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| Country Name | Project for the Friendly Learning of Mathematics in Secondary Education |
| Republic of Nicaragua | |

I. Project Outline

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|---|---|-----------------------------------|---|---------------|-----------------|-----------------------|--------------------------------|---------------------------------|---------------------------------|---|--|---|--|
| Background | In Nicaragua, the net enrolment rate in secondary education increased following the improvement at the primary level. Comparing 2010 and 2013, the rate increased from 41.9% to 89.4% in lower secondary education and from 23.8% (MINED) in 2013 to 48.5% (UNESCO) in 2016 in upper secondary education. However, secondary education still had the challenge to improve learning achievement in mathematics—the pass rate of the examination to enter the National Autonomous University of Nicaragua (UNAN) was only 8.66% in 2014. | | | | | | | | | | | | |
| Objectives of the Project | By developing students' textbooks, teacher's guides, and students' activity notes in accordance with the revised mathematics curriculum for secondary education in Nicaragua, strengthening the induction training system for mathematics teachers, and revising the program of the special didactics of mathematics in teacher training courses, the project aims at introducing educational activities in accordance with the revised mathematics curriculum in secondary education, thereby contributing to the implementation of educational activities in accordance with the curriculum. | | | | | | | | | | | | |
| | <ol style="list-style-type: none"> Overall Goal: Educational activities in accordance with the revised mathematics curriculum are implemented in secondary education. Project Purpose: Educational activities in accordance with the revised mathematics curriculum are introduced in secondary education. | | | | | | | | | | | | |
| Activities of the Project | <ol style="list-style-type: none"> Project site: Whole Country Main activities: Analysis of the preliminary curriculum of mathematics, development of the annual lesson plan, the learning unit plan, draft of students' textbooks, teachers' guide for validation, students' activity note, design of the teacher training contents, revision of the program of special didactics of mathematics of UNAN Managua and UNAN León, etc. Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Japanese Side</td> <td style="width: 50%;">Nicaraguan Side</td> </tr> <tr> <td>1) Experts: 7 persons</td> <td>1) Staff allocated: 27 persons</td> </tr> <tr> <td>2) Trainees received: 5 persons</td> <td>2) Facility: Office space, etc.</td> </tr> <tr> <td>3) Equipment: PC, printer, copy machine, etc.</td> <td>3) Local cost: Expenses for training and monitoring, printing of textbooks, etc.</td> </tr> <tr> <td>4) Local cost: hiring local consultants, etc.</td> <td></td> </tr> </table> | | | Japanese Side | Nicaraguan Side | 1) Experts: 7 persons | 1) Staff allocated: 27 persons | 2) Trainees received: 5 persons | 2) Facility: Office space, etc. | 3) Equipment: PC, printer, copy machine, etc. | 3) Local cost: Expenses for training and monitoring, printing of textbooks, etc. | 4) Local cost: hiring local consultants, etc. | |
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| Project Period | (ex-ante) January 2017 to July 2019 [30 months] (actual) January 2017 to October 2019 [34 months] | Project Cost (Japanese side only) | (ex-ante) 258 million yen, (actual) 248 million yen | | | | | | | | | | |
| Implementing Agency | Ministry of Education, UNAN Managua, UNAN León | | | | | | | | | | | | |
| Cooperation Agency in Japan | Koei Research & Consulting, Inc. | | | | | | | | | | | | |

II. Result of the Evaluation

<Special Perspectives Considered in the Ex-Post Evaluation>

[Confirmation of the achievement of the Super Goals]

- In the project, the following super goals were set. In the ex-post evaluation, these were verified as long-term impacts.
 - The academic performance in mathematics in secondary education is improved. (Indicator: Improvement of students' results in mathematics in secondary education.)
 - Mutual cooperation for improving teaching methods in mathematics is promoted at the regional level. (Indicator: Participation in the Regional Seminars of the Regional Project in Mathematics (at least twice).

1 Relevance/Coherence

[Relevance]

<Consistency with the Development Policy of Nicaragua at the Time of Ex-Ante Evaluation >

One of the goals set in the “Education Plan” (2017-2021) (draft as of the ex-ante evaluation in 2017), was “improvement of education quality.” Related to this objective, student-centered curriculum/teaching was considered a strategic theme among others. The project aimed at the class management with the student-centered approach. Therefore, the project was consistent with the development policy of Nicaragua at the time of ex-ante evaluation.

