

Republic of Niger

FY2016 Ex-Post Evaluation of Technical Cooperation Project¹

“The Project on Strengthening of Mathematics and Science in Secondary Education in Niger Phase 2 (SMASSE-NIGER Phase 2)”

External Evaluator: Yutaka Yamaguchi, International Development Associates Ltd.

0. Summary

The project implemented training to strengthen the capacity of teachers in mathematics and science in secondary education principally by means of In-Service Training (hereinafter referred to as “INSET”) which introduced an approach to teaching methods (called the ASEI-PDSI approach²) and developed teaching materials.

From the time of ex-ante evaluation to ex-post evaluation, the improvement in the quality of education has been consistently proposed as a policy goal in Nigerien development policies. In addition, it had become an important issue to improve the quality of education by offering INSET to the increasing number of contract teachers. Further, the project is in accordance with the development policy of Japan at the time of planning, therefore its relevance is high. In connection with the project purpose “The capacities of mathematics and science teachers are strengthened through quality INSET”, achievement of the targeted indicators for the implementation of ASEI-PDSI was confirmed and its effectiveness proved to be high. With regard to the overall goal “The ability of Base II and Middle Education Cycle students in mathematics and science is improved”, the results of the beneficiary survey were employed as an alternative indicator, since the ratio of successful applicants for First Cycle Studies Certificate in Secondary Education (hereinafter referred to as “BEPC”³) proved to be inappropriate as an indicator to measure the level of academic achievement of students. The results of the beneficiary survey confirmed that there existed changes in the attitudes of students in the mathematics and science classes. The favorable changes in attitudes of students in class are considered to lead to an improvement in the academic achievement of students, which proves the positive impacts of the project. However, it was also confirmed that there exist many external harmful factors which produce negative influences on the achievement of the overall goal. These external harmful factors include a rapid increase in the number of

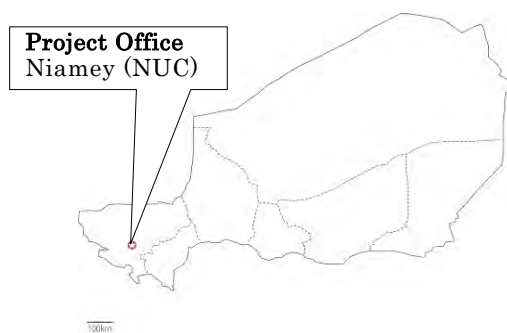
¹ In order to objectively measure the extent of improvement in science and mathematics classes at the time of ex-post evaluation, this ex-post evaluation also carried out in depth analysis by a Japanese researcher who had wide experience of direct and indirect involvement in the science and mathematics education improvement projects implemented by JICA in Asia and African countries. Selection of the researcher was done by the external evaluator, and subsequently agreed by JICA.

² Abbreviation of “Activity, Student-centered, Experiment, Improvisation-Plan, Do, See, Improve”, the catch words for the approaches that the project pursues, which represents the directions for the improvement of the lessons and the methodologies for them, through the active participation by the students, enhancing practical knowledge and promoting scientific and logical thinking in the class. Please refer “3.2.1.2 Achievement of Project Purpose” for further information.

³ Brevet d’Etude du Premier Cycle (BEPC)

students, lack of basic academic ability in primary education, some issues related to education in French, an increase in the number of contract teachers, and reduction in teaching hours due to strikes carried out by teachers and school boycotts by students. Considering these factors, the level of its effectiveness and impact is fair. The efficiency of the project is judged to be high, which is cost-efficient having its cost lower than planned and finished within its planned project period. Furthermore, the sustainability of the project is high. In order to continue INSET, the project owns necessary conditions in policy and institution background, in addition to that, which also secured necessary conditions in organizational, technical and financial aspects of the implementation agency. In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location (Niamey Urban Community and 7 regions)



Lesson on one of the mathematics and sciences subjects in a school of the first cycle of secondary education (Base II)

1.1 Background

In October 2003, the government of Niger issued the “Ten-Year Education Development Program (PDDE)” in relation to the expansion of primary education and aimed to achieve “Education for all (EFA)” by 2015 through the implementation of this program. In response to this, many development partners collaborated in primary education to expand it. However, support by development partners was limited in secondary education and which did not show much development.

According to the document for the preparatory study of the project, there existed approximately 470 public secondary schools and 6,200 teachers, 2,262 of which were in mathematics and science, at those schools in 2006. However, approximately 80 % of them were contract teachers, and most of them had not received teacher training or professional education in a Faculty of Education in university education. In addition, it cannot be said that the quality of education was high in secondary education. In most of secondary education, education that places emphasis on letting students memorize what is written on

the blackboard was prevalent, in which the level of understanding by students was not taken into consideration very much.

Therefore, it was indicated as an imminent issue to strengthen the capacity of core human resources and teachers in mathematics and science by INSET and other measures, in order to improve the quality of secondary education which places a basis for development of human resources playing important roles in the future of Niger.

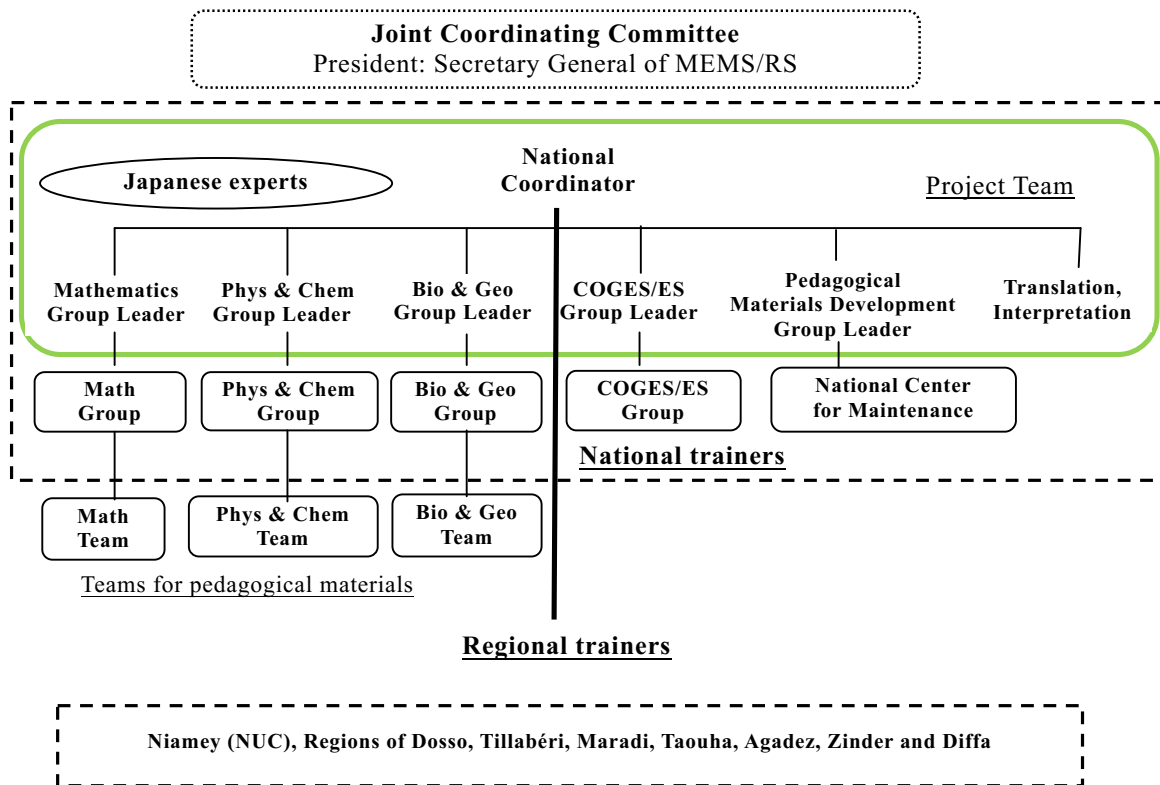
With this background, Japan International Cooperation Agency (JICA) implemented a technical cooperation project “Strengthening of Mathematics and Science in Secondary Education in Niger (SMASSE-Niger)” (hereinafter referred to as “Phase 1”) for three years from October 2006 to October 2009. The Phase 1 project conducted INSET in the three Regions of Niamey, Tillabéri and Dosso. After that, the government of Niger recognized the effects of the Phase 1 and requested the Japanese government to cooperate in a successive project to extend the implementation of the INSET to all of the eight Regions of the country and establishing a system of INSET.

1.2 Project Outline

Overall Goal		The ability of Base II and Middle Education Cycles students in Mathematics and Science is improved.
Project Purpose		The capacities of Mathematics and Science teachers are strengthened through quality INSET.
Output(s)	Output 1	The capacities of National Trainers are reinforced.
	Output 2	The National and Regional Training Structure is established.
	Output 3	The supporting system for the INSET Project is strengthened.
Total cost (Japanese Side)		226 million yen
Period of Cooperation		March 2010 to September 2013
Implementing Agency		Ministry of Secondary Education (MES); Ministry of Secondary and Higher Education, Research and Technology (MESS/R/T) at the time of ex-ante evaluation was renamed to Ministry of Higher Education and Scientific Research (MEMS/RS) during the project implementation period, which was changed into the MES in August 2013.
Other Relevant Agencies / organizations		-
Supporting Agency/Organization in Japan		-

Related Projects	<p>Technical cooperation: “Strengthening of Mathematics and Science in Secondary Education in Niger” Phase 1 (2006 - 2009), (SMASSE-Niger), “School for All: The project on Support to Educational Development through Community Participation” (hereinafter referred to as “School for All Project Phase 1”) (2012 - 2016), “School For All: The Project on Support to Educational Development Through Community Participation Phase 2” (hereinafter referred to as “School for All Project Phase 2”) (2016-2020), Follow-up Cooperation for Strengthening of Mathematics and Science in Secondary Education in Niger Phase 2” (Follow-up Cooperation for the project, hereinafter referred to as “Follow-up Cooperation”) (2014)</p> <p>Grant Aid: The Project for Construction of Secondary School in Niger (Grant Agreement signed in 2013)</p>
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The following is the organizational chart of the project.



Note: COGES/ES stands for “School Management Committee/ Secondary Education”

Source: Prepared based on Report of the Terminal Evaluation of the Project (JICA).

Figure 1: Implementation System of the Project

The Niger education system has six years of primary education, four years for the first cycle of secondary education (also called Base II), and three years for the second cycle of secondary education (also called Middle Education). The Phase 1 was concerned with the first cycle of secondary education. The project for this ex-post evaluation was concerned with both the first and the second cycles of secondary education. The Group Leaders of the project principally played a leading role in developing training texts/programs and new pedagogical materials for INSET, and conducted training in mathematics, physics/chemistry and biology/geology. For the purpose of developing pedagogical materials, a team for pedagogical materials for each subject was organized. National Inspectors were assigned to the posts of Group Leaders for the three subjects in mathematics and science, who had expert knowledge on these subjects and a wealth of teaching experiences. As indicated in Figure 1, INSET was conducted in a cascade method which was composed of centralized training conducted by national trainers who trained the regional trainers. Subsequently, the regional trainers conducted training at the regional level.

