

## TERTIARY OR POST-SECONDARY EDUCATION

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### 1. Introduction

The dawning of the twenty-first century has witnessed an unprecedented demand for and a great diversification in tertiary or post-secondary education, as well as increased awareness of its importance for sociocultural and economic development and for building the future. Tertiary education includes “all types of studies, training or training for research at the post-secondary level, provided by universities or other educational establishments that are approved as institutions of higher education by the competent State authorities.” Although distinctions can be drawn between “higher education” and “tertiary education” these two terms are used interchangeably in this article and refer to studies or formal education beyond the secondary level.

Everywhere tertiary education is faced with great challenges and difficulties related to financing, equity of access, improved staff development, enhancement of quality in teaching, research and services, relevance of programs, employability of graduates, and establishment of efficient cooperation. At the same time, tertiary education is being challenged by new opportunities relating to technologies that are improving the ways in which knowledge can be produced, managed, and disseminated. Equitable access to these technologies should be ensured at all levels of the education system.

The second half of the twentieth century saw the most spectacular expansion ever of tertiary education with a more than six-fold increase in student enrolment worldwide, from 13 million in 1960 to 82 million in 1995. But this was also the period that saw a widening of the already enormous gap between industrially developed, developing, and in particular the least developed countries with regard to access, and higher learning resources, and research. It was also a period of increased socioeconomic stratification and greater difference in educational opportunity within countries, including some of the most developed and wealthiest nations. Without adequate tertiary education and research institutions providing a critical mass of skilled and educated people, no country can ensure genuine endogenous and sustainable development and developing and the least developed countries in particular cannot reduce the gap separating them from the industrially developed ones. Sharing knowledge, international cooperation, and new technologies can offer new opportunities to reduce the gap.

Tertiary education has given ample proof of its viability over the centuries and of its ability to change and to induce social change and progress. Owing to the scope and pace of change, society has become increasingly knowledge-based, so that higher learning and research now act as essential components of the cultural, socioeconomic, and environmentally sustainable development of individuals, communities, and nations. Tertiary education itself is confronted therefore with formidable challenges and must proceed to the most radical change and renewal it has ever been required to undertake, so that our society, which is currently undergoing a profound crisis of values, can transcend mere economic considerations and incorporate deeper dimensions of morality and spirituality.

## **2. Relevance of Tertiary Education**

The relevance of higher education will be considered primarily in terms of its role and place in society, its functions with regard to teaching, research, and relevant services, and its links with other levels and forms of education.

The globalization of the economy, the increasing size of multinational companies and their international influence, the modernization of production processes involving a raising of the education level of an increasingly large part of the labor force, and the headlong advance of technology bringing with it a need for lifelong training represent changes that are bringing tertiary education into increasingly frequent contact with the world of work. One of the first fruits of such contact is that the business world can bring to tertiary education its entrepreneurial spirit and its concern for effectiveness and efficiency. Conversely, the world of tertiary education can contribute to business the wisdom gleaned from its legendary impartiality towards phenomena and appearances, its power to look ahead and concern for the long term, the multiplier effects of the results of its basic research, and its concern for the universality of what is true and just for the development of a more harmonious world. One of the first changes concerns curricula, which are too often directed at piling up knowledge. While there was a time not too long ago when one person could master all the knowledge existing in a particular field, this is now impossible: knowledge in chemistry doubled in less than six years in the late twentieth century; in informatics it doubled in less than five months. It

is now necessary for the emphasis placed on the transmission of knowledge to switch to the process of generating it.

More than ever, tertiary education must adopt a proactive attitude towards the labor market by analyzing, forecasting, and preparing for the emergence of new areas and forms of employment. Here, too, university research must acquire databases in order to observe, analyze, and anticipate trends in the world of work more efficiently. Side by side with major companies with subsidiaries in many countries, numerous small and medium-sized firms (SMF) are providing a multiplicity of jobs. While more difficult to study because of their numbers, varied nature, and less formal status, they are still an important field of economic activity in both the developed and developing countries. Tertiary education should give them more importance and promote more constructive relations with them. Likewise, highly developed informal economies in the poorest nations should be another important field of study with the aim of better understanding their emergence, the way they operate, the way they develop in-house skills, their contribution to the country's development or underdevelopment. Partnerships with firms both great and small are increasingly necessary at the level of both basic training and continued training, the latter destined to assume even greater scope in the future. The joint organization of training courses, cost sharing for certain types of training, linked work, and technological transfers are potential fields for partnership to be developed in a spirit of mutual respect. This means helping to train graduates who, having learned to learn, are in position to generate their own jobs.