<Consistency with the Development Needs of Nicaragua at the Time of Ex-Ante Evaluation >

Although enrollment in the first secondary education improved significantly (89.4%, 2013), poor performance in mathematics was an issue. Based on the results of the preceding projects¹, there was a need to revise and develop the secondary mathematics textbooks and instruction manuals for teachers so that the textbooks would be consistent with the primary mathematics textbooks. The project was consistent with the development needs of Nicaragua at the time of ex-ante evaluation.

<Appropriateness of Project Design/Approach>

The project design/approach was appropriate. Before the project, the textbooks were very complex and did not have a didactic

¹ JICA implemented the “Project for Improving the Learning of Mathematics in Primary Education (PROMECM)” (2006-2011) and PROMECM Phase 2 (2012-2015).

sequence, which did not allow students' self-study. Based on the experience of the preceding projects, the project activities started with the comprehensive revision of the curriculum to make mathematics learning friendly in secondary school and to realize a student-centered class. This approach has contributed to the continuous utilization of the textbook and the improvement of the students' achievement.

<Evaluation Result>

In light of the above, the relevance of the project is ③².

[Coherence]

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

In the "Country Assistance Policy for the Republic of Nicaragua" (2013), one of the priority areas is "social development for the poor groups and regions," which aims to contribute to improving the quality of primary and secondary education to support the poor in rural areas and other regions. The project was consistent with Japan's ODA policy to Nicaragua at the time of ex-ante evaluation.

<Collaboration/Coordination with JICA's other interventions>

The collaboration/coordination between the project and the relevant projects under the "Central American Regional Cooperation in Mathematics Education" of JICA was planned at the time of ex-ante evaluation and implemented beyond the plan, and the positive effects expected were confirmed at the time of ex-post evaluation. The project members participated in the regional seminars in El Salvador three times and visited a similar mathematics project in Honduras to share their learnings. Based on these mutual learning and experience sharing, the project methodology was enriched in the aspects of the problem-solving approach, active learning, student-centered classes, and so on more than expected.

<Cooperation with other institutions/ Coordination with international framework>

The cooperation/coordination with the World Bank and the European Union was planned at the time of ex-ante evaluation but not implemented.

<Evaluation Result>

In light of the above, the coherence of the project is ③.

[Evaluation Result of Relevance/Coherence]

In light of the above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the Time of Project Completion>

At the time of project completion, the Project Purpose was partially achieved. The textbooks were distributed to teachers in the training in January 2019 and the digital version was uploaded in MINED portal, and it was confirmed by the monitoring of February 2019 that the mathematics class was being conducted with the textbook. However, the teachers' guide, students' textbooks, and the students' activity notes could not reach all teachers and students by the end of the project, because of some delayed activities due to security problems in 2018 (Indicator 1). The delay in the printing process due to the non-timely funding management was another reason. The program of the Special Didactics of the Mathematics was operated on a trial basis with the initiative of UNAN Managua and the UNAN León from 2018 (Indicator 2).

<Continuation Status of Project Effects at the Time of Ex-Post Evaluation>

By the time of the ex-post evaluation, the project effects have been continued. The students' textbook, teachers' guide and students' activity note developed by the project have been official at UNAN Managua and UNAN León. Also, the program of the Special Didactics of the Mathematics has been in the curriculum of both universities. In 2021, UNAN Managua revised the curriculum and decided to continue the contents and methodological strategies. The contact hours of the mathematics lesson have been monitored in the 19 pilot schools of the project. The rest of the schools have been also monitored through random visits (pedagogical accompaniment) programmed each year by MINED. Monitoring results have been shared with coordinators of the Pedagogical Meeting for Inter-learning³ (Encuentro Pedagógicos de Interaprendizaje: EPI) to improve several aspects including active learning, the use and management of educational materials, and standardized tests to students. MINED also has shared the monitoring results with the National Education Council (integrated by the Department and Municipal Delegations of MINED). As recommended by the project, most teachers have conducted the unit test of the textbook with some variations such as dividing the test into two parts because students require more time to solve it. Another case is that teachers guide their students to do it as homework, and others do it as classwork in groups of two or three students. MINED has monitored the unit tests by visiting EPIs.

