

Japan's Assistance in Science and Mathematics Education

~ JICA's Activities and Achievements ~

Exciting new challenges in the classroom



$$2 \times 2 = 4$$
The equation is written in thick, colorful brushstrokes. The first '2' is orange, the 'x' is purple, the second '2' is blue, the '=' is brown, and the '4' is green.

In the last 40 years, JICA has supported education in developing countries. Knowledge in science and mathematics, in particular, is essential for ensuring tens of millions of children to fulfill their individual potentials. It also forms a building block for nations to advance its capacities in technological development. JICA is committed to strengthening this field of education in developing countries as a major goal in the new millennium.



President
Japan International
Cooperation Agency

Sadako Ogata

Why support science and mathematics education?

Some 771 million of the world's adults are illiterate, and far more do not know how to calculate. They are not only disadvantaged in employment, income and, social status, but are also more susceptible to poverty and illness. Basic education provides children with an opportunity to acquire skills and knowledge needed for their daily lives and prepares them to be full-fledged members of society.

In 2000, the World Education Forum was held in Dakar, Senegal, which adopted the "Dakar Framework for Action, Education for All: Meeting Our Collective Commitments." Also, the United Nations Millennium Summit held in the same year set eighteen targets to be achieved by 2015. These are known as the "Millennium Development Goals (MDGs)", two of which are directly related to education: 1) ensuring that all boys and girls complete a full course of primary schooling by 2015; and 2) eliminating gender disparity in primary and secondary education, preferably by 2005, and at all levels by 2015.

Japan announced the "Basic Education for Growth Initiative (BEGIN)" at the G8 Kananaskis Summit in 2002, expressing Japan's commitment to supporting developing countries as they improve the quality of their basic education.

Science and mathematics education equips children with the basic life skills necessary for improving their lives. It also provides them with opportunities to find scientific truth and experience the joy of discovery and creation.

Moreover, quality education in science and mathematics is vital for developing countries that want to pursue progress in science and technology and achieve socio-economic development in the growing global economy. In fact, Japan's economic development has been supported by its high standard of science and mathematics education.

Features of JICA's cooperation in science and mathematics education

JICA started its first technical cooperation project to improve science and mathematics education in 1994. Since then, JICA has conducted a variety of aid activities, including teacher training programs and teaching guides development, in as many as 27 countries. The achievements in Kenya and Honduras have been shared with neighboring countries under the framework of "South-South Cooperation."

For a better
tomorrow for all.





Through JICA's cooperation, teachers in developing countries have improved their skills, knowledge, and attitudes in the classroom, making their lessons more understandable and interesting for children.

At the grassroots level, Japan Overseas Cooperation Volunteers (JOCV) have assisted science and mathematics education in many developing countries since 1966. Up to 2006, 2,146 Japanese volunteers, including incumbent teachers, have been dispatched to 57 different developing countries.

Many of these volunteers share their valuable experiences with Japanese children at schools after their return. Thus, JICA's assistance in the field of education has had a positive impact not only on partner countries but also on Japan itself.

JICA's cooperation policies and approaches in education

Many developing countries face the challenge of improving the quality of their education. Some examples are the insufficient level of teaching skills and a lack of education materials. For instance, when observing lessons in primary and junior-high schools in developing countries, one often finds teachers explaining their subjects merely by writing on the blackboard while their students simply listen to the lectures. There are often no textbooks on the students' desks, no teaching guides, and no teaching aids. Other difficulties include poor quality curricula and textbooks, a lack of classroom facilities and educational equipment, inefficient school administration and teacher management, insufficient hours of instruction, parents' low awareness of education, issues of child labor, and the low social status of teachers, which discourages morale.

Following the strategy of BEGIN, JICA actively supports developing countries as they improve the quality of basic education. The quality of teachers is one of the most critical factors in improving the quality of education. Accordingly, JICA has placed a priority on improving the quality of science and mathematics teachers by combining various methods, including developing teaching guides and improving school management systems, curriculum, and textbooks.