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement Status of Project Purpose at the Terminal Evaluation

Regarding the achievement of the project purpose, teachers' attitudes were evaluated from indicators of PDSI, and students' activities were evaluated by using indicators of ASEI. Teachers' attitudes obtaining a score of 2.3 which was higher than its targeted score of 2.0, which showed an improvement. Students' attitudes toward mathematics and science subjects obtained a score of 2.0 which was also higher than its targeted score of 1.5. Therefore, the project purpose was judged as being achieved.

1.3.2 Achievement Status of Overall Goal at the Terminal Evaluation

(Including other impacts.)

Although the ratios of successful applicants for BEPC showed a tendency to improve from 2010 to 2012, the ratios fluctuated depending on certain years in the previous years and it was difficult to analyze only the results in mathematics and science subjects separated from other subjects, as the ratios of successful applicants were made public only as aggregated results of all of the subjects. While many positive impacts were observed throughout the project, there existed negative factors in the examination of the achievement of the overall goal, such as a reduction in school hours caused by strikes carried out by teachers and deteriorating learning environments due to an increased number of students per class.

1.3.3 Recommendations from the Terminal Evaluation

At the time of the Terminal Evaluation, the following five recommendations were made. The recommendations from (1) to (4) were submitted to the Ministry of Higher Education and Scientific Research (MEMS/RS) and the recommendation (5) was submitted to the project team while they were active until the completion of the project.

(1) It is to be desired that the Ministry applies training methods and pedagogical techniques to other subjects.

(2) Establishment of a Department dedicated only to training of teachers, making good use of the human resources developed by the project.

(3) Extension of the pedagogical materials and their promotion

(4) Establishment of a system of teacher training and conducting teacher training continuously

(5) Reflecting experiences of the project on its operation plan in order to realize policies related to education quality

2. Outline of the Evaluation Study

2.1 External Evaluator

Yutaka Yamaguchi, International Development Associates Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: August, 2016 – September, 2017

Duration of the Field Study: November 7, 2016 – November 25, 2016

February 17, 2017 – February 24, 2017

2.3 Constraints during the Evaluation Study

In the western part of Niger, armed groups invaded from the neighboring country, Mali. In addition, in the southeastern part of Niger, Boko Haram provoked armed conflicts extending terrorism and kidnappings. Furthermore, strikes carried out by teachers and school boycotts by students continued at a national level. Because of these conditions, surveys conducted by the interview method organized by the external evaluator and a subsequent beneficiary survey conducted by local consultants were only completed in Niamey. As to the situation outside of Niamey, those who had teaching experiences in other regions were interviewed in Niamey. Relevant documents on the implementation of regional training were collected.

3. Results of the Evaluation (Overall Rating: A⁴)

3.1 Relevance (Rating: ③⁵)

3.1.1 Consistency with the Development Plan

The project is highly consistent with the development plan. With regard to development policies in the education sector, improvement in education quality has been consistently proposed. This development policy for improved education quality contained in the “Ten-Year Education Development Program (PDDE)” also continued in the “Education and Training Sector Program 2014-2024 (PSEF)” which was approved just before the completion of the project. It can be said that PSEF places more emphasis on quality in secondary education than the former program. It is because concerns have begun to increase over the ominous repercussion of rapidly expanding quantity in primary education and the effects on the quantity and quality in secondary education. In PSEF, the direction to place more emphasis on mathematics and science education proceeds.

3.1.2 Consistency with the Development Needs

The project is highly consistent with the development needs. The number of contract teachers was increasing according to the data both in the annual report of the Ministry of Secondary and Higher Education, Research and Technology (MESS/R/T) at the time of ex-ante evaluation and the annual report of the Ministry of Secondary Education (MES) at the time of project completion. On the other hand, pre-service training (hereinafter referred to as PRESET) in universities could not cope with the rapidly increasing needs of teacher preparation. Therefore, improvement of teachers’ quality by INSET became an important issue.

3.1.3 Consistency with Japan’s ODA Policy

Consistency with Japan’s cooperation policy is high. “ODA Country Factbook 2009 of Japan” indicates expansion in quantity and quality of basic education including the first cycle of secondary education as a priority area of Japanese cooperation toward Niger in 2009. Accordingly, the purpose of the project, “The capacities of mathematics and science teachers in secondary schools are strengthened through quality INSET”, is in accordance with Japan’s cooperation policy. The project was one of the various Japanese technical cooperation projects for the improvement of education in mathematics and science in Africa including Kenya by introducing teacher training, in which Japan had a comparative advantage.

⁴ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁵ ③: High, ②: Fair, ①: Low

In light of the above, this project was highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance was high.

3.2 Effectiveness and Impact⁶ (Rating: ②)

3.2.1 Effectiveness

3.2.1.1 Project Output

National inspectors worked for the project played a principal role in producing training texts /modules, and in developing new pedagogical materials for INSET in the three subjects of mathematics and science, 1) Mathematics, 2) Physics and Chemistry and 3) Biology and Geology. Evaluation results given by trainees on training materials were good. Thus "Output 1. The capacities of National Trainers are reinforced" could be regarded as mostly achieved by the time of project completion.

"Output 2. The national and regional training structure is established" was achieved, although during the implementation period of the project, the execution of a part of the training was delayed due to an increase in the government's expenditure caused by the Northern Mali Conflict. INSET was conducted in a cascade method which was composed of national and regional training. The project team planned the training. A training system was established for the training. For regional trainers, national training was conducted at the National Center for Maintenance of Pedagogical Materials. The national training was conducted by national trainers whose capacity had been enhanced by the project. Then regional training was implemented by the regional trainers in training sites in each Region.

"Output 3. The supporting system for the INSET project is strengthened" was achieved in the main. As scheduled, the project strengthened the roles of school principals and the School Management Committees in Secondary Education (COGES/ES) for the purpose of supporting INSET in mathematics and science. Institutionalization of an INSET system did not finish within the period of the project. This is because the Ministry of Secondary Education was newly established and took time in its administrative restructuring, although the MEMS/RS had already started the examination of institutionalization of INSET since the closing seminar held before the completion of the project. Hence, a part of Output 3 left unaccomplished. After the end of the project, the MES finished and approved the Guidelines⁷ for INSET system.

3.2.1.2 Achievement of Project Purpose

During the project period, achievement was confirmed with both of the indicators of

⁶ Sub-rating for Effectiveness is to be put with consideration of Impact.

⁷ MES, "Guidelines for In-service and Pre-service Training in Niger" (2015)

the project purpose, Indicator a. Teachers' attitudes and practice of ASEI-PDSI and Indicator b. Students attitude toward the mathematics and science classes.

ASEI are the first letters of Activity (toward a class with activity-based learning), Student-centered (change a teacher-centered class to a learner-centered class), Experiment (from theoretical learning to a class that includes experiments and practicum) and Improvisation (a class with simple experiments using improvised materials), which was used as an indicator to evaluate students' attitudes in class in the evaluation of the project. PDSI are the first letters of Plan, Do, See and Improve, a cycle of daily improvement and impetus to change the way of managing a class, which was used as an indicator to evaluate attitudes of teachers in the evaluation of the project. In checking the details of each indicator, a general improvement was observed in both of the indicators, and in all of the indicators of PDSI and those of ASEI. Therefore, it can be said that the project purpose was achieved.

Table 1: Achievement of Project Purpose

Project Purpose	Indicator	Actual
The capacities of Mathematics and Science teachers are strengthened through quality INSET.	Indicator a: Teachers attitude and practice of ASEI-PDSI obtain no less than 2.0 as the mean of ASEI-PDSI indicators based on the Project's monitoring and evaluation (M & E).	According to the survey conducted in 2013, a score higher than the target score of 2.0 was obtained (out of 4 point). The project purpose was achieved. The score was 1.0 by the baseline survey conducted in 2010 at the beginning of the project.
	Indicator b: Students involvement in class obtains no less than 1.5 as the mean based on Project's M & E.	According to the survey conducted in 2013, a score of 2.0, which was higher than the target score of 1.5 was obtained (out of 4 point). The project purpose was achieved. The score was 0.6 by the baseline survey conducted in 2010 at the beginning of the project.

Source: Report of the Terminal Evaluation of the Project (JICA)

3.2.2 Impact

3.2.2.1 Achievement of Overall Goal

(1) The academic ability of the students of the first cycle of the secondary education is improved. (Overall Goal)

BEPC is an indicator for the overall goal as a national end-of-year examination. The ratios of successful applicants who sat for BEPC showed a tendency to improve from 2010 (before the project began) to 2013 (when the project completed), and after the completion the ratios continued to rapidly decrease and increase. In addition, it was impossible to analyze only the results in mathematics and science subjects separated from other subjects, as the results of BEPC were judged with the results of all the subjects combined.

Furthermore, rapid changes in the ratios of successful applicants of BEPC were unusually large. A clear explanation has not been given as to the changes in the ratios and students' academic achievement by the Ministries that conducted those BEPC examinations. Further, no national examination other than BEPC is conducted in the first cycle of secondary education. Meanwhile, the Division of Academic Achievement Follow-up (DSAS) was created to measure changes in academic achievement produced by training within the Department of Pre-service and In-service Training (DFIC) in 2016; however, the DSAS is still in the process of developing its organization and has not initiated its activities yet. Therefore, it was confirmed that the measurement of academic achievement using the ratios of successful applicants of BEPC was difficult, due to the factors mentioned above and the fact that the influences produced by external conditions were substantial as described below, which affect all the subjects of secondary education.