<Status of Achievement of the Overall Goal at the Time of Ex-Post Evaluation>

At the time of ex-post evaluation, the Overall Goal has been mostly achieved as planned. The students' textbook, teachers' guide, and students' activity note are the official materials of secondary education, and MINED has promoted the use of these materials (Indicator 1). These materials have been distributed to all schools in the country. However, according to UNAN León, in most of the schools where UNAN's students carry out professional practice, many secondary students don't have textbooks. According to MINED, this has been caused by the increase in the number of enrollment and the losses or deterioration of books due to years of use. As solutions, MINED has made the digital version of the textbooks available on its website and made an arrangement for reprinting and distribution. The revised program of the Special Didactics of the Mathematics has been utilized at both UNAN Managua and UNAN León (Indicator 2). The revised program has been explained to professors at both universities.

<Other Impacts at the Time of Ex-Post Evaluation>

The following positive impacts have been confirmed. Firstly, the students' achievement in mathematics in secondary education has been improved in the pilot schools of the project. The pass rate of the entrance examination of mathematics of UNAN increased from 31% in 2019 to 57% in 2022 in the pilot schools. At the national level, the rate increased from 64% to 85%. Secondly, even after the project completion, MINED, UNAN Managua, and UNAN León participated and shared their experiences in the regional seminars held in El Salvador in December 2019. Third, with the techniques to digitalize the textbook strengthened by the project, MINED addressed school closure issues during the pandemic of COVID-19, such as digitalization of the textbooks, conduct of TV classes, teacher training webinars, and so on.

² ④ : very high, ③ : high, ② : moderately low, ① : low

³ Teachers gather in clusters by subject area to share experiences on the last Friday of each month.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ③.

Achievement of Project Purpose and Overall Goal

| Aim | Indicators | Results | Source |
|--|---|---|---|
| (Project Purpose) Educational activities in accordance with the revised mathematics curriculum are introduced in secondary education. | Indicator 1: Introduction of the students' textbook, teachers' guide and students' activity note developed through the Project in secondary education. | Status of the Achievement (Status of the Continuation): Partially achieved (achieved as planned and continued) (Project Completion) <ul style="list-style-type: none"> The students' textbooks created by the Project were distributed to the teachers who participated in the materials introduction training for all the public secondary mathematics teachers held in January 2019. The teachers' guide and the students' activity notes were not completed by the time of project completion. (Ex-Post Evaluation) <ul style="list-style-type: none"> The teachers' guide, textbooks and students' activity notes developed by the project were distributed to all students and teachers in Nicaragua in July 2020. | PCR, MINED, UNAN Managua and UNAN León. |
| | Indicator 2: Introduction of the program of the Special Didactics of the Mathematics of the UNAN Managua and the UNAN León. | Status of the Achievement (Status of the Continuation): Achieved as planned (continued). (Project Completion) <ul style="list-style-type: none"> The programs of the Special Didactics of Mathematics were revised and introduced in 2018 based on the independent decisions of both UNAN Managua and UNAN León. (Ex-Post Evaluation) <ul style="list-style-type: none"> The revised curriculum has been officially introduced at UNAN Managua and UNAN León in 2021 and 2020, respectively. | PCR, MINED, UNAN Managua and UNAN León. |
| (Overall Goal) Educational activities in accordance with the revised mathematics curriculum are implemented in secondary education. | 1. Utilization of the students' textbook, teachers' guide, and students' activity note developed through the Project in secondary education. | Status of the Achievement: Achieved as planned. (Ex-Post Evaluation) <ul style="list-style-type: none"> The students' textbook, teachers' guide and students' activity note developed by the project have been officially utilized in secondary education. Textbooks were distributed based on the enrollment data of 2019 so that all students received them. | MINED, UNAN Managua and UNAN León. |
| | 2. Utilization of the revised program of the Special Didactics of the Mathematics of the UNAN Managua and the UNAN León. | Status of the Achievement: Achieved as planned. (Ex-Post Evaluation) <ul style="list-style-type: none"> The revised program of the Special Didactics of the Mathematics has been utilized at UNAN Managua and UNAN León. | MINED, UNAN Managua and UNAN León. |