With a few rare exceptions, the initial training of teachers and many social workers is the responsibility of tertiary education. This demands an active approach aimed at bringing all levels of the education system together to form an "educational chain." This contact is necessary if the education system is to form a consistent whole with subsystems or levels structured around a common educational project that is itself geared to a project for harmonious and sustainable development over space and time. Given the impact of education in development, academic research must give priority to analyzing and assessing the various levels of the education system in close touch with the work without subordinating itself to it, and as part of a blueprint for a society centered on humanity and the collective well-being. Such research must be essentially multidisciplinary because the economic and social components are closely linked. One of the meeting points between tertiary education and the other education levels is continuous teacher training. Knowledge is evolving at an ever-increasing pace; teachers need refresher courses. Context and needs change and the school cannot remain indifferent. Knowledge is invading all areas of life; it is therefore becoming a basic tool in which education is necessary as early as primary school. Networks are multiplying in all sectors. Pedagogical research has made enormous strides in recent decades and it is for the higher education institutions to pass on the results acquired through a deliberate policy of ongoing training.

In 1990, the hope was expressed that education for all would be a reality by the year 2000. However, even though school attendance rates have risen overall, they have fallen back in certain regions of the world where structural adjustment policies have been carried out at the expense of social needs and where genocidal campaigns have led to the disappearance of up to 50% of the teaching body. Yet the need and demand for

education are growing remorselessly under the twin pressures of population growth in the developing regions and the desire to raise the overall educational level for the sake of better development and an assured place in world competition. Population projections suggest that the world population will continue to increase from the year 2000 figure of around 5.5 billion to a population of between 11 billion and 14 billion by the end of the twenty-first century. Although average population growth rates are declining worldwide, populations continue to rise in developing regions where efforts to reduce fertility levels have met with limited success. Unless rapid population growth can be reduced, additional pressure will be put on natural and environmental resources and governance problems will increase. Over the past two decades, tertiary education has undergone dramatic and quite fundamental change and many of the forces that produced these changes continue to operate. Particularly important have been quantitative expansion in student enrolments, funding constraints and privatization, diversification in structures, and changes in curriculum design and delivery.

Access for all combined with the need to promote lifelong education calls for greater flexibility and considerable diversification in higher education training arrangements. Training programs and structures should be flexible in order to adapt rapidly to changing needs. It will also be necessary to develop a wider variety of short duration programs. Modern information and communication technologies promise to enhance teaching and learning in higher education for both on-campus and distance education students, and for disabled students who are denied access to technical and scholarly information resources, as well as facilitating communications among researchers and teachers. Already the notion of the virtual university is being actively explored. At the same time, harnessing this technology will require considerable investment in hardware, software, and staff development, while deliberate efforts will need to be made to ensure that the human and social interaction are not undervalued.

The nature of contemporary knowledge—in a process of constant renewal and sudden and dramatic growth—fully agrees with the current notion of permanent education. It should also enable all individuals—at whatever stage of their lives—to go back to the classroom and be a part of academic life once again. Establishments will have to turn into pertinent centers for facilitating professionals to be up to date, duly retrained, and reconverted. Hence they will have to offer solid training in the basic disciplines, along with a wide diversification of programs and studies, intermediate diplomas, and links between courses and subjects.

Getting together with students is more than a problem of access; it is one of genuinely meeting students as evolving beings. Beyond the formal curricula, the environment in which students move is an educational or anti-educational factor. A dirty environment is no sort of training in environmental concern or a feeling for the beautiful. An environment where a frantic spirit of competition prevails does not educate in solidarity. An environment where teachers do not respect their commitments (unjustified absences, delays, etc.) does not educate in responsibility. A changing society demands people have a comprehensive, general, and professional education. The latter must encourage the development of the whole person and should favor personal growth, autonomy, socialization, and the skills to turn the assets that perfect it into elements having real value. This integral training and the acquisition of an entrepreneurial spirit begin with

the active participation of students not only in education activities but also in the management and life of higher education institutions: student involvement in decision-making bodies should be boosted.

Teachers are primary resources on which largely depend the relevance and quality of higher education within its three basic tasks: teaching, research, and services. Meeting the needs of teachers so that they can perform their tasks is therefore fundamental in accordance with the Recommendation concerning the Status of Higher Education Teaching Personnel approved by the General Conference of UNESCO in November 1997. This means enabling teachers to maintain and update knowledge through initiatives such as sabbaticals, study tours, time at centers of excellence, attendance at scientific meetings, and networking. It also means allowing teachers to acquire the new skills required by developments in tertiary education. The shift from teaching to learning implies self-managed learning, a coaching role for the teacher, a new definition of scholarship balancing discovery and transmission, and the integration and application of knowledge. A crucial level for change is a creative and well-defined personnel policy that opens up teaching as a career, supported by appropriate staff development programs.