There are three major approaches that JICA has commonly applied to improve the quality of teachers. The first one is to introduce a learner-centered approach that engages learners in practical activities and encourages them to think and solve problems by themselves instead of providing them with prescribed knowledge through teachers.

The second one is to equip teachers with skills and knowledge of lesson planning. In order to make learners engaged and interested in a lesson, each lesson needs to be well structured.

The third one is to introduce "lesson study," which is an approach widely used in Japan to improve the quality of lessons as a collaborative action by teachers. In this approach, a group of teachers get together and one of them demonstrates a lesson in the actual classroom in front of the other participating teachers, who then discuss how to improve the lesson by sharing views and opinions.

Sustainability and ownership of the project

Improving the quality of education in developing countries requires long-lasting efforts involving multi-level stakeholders. Not only teachers but also parents and local communities need to work together to promote improvements on a school-by-school basis, while such efforts and experiences need to be reflected on policies and administration.

JICA has been promoting "capacity development," whose aim is to improve individual, organizational, and societal capacities in an integrated manner. This approach emphasizes the ownership of the partner countries, while JICA experts facilitate their own efforts, encouraging autonomous and sustainable development after JICA's cooperation is terminated.

Japan's experience

In the 18th Century, in the mid Edo era (1603-1867), popular learning places called "terakoya," originally meaning "temple schools" in Japanese, became widespread. Here, the children of ordinary people learned reading, writing, and arithmetic needed in daily life. In the late 19th Century, after the Meiji Restoration, in order to promote the modernization of the country, the Meiji Government took the initiative in advancing education with the support of foreign experts.

After the two World Wars, the Japanese government further promoted science and technology to pursue economic development, which was supported by the advancement in science and mathematics education that had reached world-leading standards in a relatively short period of time.

Vitalizing lessons : Making lessons more attractive Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project

●Kenya



Changing classes with a student-centered approach

The Government of Kenya has set a goal to achieve industrialization by 2020. Accordingly, the government faced an urgent need to improve science and mathematics education at the primary and secondary levels in order to develop the human resources that are required to support such industrialization. JICA supported a five-year project starting in 1998, and helped establish an in-service teacher training system and provided training for science and mathematics teachers.

Following discussion and exchange of ideas between Kenyan and Japanese experts, the project has adopted a unique approach to improve lessons. It is called the ASEI (Activity, Student, Experiment, Improvisation) approach, which aims to make teaching and learning more student-centered.

This approach encourages teachers to develop lesson plans and introduce experiments and practices in the classroom using easily available materials. In this way students are encouraged to generate hypotheses, test them, and formulate their own conclusions, thus making science and mathematics more appealing. One student says, "Experiments help us better understand why a particular phenomenon happens", and another says, "Experiments are the most interesting!"

The project has also successfully introduced the PDSI (Plan, Do, See, Improve) method, which encourages teachers to constantly improve their lessons according to the students' learning achievements and educational needs.

Moreover, the project has established the SMASSE Fund. This fund, collected from parents as part of the tuition fee, enables the



teachers to participate in training. Teacher training has been effectively managed in cooperation with the Teachers Service Commission as well as District Education Officer and school principals.

JICA has introduced the perspective of "capacity development" in the project by not only training individual teachers but also getting schools and administrative bodies actively involved in project implementation. The project has been recognized as one of JICA's cooperation models in the field of science and mathematics education for neighboring countries in Africa.

Ms. Alice N. Wahome, a former project trainee and a mathematics teacher says, "I used to spend the whole lesson writing on the chalk board. It was tiring and I am sure I was a boring teacher then. After the teacher training, however, my lessons have changed for the better. I am convinced that lessons can change if the teacher can change."

During the first five years, the project was carried out in 15 regions in Kenya. As the Kenyan Ministry of Education recognized the successful achievement of the project, it decided to start a second phase of the project, expanding it throughout country. Today, under the project, about 1,200 local training instructors trained in Nairobi teach more than 16,000 science and mathematics teachers annually nationwide, thus promoting comprehensive reform to improve science and mathematics education in Kenya.