Table 2: Ratio of Successful Applicants for First Cycle Studies Certificate in Secondary Education (BEPC)

2010	2011	2012	2013	2014	2015	2016
31.4%	35.9%	48.2%	46.8%	26.6%	45.9%	30.2%

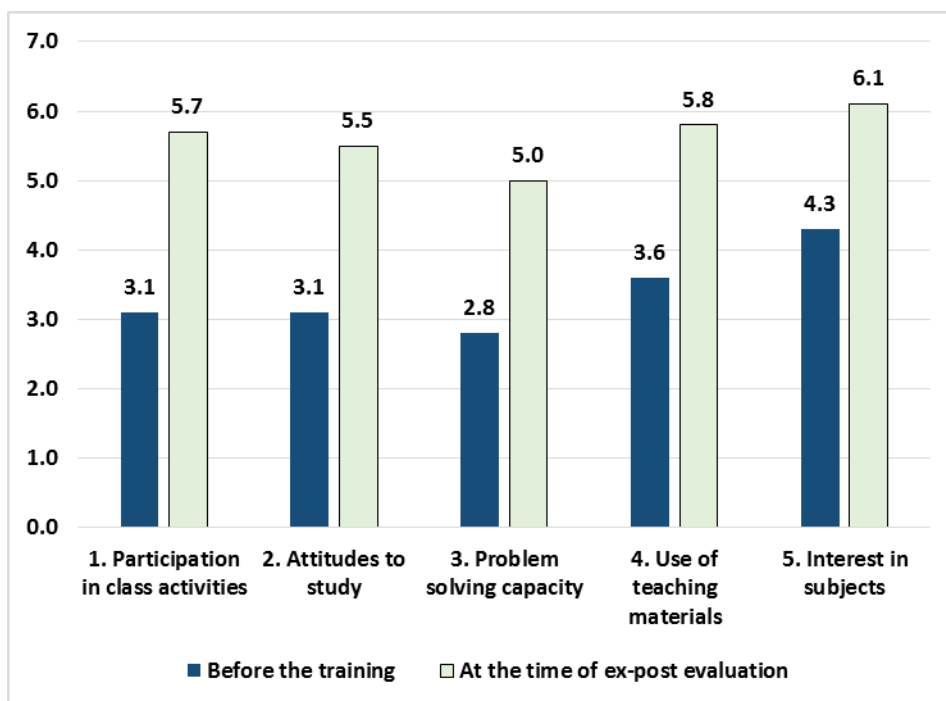
Source: Report of the Terminal Evaluation of the Project (JICA), Documents of DFIC, MES Statistical Yearbook (2017 provisional)

(2) Teachers' evaluation about changes in students' attitudes (alternative indicator)

Results of the questionnaire survey to teachers in the beneficiary survey⁸ were employed as an alternative indicator to measure changes in academic achievement of students in relation to the overall goal. Questions were asked to compare before the training and at the time of ex-post evaluation about changes in the attitudes of students (these changes correspond to Indicator b. Changes in the attitudes of students toward science and mathematics) observed by teachers who had received the training from the project. This is because it is conceivable that improvements in the attitudes of students in the classes of mathematics and science are quite likely to lead to improvements in the academic achievements of students. Targeting only trained teachers has an

⁸ In December 2016, a questionnaire survey was conducted to 101 teachers in mathematics and science who had received training by the project. The public secondary schools where the teachers work were chosen at random out of all of the five school districts of Niamey. The 101 teachers were selected, considering the real distribution of teachers among the three subjects of mathematics and science. The composition of number of the teachers with their subjects in charge was as follows: Mathematics 40, Physics and Chemistry 30, Biology and Geology 29, Mathematics and Physics/Chemistry 1, all of the three subjects of Mathematics, Physics/Chemistry and Biology/Geology 1. The 101 teachers break down into 79 male (78%) and 22 female (22%) teachers. (The percentages of male and female teachers in secondary schools in Niger were 75% and 25% respectively. There has been little or no change in the percentages, since school year 2013-2014 when the project completed.)

advantage of preventing the negative influences of external conditions such as subjects other than mathematics and science or recent increase of contract teachers.



Source: Beneficiary survey conducted by the ex-post evaluation

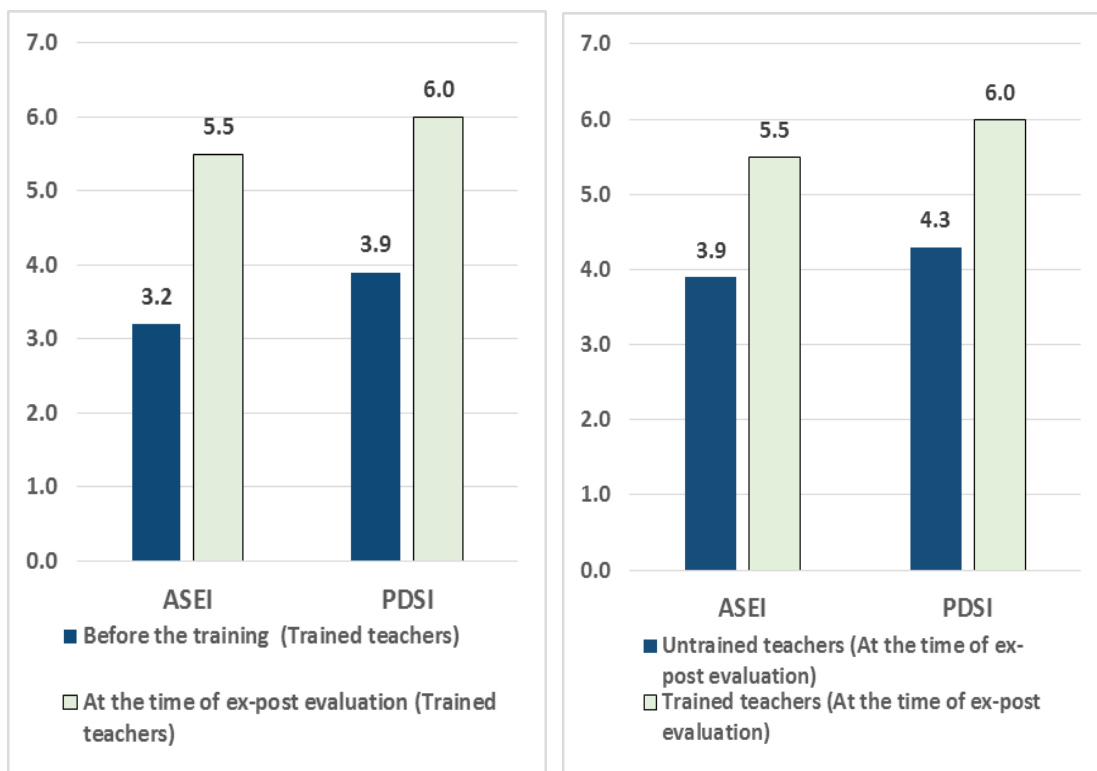
Note: Teachers evaluated their students' attitudes applying the seven-grade evaluation system

Figure 2: Students' Attitudes, Evaluation by Trained Teachers in Mathematics and Science

According to the results of this beneficiary survey, teachers evaluated that there existed improvement in students' attitudes in classes of mathematics and science, comparing before the training and at the time of ex-post evaluation (when the beneficiary survey was conducted in December 2016) (Figure 2). Favorable changes were reported in all of the five points of view: "Participation in class activities", "Attitudes to study", "Problem solving capacity", "Use of teaching materials" and "Interest in subjects". The same tendency was confirmed for both male and female teachers. The first four points of views⁹ were about the changes in students' activities expected to be produced as a result of changes in teachers' attitudes through the class evaluation and monitoring conducted by the project. The last point of view, "Interest in subjects", was often indicated as an effect of training in the report of the Mid-Term Review of this project and also in the interviews to teachers in the ex-post evaluation.

⁹ These four points of views for evaluations were used to observe changes in students' attitudes with a "Class Evaluation Sheet" prepared by the project for class evaluation and monitoring based upon the ASEI-PDSI approach.

Accordingly, these changes can be regarded as effects of change in teachers' attitudes (teaching capacity) (PDSI indicator), which are likely to lead to improvement in academic achievement of students namely impacts of the project. Thus, it was confirmed that there were changes in students' activities which will lead to improvement in their academic activities, with the beneficiary survey to teachers who had received the training using the alternative indicators.



Source: Beneficiary survey conducted by the ex-post evaluation

Note: Teachers evaluated their own activities and their students' activities from the points of view of ASEI-PDSI, applying the seven-grade evaluation system. Sample size: 101 trained teachers and ten untrained teachers in mathematics and science

Figure 3: Evaluation of Lessons by ASEI-PDSI Comparison between before and at the time of evaluation

Figure 4: Evaluation of Lessons by ASEI-PDSI Comparison between untrained and trained teachers

Likewise, an improvement was observed in both ASEI indicators to evaluate students' attitudes toward mathematics and science class and PDSI indicators to evaluate teachers' activities, according to the results of teachers' self-assessment of their class using ASEI-PDSI indicators, comparing before and after the training. Furthermore, differences were noted even when we compare the above results with the assessment of students' attitudes in lessons by untrained teachers by themselves, which

was lower than that of trained teachers, though the sample size was small¹⁰. These tendencies were equally observed, when the survey results were analyzed by gender. In light of the above, it can be presumed that there was an improvement in the teaching capacity of the teachers trained by the project.

(3) Situation of INSET after the project completion

After the completion of the project, the system of national and regional training has become well-established and the training continues. Through the system, delayed regional training were implemented; training contents were extended by lesson studies at the school level and the capacity of newly contracted teachers was improved, all of which contributed to the overall goal, “the improvement of the ability of secondary school students in mathematics and science” by strengthening the teaching capacity of mathematics and science teachers. Various types of training started to be implemented in addition to SMASSE type training implemented by the project (mathematics and science INSET based upon the ASEI-PDSI approach). Principally, three types of training are being conducted under the oversight of the DFIC: 1) SMASSE type training in mathematics and science, 2) Lesson studies by Pedagogic Units, and 3) PRESET for contract teachers. All of these activities of the DFIC were confirmed by interview and questionnaire surveys.

In December 2014, continuing the training system of the project, the DFIC conducted SMASSE type regional training for 612 teachers with funds from the national budget, the implementation of which was scheduled during the term of the project. Although the number of the participants was less than the planned number of 900, the DFIC conducted additional training for 972 teachers supported by United Nations Children's Fund (UNICEF) in 2016. Audio-visual training materials such as videos of model lessons were used in the above training which was conducted after the completion of the project, which was useful for an effective implementation of training. In addition, the DFIC plans to conduct similar training in mathematics and science. The plan has been included in the annual action plan of PSEF for 2017 (PAA2017).

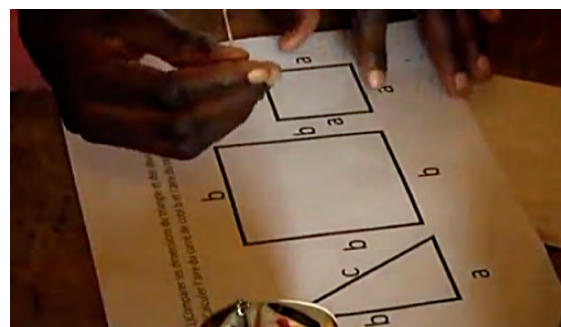
The activities of Pedagogic Units (groups of teachers who teach the same subject) were stagnated and inactive since long before the beginning of the project and were

¹⁰ In December 2016, a questionnaire survey was conducted to ten teachers in mathematics and science who had not received training by the project. The six public secondary schools where the teachers work were chosen at random out of the 3rd and the 4th districts of the five school districts of Niamey. The two districts were also selected at random. A questionnaire survey based upon ASEI-PDSI evaluation points identical to that of trained teachers was conducted to the ten teachers who had not received training of the project. The ten teachers were selected, considering the real distribution of teachers among the three subjects of mathematics and science. The composition of number of the teachers and their subjects in charge are as follows: Mathematics 4, Physics and Chemistry 3, Biology and Geology 3. The ten teachers break down into seven male and three female teachers.

limited mainly to adjustments of lesson schedules and normal communication among teachers, according to interview survey results. The project and its Follow-up cooperation promoted arrangements for an In-School INSET using Pedagogic Units as a system of INSET at the school level¹¹. Furthermore, a system was created to conduct training by multiple Pedagogic Units in supporting each other, combining several neighboring schools into a cluster. With this system, an integrated system of training was established utilizing Pedagogic Units in addition to training in the cascade method by the project. This organization is able to provide significant direction for improvement, although it is not an easy task to promote the activities of Pedagogic Units. Financial support from the Quality Education Support Project (PAEQ 2014-2018) of the World Bank was also allocated to training by the DFIC to promote Pedagogic Units' activities in 2016.



