

KEYNOTE ADDRESS

CONSTRUCTING KNOWLEDGE SOCIETIES: NEW CHALLENGES FOR EDUCATION

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Abstract

Technology is dramatically changing the knowledge being produced in the world today. The changes, which could be as fundamental as was the introduction of blackboards into classrooms two centuries ago, will test education systems in developing countries. This keynote address considers the importance of new applications of knowledge, the continuous restructuring of education systems in response, especially at the tertiary level, and the challenges that developing countries and their donors face as a result of these changes.

Introduction

Because this event organized by USAID is so important, I felt very nervous before coming and had some hesitations about what to present to this distinguished audience. So I went to consult a fortune teller about the future of education in the age of knowledge. This is what she told me. In the school of the future, professors and students will be greeted by a robot receptionist. Incoming students will receive a free Ipod, a Blackberry, a laptop and bicycle, or they will be able to buy a desktop for \$1. Low income students in need of financial aid will log onto Ebay to participate into scholarships auctions. In the school of the future, there will be no physical library or laboratories, only i-labs and e-libraries. Students who graduate on time will receive a \$500 cash reward. School principals will communicate daily with their students through SMS addressed to their cellular phones. At the university level, each student will have an individualized program; most students will enroll in at least two if not three institutions and get credits towards their degree. The validity of degrees will be only five years; courses will be redesigned every three year. Most courses will be online, through dynamic interaction with cognitive tutors based on artificial intelligence software. Many of the courses will be sub-contracted to private firms. Graduates who do not find a suitable job within six months of graduating will be reimbursed the cost of their studies. Public universities will receive only 10% of their resources from the government budget. A university president will earn more than a million dollars a year. To stimulate institutional responsiveness and relevance, the president will tax each university department at the beginning of the academic period and award the most innovative department a one million dollar prize at the end of the period. Professors will receive a bonus based on the labor market outcomes of their students. The most sought after program will not be the MBA anymore but the Master in Fine Arts recognized for the critical creativity skills imparted to future industry leaders.

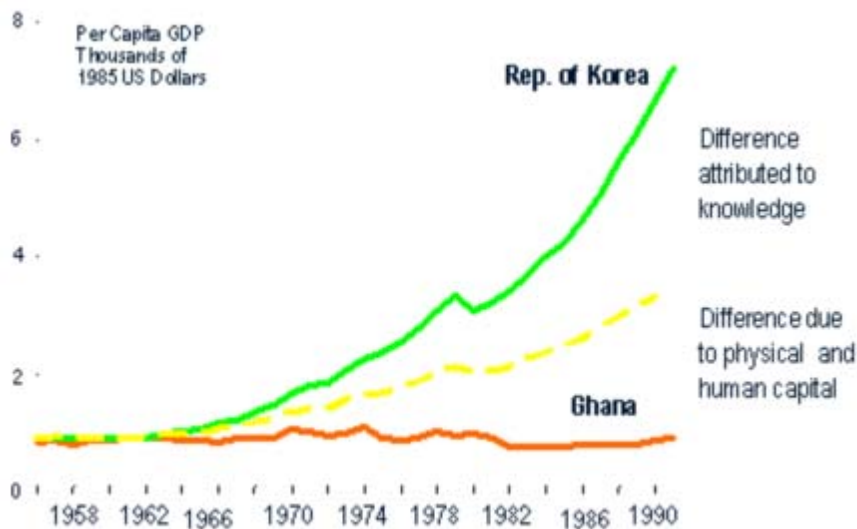
If you think that these are stories of science fiction, the fact is that all these examples are real life

cases that symbolize the revolution that education is confronting today. And the question we need to ask ourselves, those of us who work on supporting education progress in developing countries, is “Are their education systems prepared to face these dramatic changes?” This paper will consider four aspects to this question: (1) the importance of knowledge for developing countries and the role of education in that context; (2) the changes in education and training needs; (3) the implications for education systems all over the world; and (4) the implications for the way donor agencies operate in support of education development.

Importance of Knowledge

It is recognized widely that economic development is increasingly linked to the ability of a country to acquire and apply knowledge. A few years ago, some of my World Bank colleagues compared two countries, South Korea and Ghana, which in the late 1950s had the same level of economic development. Today we know how much progress South Korea has achieved, while Ghana has not advanced that much, unfortunately. One could say simply that it is because Ghana is poorer than Korea. But what my colleagues did was to estimate where Ghana would be today if it had benefited from the same endowment of capital and labor inputs, as shown on the middle (yellow) line of the attached graph. The difference between the top (green) and the middle (yellow) lines on the graph is attributed to the fact that South Korea has been able to acquire foreign technology and then develop and apply its own technologies over the years. Some of you may own a Samsung cellular phone or a LG television or drive a Hyundai. Ghana, by contrast, does not boast similar technological advances.

