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BUILDING HUMAN CAPACITY FOR ECONOMIC GROWTH

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Introduction

I want to thank Guillermo Fernandez, the US/Mexico Foundation for Science, the Science Academy of Latin America, the State of Nuevo Leon and their partners both for holding this meeting on basic science education and for inviting me. There is no question that we are here to discuss one of the most important issues facing not just Mexico and Latin America more generally, but all societies today – and that is making available effective, innovative education in mathematics and the sciences to the future citizens of the world.

In my comments today, I would like to touch on 4 things:

- One is the connections between science and technology, education, and economic development;
- The second is their status in Latin America;
- The third is the role of the InterAmerican Development Bank in supporting education in Latin America and the Caribbean; and
- Finally, some issues for the future.

1. Science and Mathematics Education and Economic Development

We live today in a discovery and knowledge-driven world. Over the last half century, science and technology have come to occupy a central place as sources of economic growth and social well-being. Scientific discovery has led to dramatic increases in agricultural productivity, the establishment of new industries with new materials and processes, a revolution in communication and information technology, and improvements in health and quality of life.

The speed and pervasiveness of innovation is definitively reshaping the world economy. Developing countries must invest in innovation, research, and education not only to improve their competitive positions, but equally, to avoid falling further behind.

This implies the acquisition of a broad range of new competencies and the implementation of social, economic, and institutional changes, including information and communication infrastructure, an appropriate legal, policy, and investment climate, systems of measurement and quality control, and, of course, education and workforce development.

The OECD notes that while financial capital appears most strongly associated with growth at early stages of industrialization, the role of human capital – always critical – increases with industrial development. Human capital eventually becomes the strongest driver of economic growth.

Recent studies indicate that in the United States, on average, a 10% increase in the educational level of a firm's workforce, that is, about one additional year of education – increases its productivity by 8.6% in the manufacturing sector and 11 % in the non-manufacturing sector.

And a study of improvements in the quality of the labor force, as measured by math and science scores, indicates that "…a difference in test performance of one standard deviation was related to a 1 percent difference in the annual growth rate of per capita GDP."

With human capacity as the key driver in innovation, science and mathematics education assumes a determining role for competitiveness:

- Knowledge economies require highly trained scientists and engineers to engage in research, development, and technology transfer and to become highly skilled managers in government and industry.
- They require a general workforce with basic capabilities in science and mathematics and the self-confidence and capability to meet the challenges of constantly evolving business and technical environments.
- They require a citizenry prepared to take advantage of the benefits of a knowledge society and also to deal with some of the consequences, whether in the environment, in public health, delivery of public services, and use of national and community resources.

This means that education, long treated by economists as an "expense" is, in fact, the single most important investment in the future. Education is vital to the well being of individuals and nations; it is a key determinant in the accumulation of human capital and economic growth; and it develops well-rounded and engaged citizens whose skills and creativity contribute to cohesive and productive societies.

2. Status of Latin America with Respect to S&T and Education

Where, in this context, does Latin America stand?

While Latin America has made progress with respect to capacity building in S&T, its productivity growth, highly dependent on science and technology, was less than half of the world average and the region has lagged not just the highly industrial countries, but also the high performance economies of Asia.

Countries with highly developed economies – for example, the United States and other OECD members, the European Union, invest between 2 and 3 percent of their GDP in Research and Development (R&D) with significant industry participation. The fast growing economies of South Korea, Taiwan, Singapore, and Ireland spend between 2.5 and 1.5 percent of their GDP on R&D. They have adopted aggressive S&T strategies that target education and workforce development, information technology, and research and innovation with the aim of increasing their market share in key sectors of economic activity.

The Latin American average investment in R&D is half a percent of GDP, the bulk of it from public sources. In national rankings, Brazil, the most advanced nation of the region with respect to R&D, invests just under one percent, and the region as a whole ranks in the bottom quartile.

Latin America also lags with respect to other indices of technological competitiveness. In a ranking of seven categories of nations, based on composite evaluations of national orientation, socioeconomic infrastructure, technological infrastructure, and productive capacity, Latin America stands last with respect to both input and output indicators and to related social, and institutional indicators as well.

It has the lowest fraction of researchers per capita, the lowest growth rate of scientific personnel, and Brazil, Mexico, and Argentina account for close to 80 percent of all research personnel in the area. In the 2002 rankings of the World Competitiveness Yearbook, out of 49 countries, no Latin American Country ranked higher than 20 (Chile), and the remaining Latin American and Caribbean countries included are found in the lower quartile. During the economic boom decade of the 90s the region experienced rising unemployment and a limited capacity to absorb increasing supplies of workers. A recent InterAmerican Development Bank study indicates that low productivity, even among skilled workers, is a challenge for many countries in the region.