A teaching material for a laboratory experiment in geoscience developed by the project (seismograph)



A teaching material used in model lessons in mathematics

PRESET has high needs. By school year 2015-2016¹², the number of contract teachers increased by 109% compared with the time of ex-ante evaluation, increasing to as many as 10,351. The DFIC is in charge of PRESET for the increasing number of newly contracted teachers in secondary education. PRESET for contract teachers had been conducted and suspended before the beginning of the project according to the

¹¹ Already existed teachers' groups of the same subject are currently called as Pedagogic Units by Subjects. Implementation of lesson studies were added to the functions of them. Implementation of In-School INSET become clearly a part of their functions. In addition, Pedagogical Units were also created organizing teachers of multiple neighboring schools in natural science and humanities to identify training needs and conduct lesson studies on specific issues. The foundation of these are defined by Ministry Decree No. 00186 of April 30, 2015 on the creation and the roles of Pedagogical Units by Subjects (UPD), Pedagogical Units for Scientific Subjects (UPS) and Pedagogical Units for Literature and Human Sciences (UPL/SH). Lesson studies by Pedagogical Units were initiated by the project. Then the Follow-up cooperation promoted the development of the system. The arrangements for the establishment of a system progressed, however it seems that it still takes time to begin to conduct their practical activities sufficiently.

¹² School years in Niger begins in September or in October and ends in June or in July, the dates of which differ slightly depending on year. In this report, a school year which begins in 2015 and ends in 2016 is described as 2015-2016.

DFIC, and restarted in the last school year of the project of 2013-2014¹³. Then until the time of ex-post evaluation, the DFIC has been implementing the training continuously supported by the World Bank's PAEQ. Regional inspectors work as trainers for PRESET for contract teachers, in mathematics and science with many of them being former regional trainers of the project. The contents of the present PRESET include preparation of lesson plans based upon ASEI-PDSI.

(4) Negative external factors for the overall goal

Following are possible major negative factors which prevent the outputs and the project purpose from producing continuing effects on the overall goal indicators: (a) Deterioration in learning environments by a rapidly increasing number of students, (b) Lack of basic academic ability in primary education, (c) Problems caused by difficulty in learning French which is a prerequisite for academic ability, (d) Increasing the number of contract teachers, (e) Reduction in teaching hours due to strikes carried out by teachers and school boycotts by students.

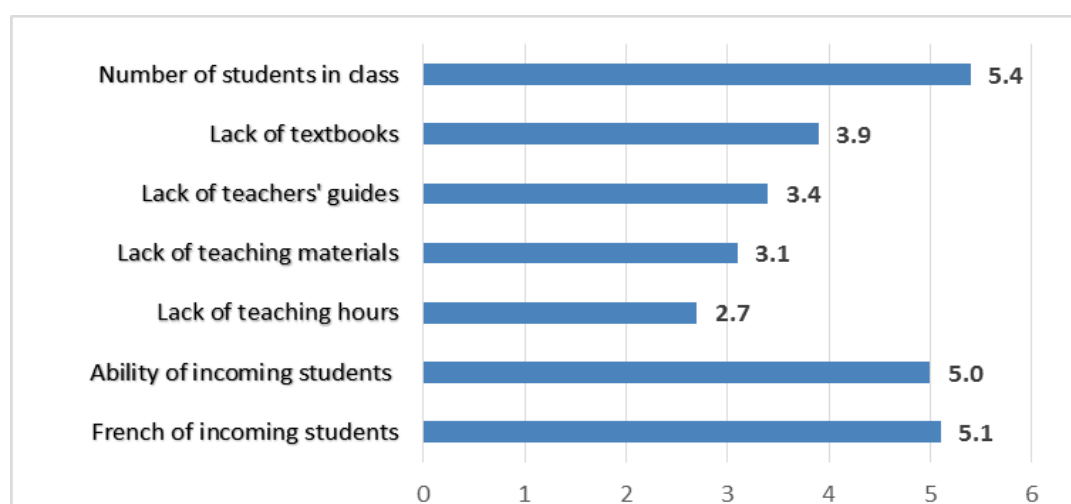
Learning environments seem to have deteriorated due to an increased number of students per teacher in public secondary education, which is demonstrated in the estimated average number of students in a class with regard to changes in the student-teacher ratio. According to MES statistics, the number of students in the first cycle of secondary education increased by approximately 126% in six years, from 253,643 in 2009-2010 at the beginning of the project to 571,117 in 2015-2016 (Average annual growth rate approximately 13%). The number of students in the second cycle of secondary education increased by approximately 176% in six years from 33,134 in 2009-2010 at the beginning of the project to 91,532 in 2015-2016 (average annual growth rate approximately 16%)¹⁴. The rapid increase in the number of students in secondary education was caused by a rapid increase in the number of incoming students from primary education. In PSEF, a plan was proposed to decrease the ratio of incoming students to secondary school from primary school in order to restrict increasing number of students from primary education. This measure was planned to cope with an expected rapid increase of students in secondary education caused by the expansion in primary education and to maintain quality of incoming students. However, the ratio did not reduce for incoming students from primary education in the first cycle of secondary education in school year 2013-2014. Furthermore, the Ministry of

¹³ Pre-service training for contract teachers has not been implemented by the project. However, it can be said that the development of a training system by the project contributed to the smooth restart of them. Example of such development include the establishment of DFIC, a system for national/regional training and training of trainers for inspectors.

¹⁴ The change in the number of students are according to annual reports of MESS/R/T (2009) and MES (2016 and 2017).

National Education abolished the examination for the Certificate of the end of studies in primary school (CFEPD), which contributed to the rapid increase in incoming students.

Lack of basic academic ability in primary education was clearly demonstrated in recent tests conducted by the World Bank and the Analysis Programme of the CONFEMEN Education Systems (PASEC) in 2014, which compared the academic ability in West African countries. In the results of the tests, Nigerien student's performance of French and Mathematics in primary schools was of one of the lowest levels in the region. The PASEC indicated a lack of understanding of the students' instruction language- French, as one of the possible causes of low performance in basis educational ability¹⁵.



Source: Beneficiary survey conducted by the ex-post evaluation

Note: About the seven problems indicated above, the teachers were asked to evaluate the importance of their problems in conducting lessons in the class, applying the seven-grade evaluation system: the least important as 1 and the most important as 7. The numbers in the Figure 5 show the average values of the evaluation.

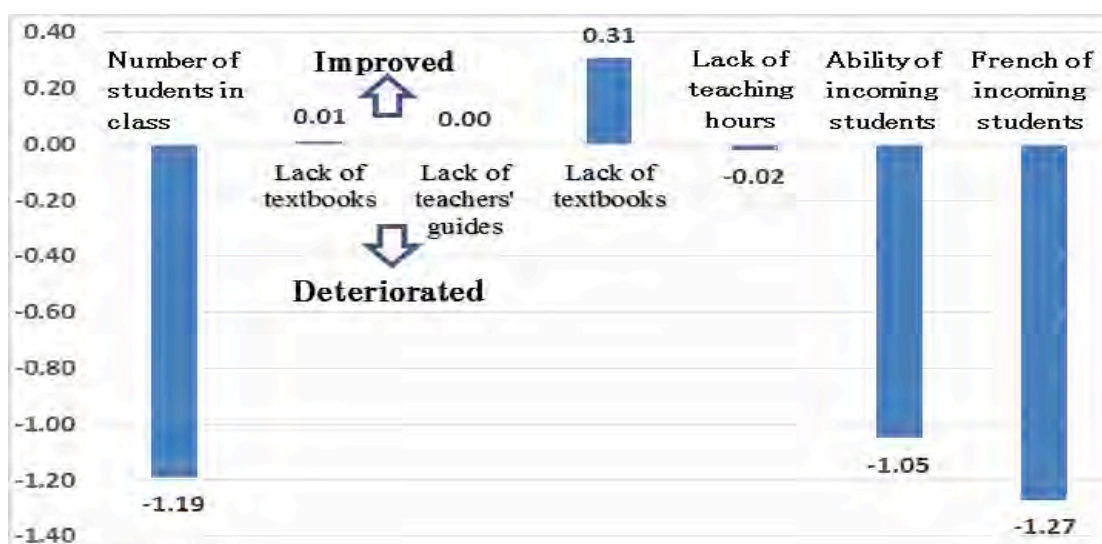
Figure 5: Importance of Problems in the Class

The beneficiary survey confirmed that the following were three important problems perceived by teachers which were becoming more serious after the completion of the project. The three problems are namely: (a) Deterioration in learning environments by rapidly increasing number of students, (b) Lack of academic ability in primary education and (c) Problems caused by difficulties in learning French which is a

¹⁵ Reports by the PASEC: "PASEC2014 Education System Performance in Francophone Sub-Saharan Africa, Competencies and Learning Factors in Primary Education (2015)" and "PASEC 2014 Performances du système Éducatif nigérien Compétences et facteurs de réussite au primaire (2016)"

prerequisite for academic ability¹⁶. In the beneficiary survey, considering the situations mentioned in this section, the evaluator asked 101 teachers in mathematics and science trained by the project about the importance of seven issues which the evaluator considered problematic in conducting lessons. Then, the survey also asked questions about changes in the importance of those issues compared with 2013 when the project was completed and at the time of ex-post evaluation (Figures 5 and 6).

The results of the survey confirmed that the above three issues of “Number of students in a class”, “Academic ability of incoming students” and “French ability of incoming students” are perceived as being more important by teachers in conducting lessons. Furthermore, they had a tendency to answer that these issues had deteriorated compared to 2013 when the project finished and at the time of ex-post evaluation.



Source: Beneficiary survey conducted by the ex-post evaluation

Note: About the seven problems indicated above, the teachers were asked about the changes in the problems in conducting lessons in the class, whether the problems showed improvement or deterioration compared with the year 2013: Deteriorated -2, Deteriorated a little -1, No change 0, Improved a little 1, Improved 2. The numbers in the Figure 6 show the average values of the evaluation.