Knowledge as a Factor in Income Differences between Countries: Ghana and the Republic of Korea, 1956–90



Source: World Development Report 1998/99: Knowledge for Development. New York: Oxford University Press: 22.

Knowledge is also important to solve the type of environmental problems that plague many cities all over the world. Knowledge is also important to deal with safety issues. In 1985, for example, a scientist warned the Colombian government that the extinct volcano called Nevado del Ruiz was in fact showing some signs of activity and might erupt anytime. No one paid attention to his warnings. Three months later, there was an eruption; the lava melted the snow which capped the mountain and created a river of mud which traveled a hundred kilometers within a few hours and destroyed the city of Armero where about 20,000 people died. With today’s scientific advances in

the fields of seismology, vulcanology and climatology, there is no excuse not to be better prepared. The terrible impact of both the Asian Tsunami on December 26, 2005 and more recently the Katrina Hurricane in Louisiana in the U.S. are sad illustrations of what happens when governments are not well prepared and do not heed the advice of scientists. Finally, countries need to have the capacity to understand global issues such as the avian flu epidemics, global warming, stem cell research or the application of genetically modified crops.

A last point to mention is the acceleration of the speed of knowledge creation, which has serious implication for what and how we teach in schools and universities. Learning facts is becoming less relevant than learning to search for the right information.

Changing Education and Training Needs

What is happening in the labor market? How are the education and training needs of firms evolving? The first observation is that, on average, *there is a demand for higher skill levels*. Statistics from the OECD show that, in all member countries and for both male and female, the gap in earnings between the tertiary and the lower levels of education has grown even though the supply of graduates has increased, reflecting the higher demand for college and university graduates. Similar statistics are available for a number of developing countries such as India, the Philippines, Brazil, Mexico and Argentina.

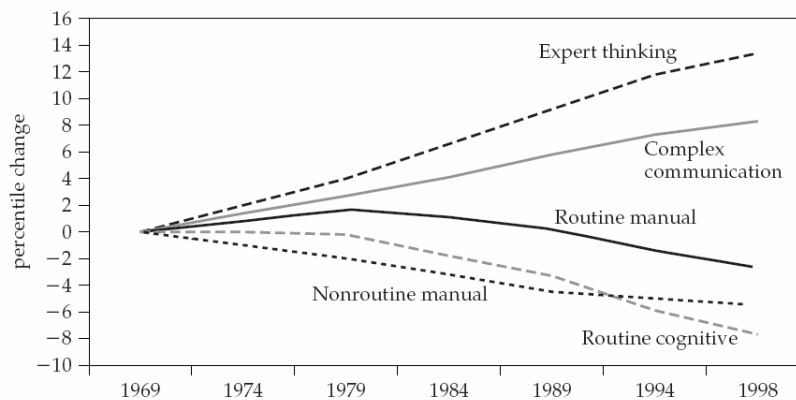
A second, related dimension of change is the *need to train young people to be flexible and to acquire the capacity to adapt easily to a rapidly changing world*. Recent research carried out by Levy and Murnane on the skills requirements for the tasks performed in the US labor market shows the types of skills for which there is less demand or that have been taken over by computers and those for which there has been increased demand.¹ In their path-breaking study, the authors divided the tasks performed in firms into five broad categories:

- *Expert thinking*: solving problems for which there are no rule-based solutions, such as diagnosing the illness of a patient whose symptoms are out of the ordinary;
- *Complex communication*: interacting with others to acquire information, to explain it, or to persuade others of its implications for action; for example, a manager motivating the people whose work he/she supervises;
- *Routine cognitive tasks*: mental tasks that are well described by logical rules, such as maintaining expense reports;
- *Routine manual tasks*: physical tasks that can be well described using rules, such as installing windshields on new vehicles in automobile assembly plants; and
- *Non-routine manual tasks*: physical tasks that cannot be well described as following a set of “if-then-do” rules and that are difficult to computerize because they require optical recognition and fine muscle control; for example, driving a truck.

The figure below shows trends for each type of task. Tasks requiring expert thinking and complex communication grew steadily and consistently during the 1970s, 1980s, and 1990s. The share of the labor force employed in occupations that emphasize routine cognitive or routine manual tasks remained stable in the 1970s and then declined over the next two decades. Finally, the share of the labor force working in occupations that emphasize non-routine manual tasks declined throughout the period.

