI Projector	1	1,590	PGK	2016/3/29	Project Office
Laptop computer 8	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 9	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 10	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 11	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 12	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Air conditioner 1	Air-con Split GREE GWC24RD-K1NNA1A	1	2,282	PGK	2016/4/19	Project Office
Air conditioner 2	Air-con Split GREE GWC12RD-K1NNA1A	1	1,355	PGK	2016/4/19	Project Office
Flat-screen TV 1	KDL50W800C	1	4,252	PGK	2016/4/20	Working room of C/Ps
Laptop computer 5	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 6	Lenovo B5070	1	1,699	PGK	2016/4/15	Working room of C/Ps
Laptop computer 14	Lenovo B5070	1	1,799	PGK	2016/11/14	Working room of C/Ps
Laptop computer 15	Lenovo B5070	1	1,799	PGK	2016/11/14	Working room of C/Ps
Laptop computer 16	Lenovo B5070	1	1,799	PGK	2016/11/14	Working room of C/Ps
Desktop Computer 2	iMac 27-inch	1	9,680	PGK	2016/10/19	Working room of C/Ps
Laptop computer 17	Lenovo B5070	1	1,799	PGK	2016/11/14	Working room of C/Ps
Laptop computer 18	Lenovo B5070	1	1,799	PGK	2016/11/14	Working room of C/Ps
Photocopy machine 2	Canon iR-ADV C5250 Copier	1	27,500	PGK	2016/6/28	Project Office
Generator	YAMAHA EF2600	1	2,200	PGK	2016/8/23	Project Office
Digital camera body 2	Sony Alpha A7S	1	2,198	USD	2016/9/7	Project Office

Item	Specifications	#	Procurement cost		Date of procurement	Place to use
			Price	Currency		
Air conditioner 3	LG HS-C1865NA8	1	1,691	PGK	2016/9/7	Working room of C/Ps
Air conditioner 4	LG HS-C1865NA8	1	1,691	PGK	2016/9/7	Working room of C/Ps
Air conditioner 5	LG HS-C1865NA8	1	1,691	PGK	2016/9/7	Working room of C/Ps
Desktop Computer 1	iMac 27-inch	1	8,910	PGK	2016/9/6	Project Office
Laptop computer 13	HP 250 T3Z18PT	1	1,810	PGK	2016/9/15	Project Office
Flat-screen TV 2	Sony Bravia KDL50W800C	1	3,499	PGK	2017/9/25	Project Office
Digital microscope	Uchida Yoko D-EL401	1	110,400	JPY	2017/11/30	Project Office
Desktop Computer 3	Apple iMac 21.5	1	4,949	PGK	2018/2/2	Project Office
Laptop computer 19	Apple Macbook Air 13	1	5,650	PGK	2018/2/2	Project Office
Laptop computer 20	HP 250 Y3N69PT	1	2,599	PGK	2018/2/2	Project Office
Laptop computer 21	HP250 2FG09PA	1	1,980	PGK	2018/8/16	Project Office
Editing Software	Adobe Creative Cloud	4	6,556	PGK	2018/9/24	Project Office

1-5. Plan of Operation

Inputs		Plan / Actual	2016 I	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	2019 II	2019 III	2019 IV	Remarks	
Output 1: The strategies and plans for the introduction of the Textbooks are formulated.																				
1.1 Form a working group amongst CDD、TED,ELD,ID,MSD	○ ○	Plan																	Chief Advisor	CDD
		Actual																		
1.2 Formulate the strategies and plans with budget plans for the introduction of the Textbooks:	○ ○	Plan																	Chief Advisor, Senior Advisor	Steering Committee
		Actual																		
1.3 Organize periodical meetings for Working Group.	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○	Plan																	All experts	CDD, TED, ELD, ID, MSD
		Actual																		
1.4 Coordinate the Steering Committee	○ ○	Plan																	Chief Advisor, Senior Advisor	Steering Committee
		Actual																		
1.5 Provide technical support to secure the budget for printing and distribution	○	Plan																	Chief Advisor, Education Policy / Donor Coordination	CDD
		Actual																		
1.6 Provide technical support to secure the budget for teacher education	○	Plan																	Chief Advisor, Education Policy / Donor Coordination	CDD
		Actual																		
Output 2: Drafted Textbooks of G3 - G6 in line with SBC are completed.																				
2.1 Define procedures of development of textbooks and teacher's manuals.	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	Plan																	Chief Advisor, Subject specialists	Steering Committee
		Actual																		
2.2 Analyse curricula and develop a structure of contents/units to be taught.	○ ○ ○ ○ ○	Plan																	Subject specialists	CDD
		Actual																		
2.3 Draft the Textbooks of Grade 3 to 6.	○ ○ ○ ○ ○ ○ ○ ○ ○ ○	Plan																	Subject specialists	CDD
		Actual																		