Figure 6: Changes in Problems in the Class

The increase in number of contract teachers is also an external factor which affects the indicators of the overall goal. The problem of the increasing number of students was dealt with continuously by replenishment of contract teachers without any

¹⁶ In Niger, national languages such as Hausa and Zarma are used in daily life, while French is used as medium of instruction in school education. Students learn French through school education (in some secondary school students learn both French and Arabic as languages of instruction). Introduction of education using national languages has been delayed, applying it only to some experimental schools. From 2016, introduction of textbooks has initiated in the first two years of primary schools from for the purpose of using national languages as medium of instruction.

PRESET, since the system for PRESET was not functioning sufficiently. The number of contract teachers rapidly increased from 4,955 in 2008-2009 to 10,351 in 2014-2-2015, although the ratio of contract teachers' numbers to the total number of teachers decreased from approximately 80% to 63% in the same period. The employment of so many contract teachers without any PRESET meant an increase in the percentage of untrained teachers in the total number of teachers in mathematics and science, for all subsequent training conducted by the DFIC in those subjects. Consequently, it can be considered that this situation may have produced negative influences on the efforts to improve academic ability in mathematics and science.

Table 3: Distribution of Secondary Teachers in Public Schools according to Their Status

Unit: person

	Civil Servants	Contract Teachers	Volunteer Teachers	Others	Total
2008-2009	933	4,955	322	58	6,268
Ratio (%)	14.9%	79.1%	5.1%	0.9%	100%
2015-2016	4,715	10,351	100	11	15,177
Ratio (%)	31.1%	68.4%	0.7%	0.0%	100%

Source: Statistical Yearbook MESS/R/T (2009) and MES (2017 provisional)

School hours decreased because of more frequent strikes carried out by teachers and school boycotts by students, however there exists no statistical documentation on this issue. The increased frequency of the strikes and the boycotts was noticeable. In fact there was only one week without any such incident from the beginning of the school year until the third week of November 2016 when the first ex-post evaluation mission ended, even though the second cycle of secondary education had started in the middle of September and the first cycle had started in the beginning of October in 2016-2017, according to the interview results with inspectors, pedagogic counselors and teachers. Various teachers' unions in Niger possess nation-wide communication and cooperative organizations, through which strikes are often conducted on a nation-wide scale. Accordingly, the strikes usually exert a nation-wide influence.

From the below, the overall goal is regarded as achieved using an alternative indicator. Meanwhile, it is confirmed that there does not exist any examination in mathematics and science to measure the achievement of academic ability including BEPC. In addition, there are significant external factors that provide negative impacts on academic achievement. Therefore, it is difficult to measure precisely the level of achievement of the overall goal.

Table 4 Achievement of Overall Goal

Overall Goal	Indicator	Actual
The ability of Base II and Middle Education Cycles students in Mathematics and Science is improved.	Indicator a: Performance in the End of Year Exams improves.	It is confirmed that the ratios of successful applicants of BEPC is not suitable as an indicator for the overall goal. The rapid changes in the ratios were unusually large.
	Indicator b: Performance of students in Mathematics and Science through the evaluation of learning achievements test improves.	No national examination other than BEPC is conducted in the first cycle of secondary education.
	Alternative indicator: Attitudes of students in the lesson are improved, according to the evaluation by trained teachers in mathematics and science.	The teachers evaluated that there existed improvements in the attitudes of students in the lessons of mathematics and sciences, compared with before the training and at present. Positive changes were reported in the results of teachers' self-assessment of their class of mathematics and science.

Source: Prepared based on Report of the Terminal Evaluation of the Project (JICA), answers to questionnaire survey for the implementing agency, and results of interviews and the beneficiary survey at the time of ex-post evaluation

3.2.2.2 Other Positive and Negative Impacts

It has also become easier to implement training for subjects other than mathematics and science, due to the institutionalization of INSET to which the project has contributed. By surveys undertaken through interviews and the collection of information on DFIC's activities, it was confirmed that training in other subjects was initiated using as a reference the project's model for national and regional training. The DFIC was established based upon a recommendation of the project and is in charge of training in all the subjects of secondary education. All the subjects are dealt with in the lesson studies training by Pedagogic Units and the PRESET for contract teachers.

The new training system covers not only INSET but also PRESET according to the Guidelines, the preparation of which the project initiated and the DFIC completed after the end of the project. The Guidelines made clear that the related organizations and their roles demonstrate an integrated system of training including both INSET and PRESET. The Higher Normal School (ENS), a teacher training school for secondary education, has not been able to cope sufficiently with the increasing needs of PRESET even after the completion of the project, although the roles of each organization related to training were clearly defined in the Guidelines¹⁷.

¹⁷ The number of students in all the courses in ENS was only 895 in 2012-2013 and 1,054 in 2014-2015 (Statistical annuals of Niger 2016). It cannot be said that ENS is complying with rapidly increasing demands for teacher training. Not only training for teachers, the courses being conducted in ENS include training for higher officers in the management of secondary schools such as school principals, Pedagogic Advisors and Inspectors.

Not only In-School INSET, the roles of Pedagogic Units include other varieties of activities such as arrangements for lesson scheduling, selection of teaching materials and preparation of lesson plans. The activities of Pedagogic Units are supported by the project and the Follow-up cooperation and the roles of which are well defined in the Guidelines and a Ministerial decree. Their contents are incorporated into the training modules to make them known to teachers, school principals and inspectors to improve the performance of Pedagogic Units. This was confirmed through the surveys conducted on training texts, modules and other related documents of the DFIC.

The project's pedagogical materials played a pioneering role in francophone African countries. The pedagogical materials are digitalized on PDF or DVD, which has an advantage of making their use and technical transfer easier as examples¹⁸.

Furthermore, recently the number of private secondary schools has been increasing in Niger, and these schools have been playing a more important role accordingly. In private schools, contract teachers including freelance teachers are in the majority (approximately 93% according to the Annual report of the MES of 2017). In order to have a better reputation, many private schools would like to employ better teachers from public schools on freelance contracts. Consequently, many teachers trained by the project also teach in private schools. Therefore, it can be considered that the project actually has had influences on private schools as well.

In light of the above, this project has to some extent achieved the project purpose and overall goal, and the effectiveness and impact of the project are fair. For the project purpose "The capacities of mathematics and science teachers are strengthened through quality INSET" was achieved. The overall goal can be evaluated as partially achieved, since impacts were observed with alternative indicators measuring changes in students' activities which are expected to lead to an improvement in the academic achievement of students. Furthermore, substantial quantity of INSET was implemented after the end of the project. In addition, other positive impacts were also confirmed. However, improvements in the academic activities were not able to be confirmed due to the fact that BEPC was found to be inappropriate as an indicator. Finally, also confirmed were significant influences produced by negative external factors which prevent the sound development of the above impacts.

¹⁸ JICA projects for mathematics and science education implemented in francophone countries such as Burkina Faso and Senegal targeted for primary education. The Niger's project is the first in French speaking countries and took a pioneering role in producing audio-visual pedagogical materials, which seem to have served as reference in producing pedagogical materials in other countries.

3.3 Efficiency (Rating: ③)

3.3.1 Inputs

3.3.1.1 Elements of Inputs

In general, considering the outputs produced, the elements of inputs of the project were considered to be appropriate. With regard to long-term experts, one expert was dispatched for INSET/project management, and the other for education in mathematics and science education. Short-term experts were dispatched in support of the production of audio-visual training materials to make up for a deficiency of technicians in that field in Niger. The Niger side allocated seven project team members including national inspectors in mathematics and science and the head of the National Center for Maintenance of Pedagogical Materials, and they worked almost exclusively with the project. In addition, the project provided third-country training by “Strengthening of Mathematics and Science Education - Western, Eastern, Central and Southern Africa” (SMASE-WECSA), which is a Kenya-based mechanism for regional cooperation in mathematics and science. Further training in Japan and training for statistics in Senegal were also implemented by the project.

Table 5: Planned and Actual Inputs

Inputs	Plan	Actual
(1) Experts	Long-Term: 2 Short-Term: if necessary	Long-Term: 2 Short-Term: 4
(2) Trainees received	Not mentioned	Training in Japan: 7 Third-country Training: 28 (20 in Kenya, 5 in Senegal and 3 in France)
(3) Equipment	12 million yen (a vehicle for monitoring, office equipment and others)	10 million yen (a vehicle for monitoring, office equipment and others)
Japanese Side Total Project Cost	250 million yen including expenses for local cost (91 million yen)	226 million yen which including expenses for local cost (66 million yen)
Nigerien Side Total Project Cost	259 million CFA francs including expenses for training and monitoring activities from the second year of the project	91 million CFA francs including expenses for central/regional training and monitoring activities

Source: Ex-ante project evaluation sheet, Basic design study report and documents provided by JICA

3.3.1.2 Project Cost

The project cost was lower than planned. The project produced planned outputs with a relatively small cost. The reasons why the project could produce outputs with a small cost are as follows: 1) The project made good use of technical inputs in the Phase 1 project such as third-country experts and training in a third-country provided by the SMASE-WECSA; and 2) The Niger side assigned many counterparts including inspectors and pedagogic advisers who had expert knowledge on subjects and a wealth of experiences in advising teachers, and they could adapt the transferred technologies into the Niger situation. Consequently, inputs from the Japanese side were kept low and the total cost did not become a large amount. Cost for equipment and expenses for local expenditure were also lower than planned.

3.3.1.3 Project Period

The project period was as planned. The planned period was three and a half years from January 2010 to June 2013. A review of the plan of operation became necessary due to the coup d'état carried out on February 18, 2013. After the coup d'état, an agreement was reached on a modified plan of operation. The period was changed into three and a half years from March 2010 to September 2013.

In light of the above, the project cost was lower than planned and the project period was as planned. Therefore, its efficiency is high.

3.4 Sustainability (Rating: ③)

3.4.1 Related Policy and Institutional Aspects for the Sustainability of Project Effects

In June 2013, PSEF was approved by the government of Niger as a concrete sector development plan. Further, the Technical and Financial Partners (PTF) for Niger decided to support PSEF in July 2013. The PTF offers support consistent with the Global Partnership for Education, and the World Bank which is the supervising organization for the common fund. In addition to primary education, secondary education started to receive assistance from many development partners with the above cooperation from PTF. “Means to improve quality of learning” is one of the three principal cooperation areas of PTF in supporting PSEF, in which the improvement of the capacity of teachers and personnel related to the management of schools are included. The sustainability of the project is enhanced, due to the start of the cooperation for INSET in secondary education.