¹ Levy, Frank, and Richard Murnane (2004). *The New Division of Labor: How Computers Are Creating the New Job Market*. Princeton, NJ: Princeton University Press and Russell Sage Foundation.

Economy-wide Measures of Routine and Non Routine Task Inputs United States, 1969–98



Source: Levy and Murnane (2004), p. 50, figure 3.5.

Note: Each trend reflects changes in the numbers of people employed in occupations emphasizing that task. To facilitate comparison, the importance of each task in the US economy is set to zero in 1969, the baseline year. The value in each subsequent year represents the percentile change in the importance of each type of task in the economy.

The third dimension of change in education and training needs is *the growing importance of continuing education* needed to update knowledge and skills on a regular basis because of the short “shelf life” of knowledge. At the post-secondary level, for instance, the traditional approach of studying for a discrete and finite period of time to acquire a first degree or to complete graduate education before moving on to professional life is being progressively replaced by practices of lifelong education. Training is becoming an integral part of one’s working life, and takes place in a myriad of contexts: on the job, in specialized higher education institutions, or even at home.

Lastly, an important consequence of the acceleration of scientific and technological progress is the diminished emphasis in tertiary education programs on the learning of facts and basic data *per se*. There is a growing importance of what could be called *methodological knowledge* and skills, i.e. the ability to learn in an autonomous manner. Today, in many disciplines, factual knowledge taught in the first year of university study may become obsolete before graduation. The learning process now needs to be increasingly based on the capacity to find, access and apply knowledge to problem-solving. In this new paradigm, where learning to learn, learning to transform information into new knowledge, and learning to transfer new knowledge into applications is more important than memorizing specific information, primacy is given to information seeking, analysis, the ability to reason, and problem-solving. In addition, competencies such as learning to work in teams, peer teaching, creativity, resourcefulness and the ability to adjust to change are also among the new skills which employers value in the knowledge economy. The following remarks by Professor Anthony Komaroff from the Harvard School of Medicine² suggest how many skills are required to do a job well.

To be a good doctor, you have to know a lot of facts. Medical training does a very good job of teaching those facts. But a good doctor also needs to have many other skills: to keep up with an ever changing body of medical knowledge; to efficiently find information that it is not possible to memorize; to learn how to make decisions such as how to balance the benefits of a test or treatment against its risks; to sense a patient’s unexpressed fears or

² Quoted in *Newsweek*, 12 December 2005, p. 84.

misunderstandings; to elicit a patient's wishes; to explain things clearly, and, above all, to care. It is a lot harder to teach these skills than to give medical students facts to memorize. At our medical school and, at many others the curriculum is being changed to emphasize such skills.

Changing Education Systems

New Forms of Competition at the Tertiary Education Level

The decreased importance of physical distance means that the best universities in any country can decide to open a branch anywhere in the world or to reach out across borders using the Internet or satellite communication links, effectively competing with any national university on its own territory. With 90,000 and 500,000 students respectively, the [public] University of Maryland University College and [private] University of Phoenix have been the fastest growing distance education institutions in the US in the past five years. It is estimated that, in the US alone, there are already more than 3,000 specialized institutions dedicated to online training. Thirty-three states in the US have a statewide virtual university. Distance education is sometimes delivered by a specialized institution set up by an alliance of universities, as is the case with Western Governor University in the US and the Open Learning Agency in British Columbia. In Thailand and Turkey, the national open universities enroll respectively 41 and 38 percent of the total student population in each country.

Corporate universities are another form of competition with which traditional universities must increasingly reckon, especially in the area of continuing education. It is estimated that there are at approximately 1,600 institutions in the world functioning today as corporate universities, up from 400 ten years ago.

Franchise universities constitute a third category of new competitors. In many parts of the world, but predominantly in South and Southeast Asia and the formerly socialist countries of Eastern Europe, there has been a proliferation of overseas "validated courses" offered by franchise institutions operating on behalf of British, US, and Australian universities. One-fifth of the 80,000 foreign students enrolled in Australian universities are studying at offshore campuses, mainly in Malaysia and Singapore.³ The cost of attending these franchise institutions is usually one-fourth to one-third what it would cost to enroll in the mother institution.

The fourth form of unconventional competition comes from the new "academic brokers," virtual entrepreneurs who specialize in bringing together suppliers and consumers of educational services.