Networking Africa : Supporting South-South Cooperation

Kenya's experience and achievements have gained a great deal of attention from neighboring countries in Africa, and a regional cooperation network in science and mathematics education called "SMASSE-WECSA (Western, Eastern, Central and Southern Africa)" was established in 2002. Currently, more than 30 African countries participate in the network, sharing information and promoting mutual understanding. The network also conducts training in Asian countries, such as the Philippines, helping establish an inter-regional network between Asia and Africa to pursue improvements in science and mathematics education under the framework of South-South Cooperation.

The SMASSE-WECSA is recognized as one of the most important projects in the New Partnership for Africa's Development (NEPAD), and it also plays a central role in the science and mathematics working group of the Association for the Development of Education in Africa (ADEA).

CASE REPORT

All Children Will Complete Primary Education Improvement of Teaching Method in Mathematics Project



Improving teachers' competence

The Government of Honduras has set a goal that all children of school age receive and complete six years of primary education by 2015. While almost all children have access to primary school in Honduras, many students frequently repeat grades, especially in the lower grades: as a result, one-third drop out before completion. Spanish and mathematics are the main obstacles for children to be promoted to higher grades and graduate.

From 1989 to 2002, Japan dispatched a total of 58 JOCVs to Honduras to provide training in mathematics for approximately 20,000 teachers. Building on this experience of JOCVs, the government of Honduras requested the Japanese government to support a new project that started in 2003 with the aim of improving skills of in-service teachers in mathematics.

The key activities of the project include development of teaching and learning materials, in-service teacher training, and the establishment of evaluation methods at the classroom level. Due to a lack of textbooks, in Honduras teachers write questions and answers on the blackboard while children simply copy them. This type of lesson requires that children spend long hours transcribing all

the questions and answers written on the blackboard, thus leaving them little time for thinking. Moreover, most children cannot study at home because they have no textbooks.

Under the project, teachers' guidebooks and students' workbooks have been developed for all six grades of primary school. They were authorized by the Government of Honduras in 2005 and distributed to all primary teachers and students nationwide in collaboration with other donors. Sweden and Canada financially supported reproduction of these materials, and a Common Fund, made up of contributions from major donors, has been used to deliver them to about 1.3 million children and about 40,000 teachers all over Honduras. These efforts were carried out within the framework of the Fast Track Initiative (FTI: a global partnership to ensure accelerated progress towards the universal primary education by 2015).

Sharing best practices in Central America and the Caribbean

The project in Honduras has gained a great deal of attention from neighboring countries that have struggled with similar problems, thus expanding its impact throughout Central America and the Caribbean. Guatemala, El Salvador, Nicaragua, and the Dominican Republic also launched similar projects to develop teachers' guidebooks and students' workbooks adapting the methods developed in Honduras. In some of these countries, JOCVs are also involved in teacher training.

In 2006, JICA launched "Regional Program for Mathematics Education in Central America and the Caribbean" in five countries. Honduras conducts training programs for the region utilizing its National Institute for Educational Research and Training, which was established with support from the Japanese government. The program has also started networking with relevant projects in other Latin American countries, such as Colombia and Chile.

JICA's assistance for improving mathematics education, starting with the JOCVs dispatched to Honduras, is now taking root in the Central America and Caribbean region based on the experiences of the Project. This is an excellent example of grass-roots activities blossoming into a region-wide achievement.