Inputs	Plan / Actual	2016 I	2016 II	2016 III	2016 IV	2017 I	2017 II	2017 III	2017 IV	2018 I	2018 II	2018 III	2018 IV	2019 I	2019 II	2019 III	2019 IV	Remarks	
Output 3: The Textbooks and Teacher's manuals with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.																			
3.1 Select and appoint pilot schools and teachers.	Plan																	Chief Advisor	Steering Committee
	Actual																		
3.2 Obtain feedback from teachers on the first drafts (first quality assurance).	Plan																	Subject specialists	CDD/ID
	Actual																		
3.3 Revise the first drafts based on the feedback from the first quality assurance.	Plan																	Subject specialists, Textbook Dev'	CDD
	Actual																		
3.4 Examine the second drafts through continuous try outs of lessons at pilot schools (second quality assurance).	Plan																	Subject specialists	CDD/ID
	Actual																		
3.5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance).	Plan																	Subject specialists	CDD/ID
	Actual																		
3.6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5.	Plan																	Subject specialists	CDD
	Actual																		
3.7 Edit and proofread them for completion.	Plan																	Textbook Dev'	CDD
	Actual																		
3-8 Conduct baseline and endline surveys including the pilot schools at appropriate timings.	Plan																	Textbook Dev'	CDD
	Actual																		
Output 4: The orientation kit for teachers to learn how to use the textbooks is developed.																			
4.1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson.	Plan																	Senior Advisor	Steering Committee
	Actual																		
4.2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers.	Plan																	Senior Advisor	CDD
	Actual																		
4.3 Try out the observation sheet in the process of the quality assurance (Activity 3-5), and finalize it.	Plan																	Senior Advisor, Subject specialists	CDD/TED/MGD
	Actual																		
4.4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3.	Plan																	Senior Advisor	CDD
	Actual																		
4.5 Try out the materials for modification.	Plan																	Senior Advisor, Training plan	CDD/TED/MGD
	Actual																		
4.6 Finalize the orientation kit including the observation sheet.	Plan																	Senior Advisor	CDD
	Actual																		

Annex 2. List of products produced by the Project

2-1. List of documents and books as technical assistance outputs

No	Name of outputs	Main user and purpose	Remarks
1	The strategies and plans for the introduction of new textbooks	DoE can use the strategies and plans during and after the Project to disseminate the national textbooks and as a source of budget request to the government.	
2	The national textbooks	Primary school students and teachers will use them in class.	2 subjects: Mathematics and Science 4 Grades from G3 to G6 8 books in total
3	The national teacher's manuals	Primary school teachers will use them to teach lessons for effective use of textbooks in class.	2 subjects: Mathematics and Science 4 Grades from G3 to G6 8 books in total
4	The orientation kit	Primary school teachers and trainers will use it for training on the introduction of national textbooks and teacher's manuals.	Training materials for teachers, Trainer's guides and electronic data of training video

2-2. List of reports

No	Name of report	Date of submission
1	Work Plan	March 2016
2	Project Monitoring Sheet Ver.1	September 2016
3	Project Monitoring Sheet Ver.2	March 2017
4	Project Monitoring Sheet Ver.3	September 2017
5	Project Monitoring Sheet Ver.4	March 2018
6	Project Monitoring Sheet Ver.5	September 2018
7	Project Completion Report	December 2019

Annex 3: All version of PDM (1)

Project Design Matrix Version 0 (PDM0)