Personnel management involves introducing a culture of assessment but this could be done in a spirit of willingness to meet the other side halfway and take the general background into account, and thus in a spirit of instructive dialog. Self-assessment must accompany external assessment, there must be attention to facts and results rather than judgment about individuals, there must be discussion with those concerned of the meaning to be attached to the results, negotiation of the decisions to be taken and contracts agreed, without forgetting follow-up.

The potential impact of higher education on a country's development is undeniable. Imbalances between the various regions of the world are increasing. Within the developing countries in particular, imbalances of all sorts (between urban and rural areas, between the sexes, between minorities and majorities, etc.) are persisting or becoming more acute. Tertiary education institutions do not possess the financial and human resources to respond in isolation and with quality sufficient to meet all needs and demands. A joint internationalization and contextualization policy is therefore necessary at both the education and the research levels. Internationalization implies increased networking, which means that institutions must carry out a whole series of operations and communicate the results among themselves using advances in information and communication technology. These include identifying strong and weak sectors in education and research; identifying priorities that can be met with a critical mass of resources and those that cannot be met; identifying potential complementarities inside and outside the country; developing a policy that, instead of scattering resources, focuses them on creating local, national, or international centers of excellence situated in the same place, or operating on an exchange basis, or even at a distance; linking these centers of excellence around a coherent project conceived as a development process lasting several years.

Excessive emphasis on applied research in response to immediate needs is liable to dry up the principal source for the development of knowledge and its transfer to applied

research and research and development. An overemphasis on basic research risks isolating oneself from the needs of the world of work and society or assigning this task exclusively to bodies whose concern for short-term profitability does not help sustainable development. It also means ignoring the increasingly obvious fact that the distinction between the two types of research is becoming more tenuous. By the same token, higher education must pay greater heed to mixing the various disciplines. Genuinely interdisciplinary research spawns the new disciplines of tomorrow and is more likely to be relevant to industrial opportunities and the resolution of industrial or societal problems. One challenge is how to stimulate interdisciplinary research proactively when institutions are normally organized on discipline-based departments and when much external evaluation reinforces this by reviewing disciplines and implicitly discouraging interdisciplinary connections.

The rigid disciplinary boundaries between the hard sciences and the social sciences and the humanities that once limited the comprehension of the fundamental processes of nature and society are already breaking down in some fields. There must be a stimulus to create interdisciplinary programs, and there must be resources for collaborative research among different disciplines and involving groups around thematic projects. Moreover, as pointed out by experts from the Council of Europe meeting in July 1998 (working document “Higher Education and Research”), by becoming the main source of wealth for individuals and nations, science is giving higher education an increasing role in lifelong education, while simultaneously its cumulatively segregative character requires higher education to provide a counterweight to its economist tendency.

### **3. Quality of Tertiary Education**

The requirement for quality has become a major concern in tertiary education. This is because meeting society’s needs and expectations of tertiary education depends ultimately on the quality of its staff, programs, and students, as well as its infrastructure and academic environment.

#### **3.1. Quality of Staff**

If the chief wealth of leading-edge enterprises lies in the quality of their human capital, this is all the more true for tertiary education establishments. They demand of teachers and researchers not only great ability but also involvement and ethical values meeting the requirements of social relevance. A quality assurance policy therefore means identifying the required skill and attitude profiles before laying down a policy of teacher and researcher selection based essentially on merit, and applying it rigorously. But this also means managing careers so that progressively evolving needs match the available skill and attitude profiles, which calls for policies for the continuous training of teachers and researchers and the appropriate back-up strategies.

A quality assurance policy also implies working to motivate staff. This requires conferring on teachers a suitable social and financial status comparable with their opposite numbers in industry. This furthermore implies countering certain imbalances and developing well-articulated policies, removing gender inequity in education and, more importantly, promoting the advancement of women in society.

The various developments in society and tertiary education institutions means that staff quality will depend increasingly on two types of major change. The first concerns the training of teachers, who are increasingly having to adopt more innovative and interactive teaching ideas and methods, to use the resources offered by the new information technology (I.T.), and to encourage their students to use them. The second change concerns the introduction of incentives and structures requiring researchers to work in multidisciplinary teams focusing on thematic projects and thus to abandon their habits of working in isolation.