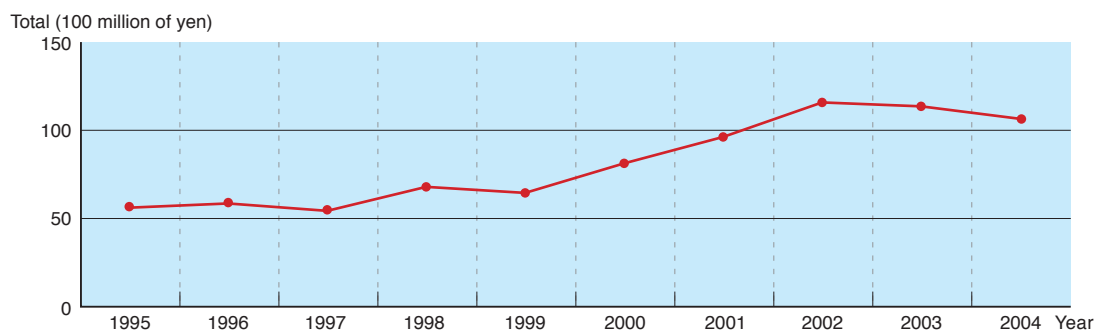


Trend of JICA's Cooperation in Science and Mathematics Education

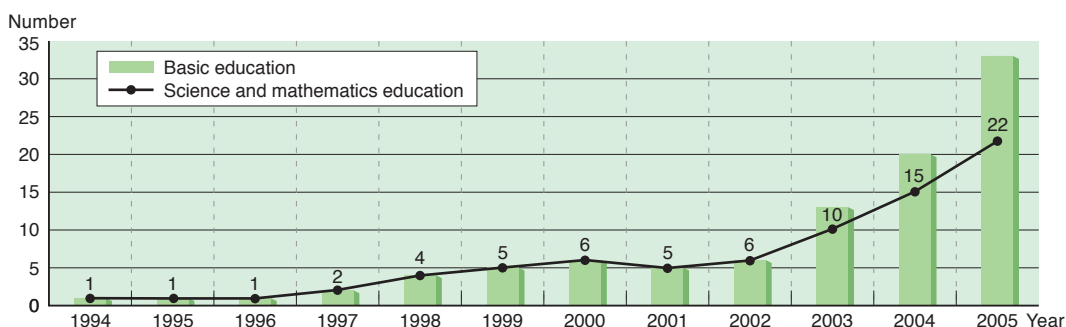
During the last decade, JICA has doubled its expenditure on basic education, of which science and mathematics has been an integral part. The technical cooperation projects in science and mathematics education, starting in 1994, have dramatically increased in number, covering 27 countries with 22 projects being carried out in 2005.

Many JOCVs have also been dispatched in the field of science and mathematics education. Since the first assignment in 1966, a total of 2,146 volunteers have worked in 57 countries.

JICA's cooperation in basic education (fiscal 1995-2004)

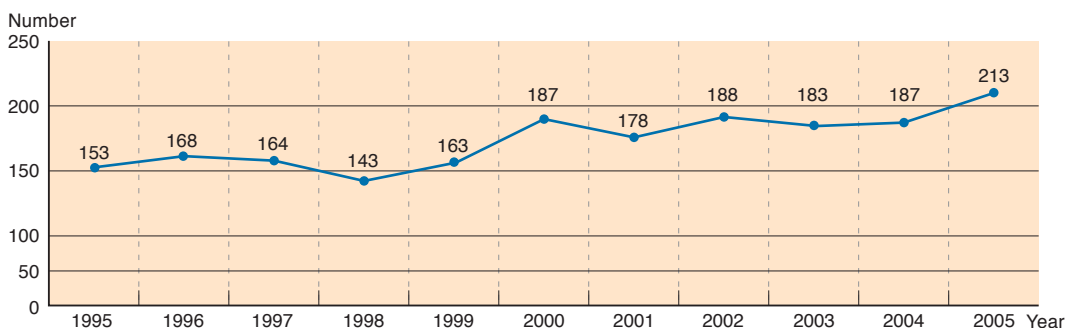


Technical cooperation projects in basic education and science and mathematics education (1994-2005: On-going projects in each fiscal year)



JOCVs in science and mathematics education

(1995-2005: Volunteer teachers in science, mathematics, or science and mathematics on duty in each fiscal year)



For a better tomorrow for all.

Japan International Cooperation Agency

Shinjuku Maynds Tower Bldg., 2-1-1, Yoyogi, Shibuya-ku, Tokyo 151-8558 JAPAN

TEL: +81-3-5352-5311 FAX: +81-3-5352-5032

URL: <http://www.jica.go.jp/>