Project Title：Improving the Quality of Science and Mathematics Education

Duration: 3 Years

Traget Group： Primary G3-G6

Target Subject : Mathematics & Science

Target Area ： Nationwide

Version : 0

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Super Goal: Students' learning is improved in Mathematics and Science through lessons implemented by teachers who are able to effectively use the Textbook in accordance with the Teacher's Manuals.	The number of teachers satisfying the standards set in Output 4. The score of the national exam or sample exam in line with SBC is improved.	Observation Sheet (developed in Output 4) National exam or sample exam	

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Overall Goal: The Textbooks and Teacher's Guide distributed nationwide for G3 to G6 of Mathematics and Science are used.	XX % of the primary schools in PNG have received the Textbooks. XX% of the teachers who have received the Textbook use it for lessons or lesson preparation.	・Deliverly Record ・Questionnaire	・The budget for teacher education is disbursed and the training for school teachers is implemented. ・The monitoring system is functioning to improve classroom lessons at primary education level.
Project Purpose: NDoE is ready to distribute the Textbooks and Teacher's Guide distributed nationwide of Mathematics and Science nationwide.	・ The Textbooks are submitted for approval ・ Budget for printing is secured. ・ Training strategy, programme, and orientation kit are completed.	・Submitted Textbooks ・Budget Plan of NDoE ・Delivarables	・Countrparts are continuously assigned to the Project. ・The budget for printing and distribution is disbursed and the Textbooks are printed and distributed. ・Obtain approval without delay
Output 1: The strategies and plans for the introduction of the Textbooks are formulated.	・The strategies including (a) -(e) specified in Activity 1-2 are submitted.	・Finalized deliverables	
Output 2: Drafted Textbooks in line with SBC are completed.	・Drafted Textbooks of G3-G6 are completed.	・Drafted Textbooks	
Output 3: The Textbooks and Teacher's Guide with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.	・Quality assurance records are complied ・Feedback from the quality assuarance process was reflected in the final drafts.	・Finalized deliverables ・Quality assurance record including the observation sheets.	
Output 4: The orientation kit for teachers to learn how to use the textbooks is developed.	・ Orientation kit is developed	・Finalized deliverables	

Activities for Output 1 1-1 Form a working group amongst CDD, TED, ELD, SD and MSD. 1-2 Formulate the following strategies and plans with budget plans for the introduction of the Textbooks: (a) the strategy for the printing and distribution of the Textbooks; (b) the strategy for the teacher education on the Textbook use; (c) the strategy for the introduction of the Textbooks to education colleges; (d) the strategy for the raising of awareness and monitoring on the Textbook use; and (e) the strategy for the reform of assessment tools in line with SBC. 1-3 Organize periodical meetings for WG. 1-4 Coordinate the Steering Committee. 1-5 Provide technical support to secure the budget for printing and distribution in line with the strategy (a). 1-6 Provide technical support to secure the budget for teacher education in line with the strategy (b).	Input -Japanese Side Dispatch of experts of: - Chief Advisor - Subject Specialists (Mathematics and Science) - Specialists of textbook development/Proofread - Coordinator - Other experts when necessary Provision of equipment - 1 vehicle - 1 photocopy machine - 8 computers -PNG Side Assignment of counterpart personnel: - Project Director: Deputy Secretary, Schools & Education Standards - Vice Project Director: First Assistant secretary, Curriculum & Measurement - Project Manager: Assistant Secretary, Curriculum Development Division - Curriculum Officers from Curriculum Development Division and E-learning Division - Additional 8 Subject Specialists to be selected from school teachers/lecturers * 4 for mathematics and 4 for science (See “6. Major Issues Discussed” below for details) - Members of the working group for the development of strategy on the introduction of the Textbooks (Output 3), composing of CCD, TED, ELD, SD, MSD and other relevant divisions. - Other personnel, if necessary Provision of the Project office and utility in NDoE - Office of CDD	
Activities for Output 2 2-1 Define procedures of development of textbooks and teacher's manuals. 2-2 Analyze curricula and develop a structure of contents/units to be taught. 2-3 Draft the Textbooks of Grade 3 to 6.		
Activities for Output 3 3-1 Select and appoint pilot schools and teachers. 3-2 Obtain feedback from teachers on the first drafts (first quality assurance). 3-3 Revise the first drafts based on the feedback from the first quality assurance. 3-4 Examine the second drafts through continuous tryouts of lessons at pilot schools (second quality assurance). 3-5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance). 3-6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5. 3-7 Edit and proofread them for completion.		Preconditions ・Education Policy on the introduction of SBC and textbooks is maintained.
Activities for Output 4 4-1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson. 4-2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers. 4-3 Try out the observation sheet in the process of the quality assurance（Activity 3-5), and finalize it. 4-4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3. 4-5 Try out the materials for modification. 4-6 Finalize the orientation kit including the observation sheet.		