The DFIC was established in the MES based upon the suggestions provided by the project, which prepares guidelines/manuals and conducts INSET in accordance with

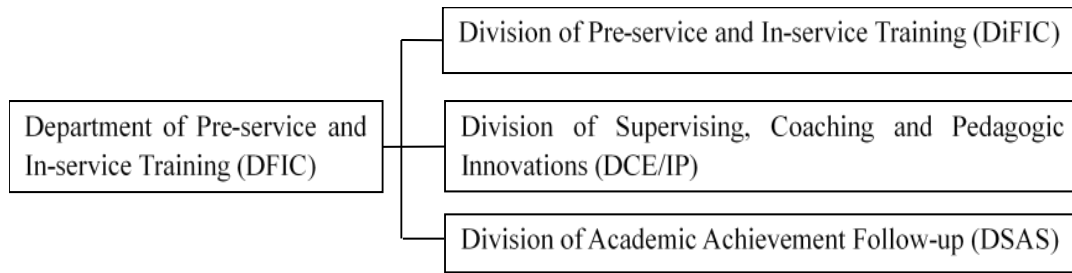
the “Education and Training Sector Program 2014-2024”. The Guidelines were approved by the Ministry of Secondary Education and an administrative and regulatory mechanism was established.

3.4.2 Organizational Aspects for the Sustainability of Project Effects

There had been a complicated relationship between the Ministry of National Education and the MEMS/RS. In 2011, administration of the first cycle of secondary education was transferred to the Ministry of National Education, meanwhile the MEMS/RS continued its INSET. However, this problem was solved, when the establishment of the MES was decided in August 2013 just before the completion of the project and subsequently the restructuring of the MES progressed succeeding both the administration of the first cycle of secondary education and its INSET. After the completion of the project, the organizational and personnel restructuring progressed, which were defined clearly in a Ministry decree.

The Department of Pre-service and In-service Training (DFIC) prepares policies of INSET and implements INSET, which belongs to the General Department of Training, Examination and Selective Tests (DGFEC). The director of the DFIC is in charge of definition, making and implementation of national policies and strategies, and supervision of monitoring/evaluation¹⁹. In addition to the director and deputy director, the DFIC is composed of three Divisions: 1) the Division of Pre-service and In-service Training (DiFIC), 2) the Division of Supervising, Coaching and Pedagogic Innovations (DCE/IP) and 3) the Division of Academic Achievement Follow-up (DSAS). The DiFIC plans and administrates the implementation of INSET, which produced many results described in “3.2.2 Impacts” since the establishment of the DFIC in 2014. The Coaching and Pedagogic Innovations (DCE/IP) examines the training contents, and the DSAS is in charge of the impacts of training on academic achievement. The details of work contents of the DCE/IP and the DSAS are still in the process of being defined. The DFIC has been actively expanding training, which started to require further improvement in the training contents of subjects other than mathematics and science. The DFIC plans to increase the number of the staff of the DCP/IP, so that at least one staff can be assigned to each subject, according to the interview results of the ex-post evaluation.

¹⁹ Decree No. 00115 of July 10th 2014 about organizations of the central services of the Ministry of Secondary Education and definitions of their responsibilities



Source: Decree No. 00115 of MES 2014

Figure 7: Organization Chart of the DFIC

In the training at the regional level, many trainers are inspectors of the Regional Pedagogic Inspection Offices (IPR) and pedagogic advisors of the Department Office of Secondary Education (DDES). In many cases, the DFIC is in charge of training for these regional trainers at the central level. The DFIC guides, administrates, trains the trainers and evaluates the training. Needs surveys and implementation of training in the region are conducted at the levels of the deconcentrated services and schools. At the regional level, the Division for Training is established in each Regional Office of Secondary Education (DRES). At the Departmental level, which is under the regional level, a person in charge of training is assigned to each DDES. The MES deconcentrated the responsibilities to the regions, making the directors of the DRES responsible for the implementation of teacher training at the regional level from 2015. The director of the DRES selects places for training and assigns trainers and supervisors. The Regional Pedagogic Inspection Offices (IPR) plan training activities and implement in-service training for teachers and pedagogic advisers, in the areas where they are in charge²⁰.

At the school level, Pedagogic Units by Subject (UPD) conduct lesson studies as In-School training. Teachers who have a wealth of teaching experiences are selected and assigned to the leaders of the Pedagogic Units by school principals who act as coordinators of the UPD. Further, Pedagogical Units for Literature and Human Sciences (UPL/SH) and Pedagogical Units for Scientific Subjects (UPS) were organized combining several neighboring schools into a cluster. In addition, the MES issued a decree on the COGES/ES in June 2016, and subsequently “School for All Project Phase 2” started in December of the same year. “School for All Project Phase 2” covers secondary education for its cooperation. The project intends to strengthen the roles and the capacities of the school management by the COGES/ES, which can be expected to contribute to an improvement in the quality of education, including

²⁰ Decree No. 0082 of February 23th, 2015 about organization of deconcentrated services of the Ministry of Secondary Education and definitions of their responsibilities

mathematics and science. For example, in order to share the expenses of schools, the COGES/ES collects funds from the parents, and these funds can be used to improve quality of education in mathematics and science. The results of the questionnaire surveys conducted by the ex-post evaluation for the school principals confirmed that the funds were used to share expenses that contribute to quality of education, as applied to the costs of copying documents, purchasing of teaching materials and others²¹.

3.4.3 Technical Aspects for the Sustainability of Project Effects

It can be said that technical transfer and knowledge sharing within the DFIC are enabled, this is because the counterparts of the project serve as core members of the DFIC providing guidance to other members. The manuals and modules of the project are also shared among the members. These human resources inherit the technical knowledge of the project and maintain the following capacities: (a) capacity to produce training materials, (b) capacities to manage training in mathematics and science, and (c) capacity to produce training manuals. They produce TOR of training programs and conduct many training sessions after the end of the project. The evaluator's visit to the DFIC revealed that the documents produced and the equipment provided by the project are continuously used. The results of the interview survey found that the National Center for Maintenance of Pedagogical Materials continues to participate in the training in mathematics and science, which took an important role in the development of teaching materials and in the preparation of experiments in training during the project. The counterparts and members of the Teams for pedagogical materials remain in the National Center and continue in assisting the training of the DFIC, which was confirmed at the time of ex-post evaluation. Furthermore, national and regional trainers of the project participate as trainers in the training in mathematics and science, which have been continuously implemented after the end of the project. Consequently, their technical capacities are maintained.

According to the questionnaire and interview survey results regarding the DFIC, many national and regional trainers serve as trainers in the sessions for mathematics and science in other types of training such as PRESET, and they make good use of their past experiences as trainers in the project. Support to Pedagogic Units was not included in the plan at the time of ex-ante evaluation. This support, when started, was expected

²¹ In the beneficiary survey of December 2016, a questionnaire survey was conducted to at randomly selected 20 school principals of public secondary schools of Niamey city. The survey was conducted to obtain information on the support to education in mathematics and science using share of expenses collected from parents who were members of the COGES/ES. The following are the results obtained from the targeted 20 schools regarding the use of share of expenses: 19 schools for "cost for copying various related documents including mathematics and science", 13 schools for "small amount of expenses for teaching and experiment materials in science", nine schools for "transport fees of laboratory equipment" and four schools for "rehabilitation of laboratories".

to play a complementary role for the regional training, and subsequently it continued receiving the Follow-up cooperation. While the number of less inexperienced contract teachers is rapidly increasing, it cannot be said that the Pedagogic Units' capacity to conduct training has reached a satisfactory level.

3.4.4 Financial Aspects for the Sustainability of Project Effects

Support to the PSEF by the Technical and Financial Partners (PTF) for Niger was decided in July 2013, by the signing of an endorsement letter to guarantee the support and agreeing on the creation of the common fund (2014-2018). With these arrangements, secondary education also became a target of the common fund. Accordingly, the funds from development partners are being allocated to INSET, in addition to the national budget²². With the above document, the PTF plans to support the PSEF until 2024, therefore continued financial support is expected to be secured. Relatively stable financial support can be expected from the common funds, meanwhile the national budget can be sometimes affected by expenditures related to security issues²³. The situation has changed significantly compared with the project period from when the cooperation from other development partners than JICA was limited for INSET in secondary education.

Table 6 indicates the budget distribution of the MES in the budget of 2016. Salary and wages for contract teachers approximately account for 64% of the total budget. The personnel expenses occupy a major share of the budget. A budget allocation for INSET is secured as described below in the part of annual budget plan (PAA) based upon PSEF, after the end of the project. The portion of expenditure is large for the training in mathematics and science. The budget for training is allocated from various types of budget items such as: 1) the budget for "Staff training expenses" to PRESET for contract teachers, 2) the budget for "Support for Pedagogic Units" to training for lesson

²² Quality Education Support Project (PAEQ); a project with which the World Bank supervises and finances the funds by the Global Partnership for Education (GPE) as a grant aid. Funds from the French Development Agency (AFD) were also added to the funds. In addition to the PAEQ, there exists coordination among various development partners including international organizations through the framework of the PTF in order to support the implementation of the PSEF. The implementation period of the PAEQ is expected to be extended for one more year, according to interview results with development partners.

²³ Generally speaking there has not been a substantial change in the mechanism of the budget requests by the ministries and the budget spending by the Ministry of Economy and Finance from the period of the project implementation. Some measures to improve the spending of the budgets are included in the PSEF, such as a measure that enables the Ministries to start the procedures for procurements earlier. The PSEF indicates the target budget execution rates to achieve (regarding the procurement of goods and services) by the education-related Ministries, setting goals to increase to 85% in 2016 and to 100% in 2024. However, the situation is the same as the time of ex-ante evaluation in which the Ministry of Economy and Finance possesses a strong authority over the budget management of the other Ministries. The budget expenditures on security issues continue to restrain the budget. In 2013 when the project finished, acts of terrorism by al-Qaeda-linked groups and armed attacks by Boko Haram militants started to increase, in addition to the conflicts in Mali. Afterwards, armed conflicts with Boko Haram continue in some parts of the Region of Diffa.

studies by Pedagogic Units, and 3) the budget for “Development of scientific and technology education” to training for teachers in mathematics and science. Similarly, the training budget for curricular amendments is allocated from the budget of the “Curriculum development”. Additionally, a Grant Aid by JICA “The Project for Construction of Secondary School in Niamey city” plays an important role in dealing with the issues related to the rapidly increasing number of students in the first cycle of secondary education.

Table 6: Budget Distribution of the Ministry of Secondary Education (2016)

Unit: Million of CFA francs and %

	Amount	Ratio
1. Salary	10,032	28.8%
2. Operation costs	5,880	16.9%
3. Subventions and transfers	14,523	41.7%
(Wages for contract teachers)	(12,177)	(35.0%)
(Staff training Expenses)	(108)	(0.3%)
(Support for Pedagogic Units)	(102)	(0.3%)
4. Investment	4,371	12.6%
(Development of scientific and technology education)	(189)	(0.5%)
(Secondary school construction project of JICA)	(2,331)	(6.7%)
Total	34,806	100.0

Source: Annual plan of Activities for PSEF of MES

Table: 7 Financial Plan of Budget 2016

Unit: Million of CFA francs and %

	Amount	Ratio
1. National budget	32,475	64.3%
2. International cooperation	7,127	14.1%
GPE/AFD (Project PAEQ)	(3,685)	-
Luxembourg	(744)	-
JICA	(2,339)	-
UNICEF	(0.2)	-
UNFPA	(158)	-
Others	(201)	-
3. To be decided	10,915	21.6%
Total	50,517	100.0

Source: Annual plan of Activities for PSEF of MES

Table 7 indicates the financial resources of PSEF, including the budget of the MES, in the financial plan of budget 2016. An increased amount of the budget is committed by international development partners, compared with the period of the project implementation. The part “to be decided” will be financed by either the national budget

or in cooperation with development partners. For example, UNICEF financed 60 million CFA francs for the support of the training in mathematics and science similar to the project in November 2016, although UNICEF’s original budget plan was only 0.2 million CFA francs at the stage of the budget plan. In addition to UNICEF, a project (GPE/AFD: Project PAEQ) supervised by the World Bank supports INSET. The part of JICA in Table 7 partially includes “School for All Project Phase 2” in addition to the construction of schools.