3 Efficiency

The project cost was within the plan, although the project period exceeded the plan (the ratio against the plan: 96% and 113%, respectively), due to the delay in the material validation activities due to security problems in 2018.

| | Project Cost (Japanese side only, yen) | Project Period (months) |
|----------------|--|-------------------------|
| Plan (ex-ante) | 258 million yen | 30 months |
| Actual | 248 million yen | 34 months |
| Ratio (%) | 96% | 113% |

Outputs were mostly produced as planned.

In the light above, the efficiency of the project is ③.

4 Sustainability

<Policy Aspect>

The promotion of mathematics education in secondary education has been and will be politically backed up, as it has been a part of the priorities for the improvement of the quality of secondary education in the "National Plan for Poverty Reduction and Human Development" (2022-2026). Also, the "National Education Plan" (2022-2026) has supported the educational model introduced by the project for both secondary and primary education.

<Institutional/Organizational Aspect>

Since the project completion, MINED and the universities have maintained the organizational structure (the Directorate of Secondary Education of and the Directorate of Teacher Training of MINED and the relevant faculties of UNAN), to promote the educational model strengthened by the project, and it would continue as per the government's commitment evidenced in the "National Education Plan" (2022-2026). Also, MINED has established an internal network with EPI Coordinators, math experts, and so on. At the time of ex-post evaluation, MINED had two national assessors, 40 local assessors, 160 EPI coordinators, and 1,821 teachers. MINED considered that it would be ideal to have one mathematical advisor for each of the national, department, and municipal levels to further strengthen mathematics education. UNAN Managua and UNAN León answered that they sustained sufficient staff to promote mathematics programs and materials introduced by the project (eight professors and 12 professors, respectively).

<Technical Aspect>

MINED, UNAN Managua and UNAN León have sustained the necessary skills and knowledge to promote mathematics programs and materials in secondary education introduced by the project, as the project members have still worked there, and they have trained new

professors on the use of the materials besides the video conference as necessary. The materials developed by the project have been utilized, as mentioned earlier.

<Financial Aspect>

Each year MINED has included a budget from the treasury funds for the implementation of the mathematics programs strengthened by the project in the Annual Operational Plan. This fund has been contemplated for teacher training and other activities such as the Mathematical Olympiads with the participation of ninth grade students. Since the cost of printing educational materials cannot be funded, MINED has responded by developing digital versions of the materials and lending out the materials, and it answered that it would continue to seek financial support from donors.

<Environmental and Social Aspect>

No issue on environmental and social aspects has been observed, and it has not been necessary to take any countermeasures.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the financial aspect of the implementing agency. Therefore, the sustainability of the project effects is ③.

5 Summary of the Evaluation

The project partially achieved the Project Purpose which was to introduce educational activities in accordance with the revised mathematics curriculum in secondary education by the time of project completion. After the project completion, it was fully achieved, and the Overall Goal to implement the introduced educational activities has been mostly achieved. Regarding sustainability, the organizational structure to sustain the project efforts has continued, and there has been no issue in the political and technical aspects.

Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

- It is recommended to discuss the effectiveness of the program of the Special Didactics of the Mathematics developed by the project with the National Universities Council at the National Education Commission and diffuse it to other two public universities so that all new graduate teachers be taught under the harmonized strategy of mathematics education.
- It is recommended that the Directorate of Secondary Education of MINED have regular meetings with UNAN Managua and UNAN León to review the project outputs and update them upon necessity such as unit tests, and board-writing plan, among others.
- It is recommended that the Directorate of Secondary Education have a closer contact with the Directorate of Primary Education which is responsible for the JICA succeeding project of mathematics education. The former can share the project experience with the latter, including both good practices and difficulties if any, regarding the project approach, work process, and so on.



Training of secondary school teachers (Rigoberto Lopez Pérez Secondary School, Managua City)



Mathematics class observation (La Salle Secondary school, Diriamba City)