Annex 3: All version of PDM (2)

Annex 1: Project Design Matrix Version 1 (PDM1)

Project Title：Improving the Quality of Science and Mathematics Education

Duration: 3 Years and 2 months

Traget Group： Primary G3-G6

Target Subject : Mathematics & Science

Target Area ： Nationwide

Version : 1

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Super Goal: Students' learning is improved in Mathematics and Science through lessons implemented by teachers who are able to effectively use the Textbook in accordance with the Teacher's Manuals.	The number of teachers satisfying the standards set in Output 4. The score of the national exam or sample exam in line with SBC is improved.	Observation Sheet (developed in Output 4) National exam or sample exam	

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Overall Goal: The Textbooks and Teacher's Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used.	XX % of the primary schools in PNG have received the Textbooks. XX% of the teachers who have received the Textbook use it for lessons or lesson preparation.	・Deliverly Record ・Questionnaire	・The budget for teacher education is disbursed and the training for school teachers is implemented. ・The monitoring system is functioning to improve classroom lessons at primary education level.
Project Purpose: NDoE is ready to distribute the Textbooks and Teacher's Manuals of Mathematics and Science nationwide.	・ The Textbooks are submitted for approval ・ Budget for printing is secured. ・ Training strategy, programme, and orientation kit are completed.	・Submitted Textbooks ・Budget Plan of NDoE ・Delivarables	・Countrparts are continuously assigned to the Project. ・The budget for printing and distribution is disbursed and the Textbooks are printed and distributed. ・Obtain approval without delay
Output 1: The strategies and plans for the introduction of the Textbooks are formulated.	・The strategies including (a) -(e) specified in Activity 1-2 are submitted.	・Finalized deliverables	
Output 2: Drafted Textbooks in line with SBC are completed.	・Drafted Textbooks of G3-G6 are completed.	・Drafted Textbooks	
Output 3: The Textbooks and Teacher's Manuals with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.	・Quality assurance records are complied ・Feedback from the quality assuarance process was reflected in the final drafts.	・Finalized deliverables ・Quality assurance record including the observation sheets.	
Output 4: The orientation kit for teachers to learn how to use the textbooks is developed.	・ Orientation kit is developed	・Finalized deliverables	