After the completion of the project, an Annual Plan of Activities (PAA) is prepared based upon PSEF, in which the budget for INSET is included. The budget for INSET is 1,056 million CFA francs in 2016 and 810 million CFA francs in 2017, according to the PSEF budget plan (all the budget for INSET, including the national budget, cooperation by development partners and resources not determined) Out of this total budget for INSET, INSET in mathematics and science accounts for 72 million CFA francs in 2016 (6.8% of the total INSET) and 50 million CFA francs in 2017 (6.2% of the total INSET) as indicated below. The expenditure by the Ministry of Economy and Finance for training in mathematics and science was delayed due to the financial crisis caused by the conflicts in Mali in 2013, when the project was finishing. Afterwards, there were training sessions in 2014 and 2015 financed by the national budget. Furthermore, UNICEF financed the training in November 2016. Additional training is also being planned for 2017 as scheduled in the annual plan.

Table 8: Budget for Training in Mathematics and Science Education

Unit: Thousand of CFA francs

	2014	2015	2016	2017
Training expenses	37,023	12,472	72,000	50,000

Source: Follow-up cooperation report (2014-2015), Annual plan of Activities for PSEF of MES (2016-2017)

In light of the above, no major problems have been observed in the policy background and the organizational, technical, financial aspects. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project implemented training to strengthen the capacity of teachers in mathematics and science in secondary education principally by means of INSET which introduced the ASEI-PDSI approach and developed teaching materials.

From the time of ex-ante evaluation to ex-post evaluation, the improvement in the

quality of education has been consistently proposed as a policy goal in Nigerien development policies. In addition, it had become an important issue to improve the quality of education by offering INSET to the increasing number of contract teachers. Further, the project is in accordance with the development policy of Japan at the time of planning, therefore its relevance is high. In connection with the project purpose “The capacities of mathematics and science teachers are strengthened through quality INSET”, achievement of the targeted indicators for the implementation of ASEI-PDSI was confirmed and its effectiveness proved to be high. With regard to the overall goal “The ability of Base II and Middle Education Cycle students in mathematics and science is improved”, the results of the beneficiary survey were employed as an alternative indicator, since the ratio of successful applicants for BEPC proved to be inappropriate as an indicator to measure the level of academic achievement of students. The results of the beneficiary survey confirmed that there existed changes in the attitudes of students in the mathematics and science classes. The favorable changes in attitudes of students in class are considered to lead to an improvement in the academic achievement of students, which proves the positive impacts of the project. However, it was also confirmed that there exist many external harmful factors which produce negative influences on the achievement of the overall goal. These external harmful factors include a rapid increase in the number of students, lack of basic academic ability in primary education, some issues related to education in French, an increase in the number of contract teachers, and reduction in teaching hours due to strikes carried out by teachers and school boycotts by students. Considering these factors, the level of its effectiveness and impact is fair. The efficiency of the project is judged to be high, which is cost-efficient having its cost lower than planned and finished within its planned project period. Furthermore, the sustainability of the project is high. In order to continue INSET, the project owns necessary conditions in policy and institution background, in addition to that, which also secured necessary conditions in organizational, technical and financial aspects of the implementation agency. In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

Promotion of the implementation of In-School INSET by Pedagogical Units

In order to improve the teaching capacity of untrained and inexperienced teachers in mathematics and science at the school level, it is efficient to use the system of Pedagogical Units by Subjects (UPD) and Pedagogical Units for Scientific Subjects (UPS) organized by combining several neighboring schools into a cluster system, which was developed by a Ministry decree of 2015. It is to be desired that the DFIC

and regional inspectors/pedagogic advisers continuously implement the training and develop the training contents so that teachers can use these systems further and conduct lesson studies using them.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

4.3.1 Encouragement for the implementation agency to assign appropriate counterparts at the stage of the project preparation

One of the principal reasons for the success of this project is that the Niger side assigned a large number of counterparts who had expert knowledge on the subjects and a wealth of experience in advising teachers. It was recognized as important to secure the participation of the appropriate counterparts who are the stakeholders of the project, by repeatedly organizing coordination meetings with the implementing agency in the project preparation stage.

For this reason, the project was implemented under the strong initiative of the Niger side. The counterparts absorbed the methods of implementing training and monitoring/evaluating in other countries including Kenya, and improved them by adapting them to the situation of Niger. National trainers conducted national training effectively contributing to the improvement of the capacity of regional trainers. This training could receive sufficient collaboration from the human resources of the implementing agency, although the number of training sessions was limited during the project period due to the delay in budget expenditure by the Ministry of Economy and Finance. Furthermore, the institutionalization of the INSET progressed and the implementation of the training continued even after the completion of the project. Therefore, it was proved that the securing the cooperation from appropriate human resources of the implementation organization contributed substantially to an effective implementation of the project and further development of the project effects.

4.3.2 Effective use of international cooperation among countries in regional groups

The counterparts of the project received the support from the SMASE-WECSA in the Phase 1 (experts from third-country, third-country training, teaching materials for lessons and so on). Then, they efficiently implemented the Phase 2, making good use of the experiences from the Phase 1 project. The project was able to be implemented by the Niger side with a limited number of input from Japanese experts and without using any third-country experts from Kenya. However, the counterparts, trainers and other

related personnel to the project actively participated in regional third-country training sessions in Kenya and Senegal. It was useful for the implementation of the project in Niger to know about the experiences in other African countries with which Niger had similar economic and social situations. Furthermore, the third-country training was cost and time efficient compared with training in Japan, which enabled an increased participation of project related personnel in the training. The project developed the teaching materials by improving those of Kenya, through adapting or localizing them to the curriculum and teaching conditions of Niger. Hence, the teaching materials can be adapted well to the conditions of Niger and can be utilized at the level of the school classroom. Thus, this regional cooperation enhanced the effectiveness and the efficiency of the project. Therefore, it is to be desirable to implement a project taking advantage of opportunities for regional cooperation, in the case that they are available.

4.3.3 Positive use of audio-visual training materials on model lessons in teacher training

The use of audio-visual training materials (videos) on model lessons was a very effective way to promote better understanding by teachers and trainers in training sessions, in order to improve the teaching practices of the teachers in the class, including the practices of lessons based upon ASEI-PDSI. The DFIC uses the audio-visual materials effectively, although it needs to pay good attention to the environments where the training materials are used (preparation of projectors and screens, appropriate use of a personal computer in small group training and so on). It was confirmed that the materials are an effective and sustainable means to implement training. The production and use of audio-visual materials are beneficial to transfer practical training contents such as improvements in the teachers' practices in class.

4.3.4 Positive use of In-School INSET utilizing lesson studies by Pedagogical Units

The project started lesson studies by Pedagogical Units, and then the Follow-up cooperation initiated the training to promote lesson studies. In-School INSET by lesson studies has been officially incorporated into an integrated training system by the MES. Lesson studies by Pedagogical Units have a function of extending further to the school level the effects of training produced by a top-down cascade model (a system of national and regional training). Lesson studies by Pedagogical Units are a good measure to cope with the current situation, being relatively cost efficient, when they are well established. In-School Training by lesson studies are considered to be suitable: 1) as a measure for a further extension of the training effects produced by a project which introduced a cascade model training, after the completion of the project, 2) as a measure to improve the teaching capacity of inexperienced teachers who are not

sufficiently trained, and 3) as a measure to implement training in schools in distant areas where the implementation of training is not easy. Lesson studies are a useful means to promote the provision of guidance by experienced (or already trained) teachers to their colleagues, which can be a help to mitigate the current difficult situation in which many untrained teachers are newly employed by contract to cope with an increasing number of students.

4.3.5 Benefits of anticipating the major future trends of the education sector, which may affect the overall goal

The expansion in quantity in primary education increased the problems in secondary education (especially the first cycle of secondary education) both in quantity and quality. The PASEC indicated the low academic ability of students in mathematics and French in primary schools in Niger, which clearly demonstrated anew the seriousness of the problems in the quality of primary education. At the same time, the number of incoming students from primary education to the first cycle of secondary education is rapidly increasing. Meanwhile, the number of students who take pre-service teacher training is small in higher education, although the number of students in secondary education has been rapidly increasing. The number of newly employed contract teachers has increased more than before. Those contract teachers did not receive professional education in a Faculty of Education or PRESET for teacher. These trends in primary and higher education produced external factors which had negative influences on the project, making the problems in secondary education larger than the time of ex-ante evaluation.

It has become difficult to set as an overall goal the strengthening of average academic ability of students, because such situations produce substantial external factors influencing significantly on the quality of teachers and academic ability of students. Therefore, it became clear that results of the national examination could not be used as an indicator for an overall goal to measure the improvement in academic ability, through this ex-post evaluation.

It is not easy to anticipate the growth of such problems caused by the external factors, at the stage of ex-ante evaluation, since there exist a lot of policy uncertainty. However, it was beneficial to be well aware of the trends of the education sector in general, and to recognize their influence on secondary education, paying more attention to the influence from the external factors to set an overall goal and its indicators, at the planning stage and during the project period. This will be useful as a reference for future planning in preparation of the operation plan of a project in the first cycle of secondary education.

On Views of Experts

In this ex-post evaluation, opinion of academia was invited to capture more specialized and diverse views for the projects, in addition to the perspectives of the DAC five evaluation criteria to be conducted by the external evaluator. The external evaluator selected and enlisted the support of a leading figure in the field: Hideo Ikeda, Professor emeritus of Hiroshima University.

Prof. Ikeda, author of this report, specializes in the science and mathematics education, and lesson study. Over the last 20 years, the Laboratory of Science Education, Graduate School for International Development and Cooperation, Hiroshima University, with which the author had been affiliated, has directly and indirectly participated in the science education improvement projects implemented by JICA in Asia and African countries. For these reasons, the external evaluator asked him to conduct in depth analysis based on his expertise and experience.

Specifically, “Classroom analysis through video recordings” was conducted to supplement the ex-post evaluations of these project, namely, the “Strengthening of Mathematics and Science Education (SMASE)” (technical cooperation project for Kenya, 2009-2013), as well as the Niger “The Project on Strengthening of Mathematics and Science in Secondary Education in Niger Phase 2” (technical cooperation project for Niger, 2006-2009).