The region's future prospects for economic growth and poverty reduction will depend on progress made in developing knowledge societies and innovation economies. Although the region continues to improve, the gap between Latin America and other areas of the world is growing. The current rate of investment and capacity building in S&T is clearly not enough, and the challenge of meeting world standards is particularly severe for the poor and small countries of the region.

Education

The status of education in the region has generally improved over the last 30 years, and almost all countries in the region have moved toward more years of compulsory general education. There has been a six-fold increase in preschool enrollment, a doubling of enrollment in elementary education, tripling in secondary education, and an eight-fold increase in higher education. Basic literacy has become the norm rather than the exception and the schooling of girls has improved as well. Investments in education as a percent of GDP have just about doubled over the past 50 years.

Education in the region has been undergoing not just growth, but reform as well, moving toward improved quality and greater equity, curricular reform, and also the recognition of the importance of training in science and technology. Teacher preparation has emerged as a priority and innovative approaches include incorporation of information technology and distance education. Technical education and quality secondary education are being valued for their own sake rather than just as preparation for higher education.

That said, the needs and deficits in the region remain large. As UNESCO's *World Science Report* indicates, the region lags in terms of the development of science and does not provide a solid foundation in primary and secondary school. Few countries in the region achieve universal net enrollment at the primary level, with the regional average at 75 percent. The level of failures and dropouts is high. Of those proceeding to the secondary level, only 50 percent complete their schooling and in rural areas the percentage drops to 10.

Teachers are poorly trained and compensated. Schools lack the resources for quality equipment – and even basic facilities. Some countries have experienced a decrease in enrollments in science and engineering, reflecting the quality of science and math education at the primary and secondary levels. In 1998 an IDB assessment concluded that "The region's educational institutions are among the worst rated by international leaders and the investment community." Quality education is a steeply rationed good, accessible to few, and still often viewed as a privilege rather than as an investment.

Given the importance of human capacity building for competitiveness and quality of life, the deficits in science, mathematics, and technology education are particularly worrisome. Teachers are largely unprepared to teach their subject matter and access to quality content, to information technology and to innovative approaches, including inquiry based education, is limited. Few Latin American countries have participated in international testing through TIMSS or PISA (Brazil, Mexico, Chile, Colombia) and those that have place at the bottom of the rankings. Compared to their counterparts in South East Asia, workers in Latin America enter the labor force ill prepared for the global economy.

3. The IDB Role in Education

The InterAmerican Development Bank has a long history and a pioneering role among international organizations in supporting education and science and technology in the region. The IDB is a multilateral development agency. Its lending activities are carried out in keeping with the policies and strategic objectives established collectively by the member countries in support of the development of the region.

While the Bank exercises policy leadership and provides technical advice, Bank loans are responsive to country strategies and demands. The Bank also has much more limited resources for technical cooperation grants and supports special activities in research, training, dialogue, and consensus building, acting as a convener on topics of interest.

Since the granting of its first education loan in 1965, the Bank has committed, on average, about 5 percent of its yearly lending, currently averaging about $6 billion, to education. The Bank has made 14 education loans in the last 3 years with a total value of about $1 billion. The current education portfolio is about $3 billion, with projects in the approval pipeline valued another $1 billion. Historically, there was also a strong educational component to the Bank's science and technology loans, totaling about 1.5 billion over 40 years, which supported the development of research infrastructure in universities before shifting more recently to a stronger emphasis on industry, innovation, and competitiveness.

In the early years, Bank's emphasis on infrastructure development in the region pervaded all sectors of support, including science and technology and education. In these two areas, IDB emphasis was on construction, infrastructure, and program development, principally within higher education and technical and vocational education.

Beginning in the mid-1970s, the focus of the Bank's efforts shifted first to primary education in keeping with a surge of enrollments at that level, then most recently, as primary education leveled off, to secondary education support. Support for higher education, which declined during the last decade, is expected to receive renewed attention, although in balance with other educational objectives.

In keeping with changing needs in the region, there has also been an evolution in the objectives and focus of IDB education projects. The focus of IDB loans has moved from quantity to quality, from program preparation to service delivery, from a centralized focus to community needs. Primary concern with infrastructure has been replaced by more attention to management, training, content, teacher preparation, and the use of new tools such as distance education, information technology, and television-supported learning processes.

The IDB Education Strategy:

In the context of implementing the Bank's Institutional Strategy, which emphasizes poverty alleviation and economic growth, the IDB is currently in the process of developing a new Education Strategy. The new strategy, building on individual strategies for primary, secondary, technical, and higher education, is founded on the premise that education is a key instrument for economic and social development. The education strategy establishes the following priorities for Bank action:

1. Equity and Access: including attainment of the Millennium Development Goals in education, by focusing on universal primary education completion, gender equality through criteria that contribute to fighting poverty and social exclusion, and by fostering the expansion of special, heretofore neglected areas such as pre-school and tertiary non-university education.