Activities for Output 1 1-1 Form a working group amongst CDD, TED, ELD, ID and MSD. 1-2 Formulate the following strategies and plans with budget plans for the introduction of the Textbooks: (a) the strategy for the printing and distribution of the Textbooks; (b) the strategy for the teacher education on the Textbook use; (c) the strategy for the introduction of the Textbooks to education colleges; (d) the strategy for the raising of awareness and monitoring on the Textbook use; and (e) the strategy for the reform of assessment tools in line with SBC. 1-3 Organize periodical meetings for WG. 1-4 Coordinate the Steering Committee. 1-5 Provide technical support to secure the budget for printing and distribution in line with the strategy (a). 1-6 Provide technical support to secure the budget for teacher education in line with the strategy (b).	Input -Japanese Side Dispatch of experts of: - Chief Advisor - Subject Specialists (Mathematics and Science) - Specialists of textbook development/Proofread - Coordinator - Other experts when necessary Provision of equipment - 1 vehicle - 1 photocopy machine - 8 computers -PNG Side Assignment of counterpart personnel: - Project Director: Deputy Secretary, Schools & Education Standards - Vice Project Director: First Assistant secretary, Curriculum & Measurement - Project Manager: Assistant Secretary, Curriculum Development Division - Curriculum Officers from Curriculum Development Division and E-learning Division - Additional 12 Subject Specialists to be selected from school teachers/lecturers * 6 for mathematics and 6 for science (See “6. Major Issues Discussed” below for details) - Members of the working group for the development of strategy on the introduction of the Textbooks (Output 3), composing of CCD, TED, ELD, ID, MSD and other relevant divisions. - Other personnel, if necessary Provision of the Project office and utility in NDoE - Office of CDD	
Activities for Output 2 2-1 Define procedures of development of textbooks and teacher's manuals. 2-2 Analyze curricula and develop a structure of contents/units to be taught. 2-3 Draft the Textbooks of Grade 3 to 6.		
Activities for Output 3 3-1 Select and appoint pilot schools and teachers. 3-2 Obtain feedback from teachers on the first drafts (first quality assurance). 3-3 Revise the first drafts based on the feedback from the first quality assurance. 3-4 Examine the second drafts through continuous tryouts of lessons at pilot schools (second quality assurance). 3-5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance). 3-6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5. 3-7 Edit and proofread them for completion. 3-8 Conduct baseline and endline surveys including the pilot schools at appropriate timings.		Preconditions ・Education Policy on the introduction of SBC and textbooks is maintained.
Activities for Output 4 4-1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson. 4-2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers. 4-3 Try out the observation sheet in the process of the quality assurance（Activity 3-5), and finalize it. 4-4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3. 4-5 Try out the materials for modification. 4-6 Finalize the orientation kit including the observation sheet.		

* Number of Subject Specialists has been updated to reflect the current actual status

Annex 3: All version of PDM (3)

Project Design Matrix Version 2 (PDM2)

Project Title：Improving the Quality of Science and Mathematics Education

Duration: 3 Years and 5.5 months

Traget Group： Primary G3-G6

Target Subject : Mathematics & Science

Target Area ： Nationwide

Version : 1

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Super Goal: Students' learning is improved in Mathematics and Science through lessons implemented by teachers who are able to effectively use the Textbook in accordance with the Teacher's Manuals.	The number of teachers satisfying the standards set in Output 4. The score of the national exam or sample exam in line with SBC is improved.	Observation Sheet (developed in Output 4) National exam or sample exam	

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Overall Goal: The Textbooks and Teacher's Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used.	・84 % of the primary schools in PNG have received the Textbooks and Teacher's Manuals. ・90% of the teachers in PNG who have received the Textbooks and Teacher's Manuals, and have used them for lesson(s) or lesson preparation.	・Deliverly Record ・Questionnaire	・The budget for teacher education is disbursed and the training for school teachers is implemented. ・The monitoring system is functioning to improve classroom lessons at primary education level.
Project Purpose: NDoE is ready to distribute the Textbooks and Teacher's Manuals of Mathematics and Science nationwide.	・ The Textbooks are submitted for approval ・ Budget for printing is secured. ・ Training strategy, programme, and orientation kit are completed.	・Submitted Textbooks ・Budget Plan of NDoE ・Delivarables	・Countrparts are continuously assigned to the Project. ・The budget for printing and distribution is disbursed and the Textbooks are printed and distributed. ・Obtain approval without delay
Output 1: The strategies and plans for the introduction of the Textbooks are formulated.	・The strategies including (a) -(e) specified in Activity 1-2 are submitted.	・Finalized deliverables	
Output 2: Drafted Textbooks in line with SBC are completed.	・Drafted Textbooks of G3-G6 are completed.	・Drafted Textbooks	
Output 3: The Textbooks and Teacher's Manuals with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.	・Quality assurance records are complied ・Feedback from the quality assuarance process was reflected in the final drafts.	・Finalized deliverables ・Quality assurance record including the observation sheets.	
Output 4: The orientation kit for teachers to learn how to use the textbooks is developed.	・ Orientation kit is developed	・Finalized deliverables	