The purpose of the analysis is to objectively measure the extent of improvement in science and mathematics classes at the point of ex-post evaluation. Thereby the author tried gaining insights regarding the impact of in-service education and training (INSET) for primary and/or secondary education, which were implemented under the two projects mentioned above. Moreover, the expert shared his comments and suggestions for the further development and improvement of capacity of teachers, which are obtained through the analysis. The result of the analysis related to the Niger’s project was appended to the evaluation report as attachments.

Appendix

Detailed analysis by an expert: “Classroom Analysis through Video Recordings”

(Excerpts of portions related to Niger)

Expert: Hideo Ikeda (Professor emeritus, Hiroshima University)

This detailed analysis was conducted to supplement the ex-post evaluations for this project and the “Strengthening of Mathematics and Science Education Project” in Kenya (2009-2013). The following is a portion of the analysis related to this project.

(1) Purpose of the analysis: To objectively and quantitatively evaluate the extent of improvement in science classes at the point of ex-post evaluation.

(2) Summary of the analysis:

Materials and method: Classroom video analyses were conducted. The questions posed by the teacher and the questions asked by the students during the class were classified and analyzed according to the revised Bloom's Taxonomy of Educational Objectives (1 point for *Remember*; 2 points for *Understand*; 3 points for *Apply*; 4 points for *Analyze*; 5 points for *Evaluate*; and 6 points for *Create*), and scored (based on an assumption that questions posed by teachers and asked by students can be classified into a gradient ranging from those cognitively most basic questions based on "recollection" to those most cognitively advanced questions based on "creation", higher points were assigned as the question approaches the "creation" category). Because the score rating for different categories described above is consistent with the idea of "making students think", which was emphasized in JICA's technical cooperation projects for basic education in African countries, this method is expected to ensure objective examinations of the level of classroom instructions. In the present analysis, the scores that concern us (tentatively referred to as "Blooms' Scores") are computed by multiplying the aforementioned score within each of the six cognitive categories by its frequency, then by dividing the sum of the multiplications by the total frequency. This method overcomes the challenge of analyzing classroom instructions quantitatively, and is, thus, expected to contribute to the improvement in the quality of teacher education²⁴.

Observation target: A total of four teachers consisting of two teachers who had attended training and another two who had not attended training were selected from three schools (two schools in the first cycle of secondary education and one school in the second cycle of secondary education). Their biology/geology classes were videotaped and analyzed²⁵.

Hypothesis: Those teachers who had attended INSET provide higher-quality instructions (higher Bloom's Scores) than those teachers who had not attended INSET.

²⁴ However, the Bloom's Score primarily measures the psychological and cognitive level of a pedagogical method, and is not concerned with the level of instructional content taught in the class. Since a quantitative classification of instructional content has not been developed, the content will be textually described in this report.

²⁵ All four teachers who were observed had attended lesson studies through in-school INSET after the completion of the project. It should be noted that videotaping was limited to four classes in Niamey because the deteriorating security as well as frequent teachers' strikes and student class boycott in the provinces made filming challenging. In order to facilitate comparisons using a small number of objects of observation, only biology classes were chosen within the biology/geology subject area.

(3) Results of classroom analysis in Niger

The variance in the Bloom's scores among the four teachers who were analyzed was small, with the high of 1.96 and the low of 1.22. Among these four teachers, two had received training from JICA and the other two had not. Those who had received training scored higher, with the teachers with training scoring 1.96 and 1.51 while the teachers without training scoring 1.30 and 1.22. Based on these results, the hypothesis (higher scores for teachers with training) appears to be supported in Niger. However, since the sample size is two in each group, the probability cannot be judged to be high.

The classes taught by the teachers who had received training exhibited signs of the effects of the training enabled by this project on the teachers. A list of qualitative observations of such effects is as follows. 1. The dimension of *Activity* in ASEI has taken root, as the first cycle of secondary education Grade 1 class "Classification of Vertebrates" incorporated individual and group student activities. However, the second cycle of secondary education Grade 3 class "Reflection" taught by a teacher who had also received training centered on question-response exchanges between the teacher and individual students, and largely lacked interactions among students. There were no group activities. 2. In terms of *stimulating students by posing questions that make them think* as a practice of *Student-Centered* in ASEI, the two teachers mentioned above seemed to be stimulating students' thinking by, among other things, making students consider causal relationships more thoroughly by posing questions in the *Analyze* and *Evaluate* categories, and prompting students to critically examine whether other students' responses were correct or incorrect. Bloom's Scores were most strongly linked to this *Student-Centered* dimension. 3. *Experiment and Observation* in ASEI is greatly influenced by the subject area and topic of each class. The class "Classification of Vertebrates" should, at minimum, use graphics and photographs to relate the name of each creature to its actual living form, and ideally introduce *Experiment and Observation*. By taking into account the living environment of students in Niger, the questions posed by the teachers and responses returned by the students suggested that the students were generally able to connect the names of mammals to their actual forms. As far as this class was concerned, however, students seemed to only know the names of individual reptiles and amphibians without recognizing their actual forms. The class on "Reflection" dealt with a topic in which it would be difficult to introduce *Experiment and Observation* in the first place. However, *Experiment and Observation* appears to have been adopted in this class because the teacher prepared study resources and conducted the lesson like a dry lab by comparing graphics. 4. *Improvisation* in ASEI facilitated improvement in teaching by encouraging teachers to innovatively use teaching materials, teaching aids, and experiment methods by adapting to diverse local and

school conditions. Measurement of this dimension was impractical in the present analysis as it would have required comparisons of the materials introduced in the textbook and training to those used in the class. However, given the reality that many of the students in the class “Classification of Vertebrates” did not have textbooks as mentioned above, the situation calls for some kind of measures. One flaw was that only the names of species and the names of the taxa to which species belong were mentioned in the class. In contrast, the teacher of the class on “Reflection” incorporated concrete improvisations such as showing diagrams to describe an experiment setting in a way that is easy to understand, suggesting that the idea of *Improvisation* has taken root.

The results of the analyses of the first cycle of secondary school Grade 4 class “Homeostasis and Regulation” and the second cycle of secondary school Grade 1 class “Asexual and Sexual Reproduction among Plants”, both taught by teachers who had not attended training, indicated following problems. 1. Both teachers rarely posed questions in the *Analyze* and *Evaluate* categories; thus, training should be implemented so that teachers acquire techniques for using questions to stimulate students. 2. The teaching materials lacked consistency and many aspects of them confused teachers themselves. Given that the two teachers tended to explain materials simply by following textbooks, (even though this problem primarily stem from faults in the syllabi and textbooks) it is necessary to reorganize teaching materials in a logical manner, and efforts should be made for more logical organization and precise selection of teaching materials when teaching materials are selected and their contents are organized for training.

Annex: Achievement of Project Results

Results	Indicator	Actual
1. The capacities of National Trainers are reinforced.	Indicator 1-1: More than 2 tryouts in pilot school of the pedagogical materials developed by the Team are implemented.	Mostly achieved. Two times of tryouts were mostly implemented for the target number of the development of 45 sets of pedagogical materials as expressed in the indicator.
	Indicator 1-2: By the end of the Project, 45 or more sets of training materials are developed and produced.	Achieved. The project developed 64 sets of training materials.
	Indicator 1-3: Level of satisfaction of Regional Trainers with the developed pedagogical materials (Survey)	Achieved. Level of satisfaction by Regional trainers was high. An evaluation score of 3.7 points on average was obtained out of 4.0 points.
	Indicator 1-4: More than 1 time per year of monitoring and evaluation in classrooms on the pedagogical materials developed by the Team is implemented.	Mostly achieved. National trainers participated actively in the development process and monitored the tryouts.
2. The National and Regional Training Structure are established.	Indicator 2-1: More than 270 Regional Trainers in total are trained in Niamey.	Partially achieved. National training was conducted in two times in 2011 and in 2012, however, which was not conducted in 2013 due to the budget expenditure constraint produced by the Northern Mali Conflict. This delayed national training was conducted in February 2015 by the DFIC which successively continues the training system of the project.
	Indicator 2-2: More than 900 teachers receive one regional training session per year.	Partially achieved. The regional training was conducted from 2010 to 2012, however which was not conducted after that as scheduled due to the delay in budget expenditure by the Ministry of Economy and Finance. The delayed regional training was conducted in December 2014 by the DFIC.
	Indicator 2-3: All planned trainings in the INSET Plan are conducted in time.	Partially achieved. The implementation of a part of the training was delayed in the Indicator 2-1 and 2-2. Additionally a seminar to share the common experiences in francophone countries was not conducted.
	Indicator 2-4: Based on the Project M&E tool, the quality of the INSET provided by the National and Regional Trainers is rated more than 3.0.	Achieved. A score of 3.3, which was higher than the target score, was achieved in questionnaire surveys regarding the quality of the training. The surveys were conducted for the participants of the training using a monitoring and evaluation tool developed by the project.
3. The supporting system for the INSET Project is strengthened.	Indicator 3-1: More than 500 stakeholders (mainly school principals and representatives of COGES/ES) participate in one sensitization workshop.	Achieved. Sensitization workshops were organized and in which 657 school principals and the members of COGES/ES participated.

	Indicator 3-2: More than 250 school principals receive one training session.	Achieved. The project conducted training workshops for school principals in 2010, in which 353 school principals participated.
	Indicator 3-3: More than 25% of school principals carry out monitoring of lessons.	Achieved. According the questionnaire surveys conducted in 2013, it was confirmed that 31% of school principals carried out monitoring of lessons recommended by the project.
	Indicator 3-4: More than 50% of COGES/ES develop at least an action plan per year to support the quality of Education.	Achieved. Nearly 90 % of the COGES/ES developed an action plan, according monitoring surveys conducted from 2011 to 2013.
	Indicator 3-5: Organization of a national workshop to share the internal evaluation result and to capitalize the project experiences	Achieved. A national workshop was organized at the closing seminar of the project. A draft of guidelines to institutionalize INSET was presented by the project team in the closing seminar organized in 2013. The draft, produced by the Niger side, proposed the establishment of a department dedicated only to the implementation of INSET.
	Indicator 3-6: INSET guide/manual is developed.	The development of the guideline was not completed by the end of the project. This is because the MES was newly created and the guidelines were produced in accordance with the restructuring of it. The manuals for INSET to strengthen education in mathematics and science were developed during the project period.
	Indicator 3-7: INSET guide/manual is evaluated and validated by MESS/R/T.	The guideline was not approved by the end of the project, which was approved after the restructuring of the MES finished in November 2015. The manuals for INSET to strengthen education in mathematics and science were approved during the project period and are continuously used.

Source: Prepared based on Report of the Terminal Evaluation of the project (JICA) and answers to questionnaire survey for the implementing agency.