2. Quality: with an emphasis on the improvement of teaching not just through pre and in service training, but through career incentives, management practices, and systems of standards and evaluation.

3. Relevance: by supporting the links between the education systems and national systems of innovation to improve competitiveness and reliance on information technology at all levels.

4. Institutional capacity: with a focus on strengthening educational institutions and systems, including policy, planning, evaluation, coordination with other sectors, cooperation and partnerships, stakeholder development, and development of an improved base of information and data; and

5. Regional cooperation: with a focus on the production of regional public goods in education based on closer coordination among governments and international agencies.

I would like to mention just a couple of examples of IDB activities reflecting the concern over the weakness of the region's science and mathematics education. The Bank's Educational Unit in the Department of Sustainable Development has undertaken some new activities specifically targeted at this area.

1. One is a regionally focused project on Technology and Distance Education in Latin America and the Caribbean, piloted in Mexico. Its objective is to improve the quality of secondary education in the sciences, mathematics, and language instruction by strengthening the capacity of the InterAmerican Teacher Training Program and of IVEN, the International Virtual Education Network, to deliver high quality content based materials, and by developing distance teacher training modules through video, communication, and information technology. The latter component is supported by Mexico's Ministry of Education, through ILCE, the Instituto Latinoamericano para la Comunicación Educativa.

2. The second initiative is a proposed regional study project on K-12 science and mathematics education in the region and its relationship to economic growth and productivity. The study aims to generate data on the status science and mathematics education in the region and provide a basis for country strategies for improvement in the context of economic development planning.

In short, with education as a consistent and significant component of its portfolio, the IDB has provided critical leadership and support for educational access and quality in the region. The Bank's approach has evolved over time to meet changing needs and address new opportunities, increasingly emphasizing the complex, mutually reinforcing relationships between education and other sectors.

Needs:

As we look to the future, what are some of the key issues for attention at the K-12 level?

1. There is a need for individual countries to articulate national strategies that clearly connect education and science and technology to economic growth and competitiveness, identify them as national priorities and back them up with meaningful resources, programs, and initiatives.

2. There is a need to capitalize on multisectoral partnerships and collaborations among national and international stakeholders. The support and commitment of the private sector, which has a major stake in the quality, skills, and competence of the workforce, deserves special mention.

3. Regional cooperation and initiatives deserve greater attention. Leveraging resources for common purposes, and sharing best practices, development of information technology networks, data bases, and assessments are strong reasons in general for the use of regional initiatives. The countries of Latin America and the Caribbean have a particular advantage in the cultural, linguistic, and geographic cohesion of the region.

4. It is critical to focus on quality and effectiveness through an emphasis on standards, content, and the use of the best tools and strategies, including information technology, distance education, and inquiry-based education. New efforts in the area of research on education and learning such as those being supported by the National Science Foundation will yield additional insights on what works. Additionally, the experiences of countries around the world will provide a rich resource of best practices.

Conclusion:

Economic competitiveness and quality of life depend on multiple factors. But from the perspective of a developing country, an aggressive strategy for high quality science and mathematics education is critical for three reasons:

1. One is the importance of human capacity as a driver in economic development.

2. Second, it is the most critical tool in the arsenal for catching up with developing economies and avoiding falling further behind.

3. Finally, as suggested by recent studies, the expansion of access to education to the entire national population, however viable a strategy for growth it has been in the past, as it has been, for example, in the United States, is self-limiting. Islands of excellence, whether few or many, are not enough. In the future, universal access must be paired with universal quality to insure competitive performance in the global knowledge economy.

Thank you.

Serious research on teaching and learning is still relatively new and will no doubt yield important insights into how we might improve the effectiveness of the learning experience. In the meantime, there is a wealth of knowledge based on experience and best practices. There is no doubt that hands-on, inquiry-based learning, which has worked so well at the graduate level, works equally well in teaching mathematics and the sciences at pre-college levels.

In closing, I would like to observe that while the challenge of providing effective, quality-based education in the sciences and mathematics in Latin America is large, the region is in a position to capitalize on the progress made in the last decades, on the experiences and insights into successful strategies employed by other nations, and on support and contributions from international, professional, and other organizations within and outside the region. There is also on a growing awareness within the region that improvements in education are the foundation for an effective and skilled workforce and scientifically literate citizenry capable, in all walks of life, of contributing to and benefiting from innovation and economic growth.