Insufficient attention to and insufficient resources for research are two of the worrying problems that higher education must tackle and whose nature varies with the region. In the developing countries, the burdens of teaching and supervision are sometimes such that high-quality research is impossible and researcher status is essentially meaningless, useful only for demanding additional funds. In certain very low income countries, the living conditions of teachers/researchers are such that their research can only be done after they have finished their teaching. In the more developed countries the problems are different: some teachers divest themselves of their teaching duties because research is better for their careers and because scientific criteria are the main factors in appointments and promotions. Others have chosen to invest in teaching for reasons of personal preference or because of the difficulties of doing research. If such an investment is not properly recognized by the establishment in its career management, the establishment will find that it is harboring a great many frustrated individuals who may have a negative effect on a high-quality research policy.

### **3.2. Quality of Curricula**

An increasing number of factors are affecting the need to modify curricula and can therefore affect their quality: the knowledge explosion and the burgeoning new disciplines; the increasing need to adopt a multi- and transdisciplinary approach to natural and social phenomena; the proliferation of short courses and the need to provide crossovers between short and long courses; the desire for greater social relevance in a changing world. These pressures compel tertiary education to adopt three major types of qualitative change in their curricula: changes in goals, in methods, and in the structure of curricula as they relate to one another.

To ensure that basic education and training are of high quality, it is important they be rooted in real-life settings and not be just a formal exercise that has no meaning and is non-transferable. The place where training takes place and its immediate environment are the initial means of exercising the aforementioned skills and attitudes and thus of responding to the explicit or implicit demands of the environment. The networking of physical or virtual exchanges provides more extensive possibilities for attaining universality through comparison with other contexts and thereby also reaching a better understanding of the specific features of local contexts. Students thus learn, together with the partner institutions, to pinpoint common and specific goals more accurately and to distinguish more clearly between what is transferable and what must be adapted.

While the quality of curricula is contingent on the quality of goals, it is also highly dependent on the quality of teaching methods. As a result of mass education—without

any proportional increase in resources—and the use of new technology, tertiary education faces the temptation to make greater use of new transmissive teaching in large groups, which it is difficult to reconcile with the goals set out above. Methods that involve students more deeply in the management of their learning and the use of certain facilities offered by I.T., whether in real time or at a distance, are routes that should be explored and cross-fertilized through exchange of experience.

With increasing openness to training throughout life and in different places, curricula will have to adapt teaching methods to the characteristic of the population concerned. Adults with professional experience do not react in the same way as young people just out of adolescence; adults sent by their firm to acquire skills relating to a change of job do not have the motivation of unemployed adults who come to study of their own volition in the hope of acquiring qualifications that will be useful.

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### **Biographical Sketch**

**Yu.D. Tretyakov** was born on October 4, 1931, in Rostov on the Don River in Russia. He graduated from Rostov State University with an M.Sc. in 1954 and gained a Ph.D. (1958) and a D.Sc. (1965) from Lomonosov Moscow State University. He has held the positions of research chemist, lecturer, professor, and laboratory head at Lomonosov Moscow State University. He became head of the Inorganic Chemistry Division in 1988, dean of the Higher School of Materials Science in 1991 at the same university, and director of the Laboratory of Chemical Synergistics (Kurnakov Institute of Russian Academy of Sciences) in 1994.

Dr. Tretyakov is a Corresponding Member (1984) and a Full Member (1987) of the USSR (now Russian) Academy of Sciences; National Representative (1987–1990) and Titular Member (1990–1993) of the IUPAC Committee on Chemical Education; Member of the IUPAC Coordination Committee on Chemistry and Advanced Materials (since 1991); Professional Member of the Academy of Ceramics (since 1987); Coordinator of the National Program in Chemistry and Technology of the HTSC (since 1987); and Member of Academia Europaea (since 1999). He received the Kurnakov Prize in chemistry from the USSR Academy of Sciences, the Avizenna Prize of the Tajikistan Academy of Sciences, and the Lomonosov Prize (twice) from the Lomonosov Moscow State University. He has been President of the Russian Materials Research Society since 1992. His publications number 10 monographs and textbooks, 50 national patents, and over 500 research papers. Dr. Tretyakov was Chief Editor of the *Journal of the Russian Mendeleev Chemical Society* (1990–1995) and a member of the editorial boards of *Journal of Solid State Chemistry*, *Ceramics International*, the Russian journal *Inorganic Materials*, *Russian Journal of Inorganic Chemistry*, and the Russian journal *Materials Science*.

He was visiting scientist at Max-Planck Institut fuer Physikalische Chemie (1964/1965), at Ohio State University and Pennstate (1967/1968), and at the Australian National University (1974/1975). He was a visiting professor at Waseda University (Tokyo 1980/1981, 1994), at Havana University (Cuba 1983), at Humboldt University (Berlin 1990), and at POSTECH and KAIST (Republic of Korea 1993, 1995)