Activities for Output 1 1-1 Form a working group amongst CDD, TED, ELD, ID and MSD. 1-2 Formulate the following strategies and plans with budget plans for the introduction of the Textbooks: (a) the strategy for the printing and distribution of the Textbooks; (b) the strategy for the teacher education on the Textbook use; (c) the strategy for the introduction of the Textbooks to education colleges; (d) the strategy for the raising of awareness and monitoring on the Textbook use; and (e) the strategy for the reform of assessment tools in line with SBC. 1-3 Organize periodical meetings for WG. 1-4 Coordinate the Steering Committee. 1-5 Provide technical support to secure the budget for printing and distribution in line with the strategy (a). 1-6 Provide technical support to secure the budget for teacher education in line with the strategy (b).	Input -Japanese Side Dispatch of experts of: - Chief Advisor - Subject Specialists (Mathematics and Science) - Specialists of textbook development/Proofread - Coordinator - Other experts when necessary Provision of equipment - 1 vehicle - 1 photocopy machine - 8 computers -PNG Side Assignment of counterpart personnel: - Project Director: Deputy Secretary, Schools & Education Standards - Vice Project Director: First Assistant secretary, Curriculum & Measurement - Project Manager: Assistant Secretary, Curriculum Development Division - Curriculum Officers from Curriculum Development Division and E-learning Division - Additional 12 Subject Specialists to be selected from school teachers/lecturers * 6 for mathematics and 6 for science (See “6. Major Issues Discussed” below for details) - Members of the working group for the development of strategy on the introduction of the Textbooks (Output 3), composing of CCD, TED, ELD, ID, MSD and other relevant divisions. - Other personnel, if necessary Provision of the Project office and utility in NDoE - Office of CDD	
Activities for Output 2 2-1 Define procedures of development of textbooks and teacher's manuals. 2-2 Analyze curricula and develop a structure of contents/units to be taught. 2-3 Draft the Textbooks of Grade 3 to 6.		
Activities for Output 3 3-1 Select and appoint pilot schools and teachers. 3-2 Obtain feedback from teachers on the first drafts (first quality assurance). 3-3 Revise the first drafts based on the feedback from the first quality assurance. 3-4 Examine the second drafts through continuous tryouts of lessons at pilot schools (second quality assurance). 3-5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance). 3-6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5. 3-7 Edit and proofread them for completion. 3-8 Conduct baseline and endline surveys including the pilot schools at appropriate timings.		Preconditions ・Education Policy on the introduction of SBC and textbooks is maintained.
Activities for Output 4 4-1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson. 4-2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers. 4-3 Try out the observation sheet in the process of the quality assurance（Activity 3-5), and finalize it. 4-4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3. 4-5 Try out the materials for modification. 4-6 Finalize the orientation kit including the observation sheet.		

* Number of Subject Specialists has been updated to reflect the current actual status

Annex 3: All version of PDM (4)

Project Design Matrix Version 3 (PDM3)

Project Title：Improving the Quality of Science and Mathematics Education

Duration: 3 Years and 9 months

Traget Group： Primary G3-G6

Target Subject : Mathematics & Science

Target Area ： Nationwide

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Super Goal: Students' learning is improved in Mathematics and Science through lessons implemented by teachers who are able to effectively use the Textbook in accordance with the Teacher's Manuals.	The number of teachers satisfying the standards set in Output 4. The score of the national exam or sample exam in line with SBC is improved.	Observation Sheet (developed in Output 4) National exam or sample exam	

Narrative Summary	Objectively Verifable Indicators	Means of Verification	Important Assumption
Overall Goal: The Textbooks and Teacher's Manuals distributed nationwide for G3 to G6 of Mathematics and Science are used.	・84 % of the primary schools in PNG have received the Textbooks and Teacher's Manuals. ・90% of the teachers in PNG have received the Textbooks and Teacher's Manuals, and have used them for lesson(s) or lesson preparation.	・Deliverly Record ・Questionnaire	・The budget for teacher education is disbursed and the training for school teachers is implemented. ・The monitoring system is functioning to improve classroom lessons at primary education level.
Project Purpose: NDoE is ready to distribute the Textbooks and Teacher's Manuals of Mathematics and Science nationwide.	・ The Textbooks are submitted for approval ・ Budget for printing is secured. ・ Training strategy, programme, and orientation kit are completed.	・Submitted Textbooks ・Budget Plan of NDoE ・Delivarables	・Countrparts are continuously assigned to the Project. ・The budget for printing and distribution is disbursed and the Textbooks are printed and distributed. ・Obtain approval without delay
Output 1: The strategies and plans for the introduction of the Textbooks are formulated.	・The strategies including (a) -(e) specified in Activity 1-2 are submitted.	・Finalized deliverables	
Output 2: Drafted Textbooks in line with SBC are completed.	・Drafted Textbooks of G3-G6 are completed.	・Drafted Textbooks	
Output 3: The Textbooks and Teacher's Manuals with which students and teachers can easily understand the subject contents are qualified through quality assurance processes.	・Quality assurance records are complied ・Feedback from the quality assuarance process was reflected in the final drafts.	・Finalized deliverables ・Quality assurance record including the observation sheets.	
Output 4: The orientation kit for teachers to learn how to use the textbooks is developed.	・ Orientation kit is developed	・Finalized deliverables	