Changes in Structures and Modes of Operation

Faced with new training needs and new competitive challenges, many universities have undertaken important transformations in governance, organizational structure and modes of operation. A key aspect has to do with the ability of universities to organize traditional disciplines differently, taking into consideration the emergence of new scientific and technological fields. Among the most significant ones, it is worth mentioning nanotechnology, molecular biology and biotechnology, advanced materials science, microelectronics, information systems, robotics, intelligent systems and neuroscience, and environmental science and technology. Training and research for these fields

³ Bennell, Paul, and Terry Pearce. 1998, *The Internationalization of Higher Education: Exporting Education to Developing and Transitional Economies*. IDS Working Paper 75. Institute of Development Studies, University of Sussex, U.K.

require the integration of a number of disciplines which have not necessarily been in close contact previously, resulting in the multiplication of inter- and multidisciplinary programs cutting across traditional institutional barriers.

The evolution towards lifelong learning means that young high school graduates will gradually cease to be the primary clientele of universities. As a result, universities must organize themselves to accommodate the learning and training needs of a very diverse clientele: working students, mature students, stay-at-home students, traveling students, part-time students, day students, night students, weekend students, etc. One can expect a significant change in the demographic shape of tertiary education institutions, whereby the traditional structure of a pyramid with a majority of first degree students, a smaller group of post-graduate students, and finally an even smaller share of participants in continuing education programs will be replaced by an inverted pyramid with a minority of first time students, more students pursuing a second or third degree, and the majority of students enrolled in short-term continuing education activities. Already in the US, almost half of the student population consists of mature and part-time students, a dramatic shift from the previous generation.

Tertiary education institutions are also changing their pattern of admission to respond in a more flexible way to growing student demand. In 1999, for the first time in the US, a number of colleges decided to stagger the arrival of new students throughout the academic year, instead of restricting them to the fall semester. In China, similarly, a spring college entrance examination was held for the first time in January 2000, marking a sea change in the history of that country's entrance examination system. Students who fail the traditional July examination no longer have to wait a full year to get a second chance.

New Challenges for the Donor Community

The various trends mentioned above have led several donors to revise their priorities when considering financial and technical support for developing and transition countries. First of all, there is a need to embrace a holistic approach of the education system and to move away from an exclusive focus on basic education. While the foundations in terms of basic skills, values and attitudes are imparted during the first years of formal schooling, young people also need the higher order competencies imparted at the secondary and tertiary education levels. During fiscal year 2005, for example, 65 percent of education credits granted by the International Development Agency, the World Bank's window for low income countries, went to basic education; 18 percent supported secondary education operations; and 15 percent were allocated to tertiary education development.

Second, it is increasingly important to design inclusive strategies that offer education opportunities to all groups in society, especially the traditionally excluded such as children from ethnic minorities, girls, and illiterate adults. For instance, the World Bank approved its first lifelong learning loan just a few years ago in Chile, followed two years later by similar operations in Mexico and in Romania.

A third shift consists in putting more emphasis on strengthening basic research to allow developing countries, even low income countries, to build up the necessary scientific and technical capacity to apply knowledge to the resolution of economic and social problems and the achievement of the Millennium Development Goals. Within the framework of the Millennium Science Initiative, the World Bank has recently supported or is currently supporting the development of Centers of Excellence in Chile, Brazil, Venezuela, Kazakhstan and Uganda.

Lastly, donor agencies can play a catalytic role in helping developing countries make appropriate choices in the use of new pedagogical resources that can enhance the effectiveness of teaching and

learning processes. For example, distance education and asynchronous learning can provide increased access to learning opportunities. Digital textbooks can be continuously updated and offer up to date content. Developing countries can also tap the rapidly growing open education resources that are available free of charge, such as virtual lab software, courseware, cognitive tutors, digital libraries, etc.

Conclusion

Two hundred years ago, in a small school in Boston, Massachusetts, a professor of mathematics saw something that he had never seen before in his life: a blackboard, some chalk and a piece of cloth. He wondered what it was meant for. Now we all know that for the past two hundred years the blackboard has been the main pedagogical support in the classroom. The question we should ask ourselves today is how the Internet and related digital resources are likely to revolutionize education in the same way as the blackboard did. In this context, it is worth mentioning Arthur Levine, the president of Teacher's College at Columbia University in New York City, who predicted the death of traditional universities characterized as the "brick universities," to be replaced by "click universities."

While it is not entirely sure that we will witness the demise of the traditional pedagogical model, what is certain is that schools and universities are called upon to change drastically under the pressure of increased competition and growing demands for accountability. But the successful integration of technology into the learning process will require a cautious approach. Notwithstanding the many advantages that modern technologies can offer, their effectiveness depends on a clear strategic vision of their role in support of a new pedagogical project. It is important to define first the new pedagogical approach that a school or a university wants to implement and then to look for the most appropriate technology to prop up that pedagogy. As the Roman philosopher Seneca wrote two thousands years ago, "there is no favorable wind for those who do not know where they are going."