Activities for Output 1 1-1 Form a working group amongst CDD, TED, ELD, ID and MSD. 1-2 Formulate the following strategies and plans with budget plans for the introduction of the Textbooks: (a) the strategy for the printing and distribution of the Textbooks; (b) the strategy for the teacher education on the Textbook use; (c) the strategy for the introduction of the Textbooks to education colleges; (d) the strategy for the raising of awareness and monitoring on the Textbook use; and (e) the strategy for the reform of assessment tools in line with SBC. 1-3 Organize periodical meetings for WG. 1-4 Coordinate the Steering Committee. 1-5 Provide technical support to secure the budget for printing and distribution in line with the strategy (a). 1-6 Provide technical support to secure the budget for teacher education in line with the strategy (b).	Input -Japanese Side Dispatch of experts of: - Chief Advisor - Subject Specialists (Mathematics and Science) - Specialists of textbook development/Proofread - Coordinator - Other experts when necessary Provision of equipment - 1 vehicle - 1 photocopy machine - 8 computers -PNG Side Assignment of counterpart personnel: - Project Director: Deputy Secretary, Schools & Education Standards - Vice Project Director: First Assistant secretary, Curriculum & Measurement - Project Manager: Assistant Secretary, Curriculum Development Division - Curriculum Officers from Curriculum Development Division and E-learning Division - Additional 12 Subject Specialists to be selected from school teachers/lecturers * 6 for mathematics and 6 for science (See “6. Major Issues Discussed” below for details) - Members of the working group for the development of strategy on the introduction of the Textbooks (Output 3), composing of CCD, TED, ELD, ID, MSD and other relevant divisions. - Other personnel, if necessary Provision of the Project office and utility in NDoE - Office of CDD	
Activities for Output 2 2-1 Define procedures of development of textbooks and teacher's manuals. 2-2 Analyze curricula and develop a structure of contents/units to be taught. 2-3 Draft the Textbooks of Grade 3 to 6.		
Activities for Output 3 3-1 Select and appoint pilot schools and teachers. 3-2 Obtain feedback from teachers on the first drafts (first quality assurance). 3-3 Revise the first drafts based on the feedback from the first quality assurance. 3-4 Examine the second drafts through continuous tryouts of lessons at pilot schools (second quality assurance). 3-5 Conduct lesson observations on selected units at pilot schools with observation sheets to be developed in Activity 4-2 (second quality assurance). 3-6 Finalize the second drafts based on the feedback from pilot schools after Activities 3-4 and 3-5. 3-7 Edit and proofread them for completion. 3-8 Conduct baseline and endline surveys including the pilot schools at appropriate timings.		Preconditions ・Education Policy on the introduction of SBC and textbooks is maintained.
Activities for Output 4 4-1 Design an orientation kit with which teachers learn how to use the Textbooks in lesson. 4-2 Develop an observation sheet to check the user-friendliness of the Textbooks to teachers. 4-3 Try out the observation sheet in the process of the quality assurance（Activity 3-5), and finalize it. 4-4 Develop materials for the orientation kit based on the materials and feedback from the quality assurance process of activities for Output 3. 4-5 Try out the materials for modification. 4-6 Finalize the orientation kit including the observation sheet.		

* Number of Subject Specialists has been updated to reflect the current actual status