



UNESCO PRINCIPAL REGIONAL OFFICE
FOR ASIA AND THE PACIFIC
Asia-Pacific Centre of Educational Innovation
for Development (ACEID)

Sixth UNESCO-ACEID International Conference

**Information Technologies
in Educational Innovation
for Development:
Interfacing Global and
Indigenous Knowledge**

Organized by UNESCO-ACEID
in collaboration with
the Office of the National Education Commission of Thailand
and in association with
the Hong Kong Institute of Education
and the Center for Learning and Teaching Styles, Philippines

Bangkok, Thailand, 12-15 December 2000

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Raja Roy Singh Lecture

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Director, UNESCO Institute for Information Technologies
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With compliments from

Vladimir Kinelev

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Information Technologies in Educational Innovation for Development: Interfacing Global and Indigenous Knowledge

Vladimir Kinelev

*Keynote Raja Roy Singh Lecture
at the 6th Annual UNESCO-ACEID International Conference*

December 12, 2000, Bangkok, Thailand

Esteemed Master of Ceremonies!
Excellencies,
Distinguished Participants,
Ladies and Gentlemen,

First of all I would like to express my gratitude to the esteemed organisers of the Sixth UNESCO-ACEID International Conference 'Information Technologies in Educational Innovation for Development: Interfacing Global and Indigenous Knowledge' for the high honour to deliver the Raja Roy Singh Lecture at such a representative forum. I presume it would be appropriate to express my strong belief that this Conference will become an outstanding event not just for the people who have gathered in the beautiful capital of the Kingdom of Thailand, but also for many thousands of decision- and policy-makers, academics, and educators – all those who think and act in different parts of the world striving to prepare humankind to respond adequately to the challenges of the coming 21st century.

Man and Civilisation Development

The Sixth UNESCO-ACEID International Conference 'Information Technologies in Educational Innovation for Development: Interfacing Global and Indigenous Knowledge' is held at the dawn of the third millennium and therefore we have perhaps the last chance in this century to gather here today and jointly try and take a look into the future in an attempt to define the key features of the human civilisation in the coming 21st century.

The advent of a new millennium should not be perceived as just another divide in the calendar of history. It is a major divide which urges us to reflect on the past and on the meaning of life, to try and discern the contours of the future, and, most important of all, to unite our efforts in shaping a better future for all those who live on this beautiful and unique planet Earth.

Probably for the first time in history the passing century has clearly demonstrated strong dependence of education on the processes unfolding in economics and society and in all spheres of human activities.

This was particularly evident in the past decades of this century when the national educational systems in most of the world's countries experienced profound transformations of both quantitative and qualitative nature. These transformations, to a considerable degree, have been brought about by dynamic scientific progress and socialization of its consequences affecting all aspects of society's life.

Today, as never before, it has become clear that no educational problems could be solved or even comprehended beyond the general processes unfolding in the world that surrounds us.

When discussing global issues of social and economic development, including education, that humanity will have to address in the 21st century, first of all we shall answer the questions: What is the significance of the age as a prelude to the new era? Which part of its legacy will be carried over into the future and which will be left behind?

I would hope to be right in suggesting that one of the most striking characteristics of contemporary life, and, increasingly, of the future, is the accelerated pace of change. The world never stands still. Its swift changeability has turned into a constituent feature of the global historical development. Even in private life, change tends to oust continuity and stability. We have entered a transitional period marked not just by the calendar watershed but by a historical divide beyond which there lies a lot of uncertainty.

The current pace and magnitude of change break the traditional framework of historical gradation. The essence of our era can no longer be conveyed by the same category of 'era' as implied in 'the era of steam', 'the era of electricity', or 'the era of great geographical discoveries'. For the first time in the history of our civilisation, generations of products and ideas come and go faster than generations of people succeed one another. Moreover, changeability reveals itself through earlier unparalleled diversity, thus making it impossible to define our era through any single event or development in the life of society.

One of the most complicated contemporary problems for humanity to solve is Man in the changing world. Today, Man has become the main factor of development as well as the main risk factor. For centuries people had to adjust to nature and social changes, building up, as they went through such adjustments, institutional, technological and intellectual potential. As a result, the magnitude of this potential has reached global proportions, and people have been taken hostage of the artificial nature created by them. Consequently, a fundamental and equally destructive incongruity between human existence and the global scale of supernatural powers and possibilities available to people has become apparent.

The turning point between the two millennia is drawing closer. We shall soon see the departure of the 20th century that showed the world some earlier unknown features of a new civilisation. Man made a breakthrough into outer space, reached far into the ocean depths, designed sophisticated machines like Hephaestus, harnessed nuclear energy and became its hostage, learned to use the wealth of nature at an unprecedented scale, but succeeded much less in healing the wounds he inflicted upon nature.

People have proved maladjusted to the new rate of civilisational development, although some earlier signs of the remarkable acceleration in science and technology, including energy generation, exploration of outer space, and information technologies were discernable already in the 30s and 40s of the 20th century. Spanish philosopher Ortega y Gasset remarked on this circumstance in 1930, by saying:

Today catastrophe is visiting Man himself who has become incapable of keeping step with his civilisation. Growing civilisation is nothing else than a painful problem. The greater the achievements, the bigger the dangers of civilisation.

Seventy years later one can say that Ortega y Gasset's diagnosis has been confirmed for many times. Our knowledge has come to resemble a kind of 'Pandora's box', from which disasters come out flying and spread around the world. This is indicative of a less than satisfactory state of public morals, educational philosophy and industrial-technological practices. In fact, society has reconciled itself to the existence of a 'one-dimensional man', narrow occupational training, and a limited and lop-sided world outlook. The kind of differentiation and socialization that are allegedly dictated by the logic of scientific progress are, in fact, pushing the world to the brink of catastrophe.

In this context, it becomes obvious that the entire system of knowledge of the world, human being and society must be exposed to a painful re-evaluation. To an extent, we may have to return, although at a higher spiral of development, to the integral knowledge, philosophy and uniform order of the Universe, in other words, to 'fundamentalization' of education on the basis of organic unity of its natural science and humanitarian components. It is imperative to bring into a coherent system, acceptable to the world and human being, the entire body of knowledge, religious faiths, cultures and technologies. It could be wise to start with developing a universal model of a harmonious world, wherein Man could see and appreciate his sensual/visual, scientific and material interrelationship with the surrounding world. Based on this, the study of peoples, countries and cultures, religions and ecology, computer science and mathematics, physics and biology, and many other subjects could make up a comprehensive curriculum for 'a universal man', whose actions will have meaning and purpose of gaining the 'universal knowledge' of the 'integral world'.

Today, as, perhaps, never before, it is necessary to secure practical realization of the triad 'ecological upbringing – ecological enlightenment – ecological education'. All the parts of this triad are closely interrelated. They constitute the basis for cultivation of an ecological world outlook in the population based on awareness of the need to preserve the vital environment for humankind, which is now, in effect, the entire biosphere of the Earth.

The point here being is that the instrumental possibilities of modern thinking have acquired global proportions. They contain both unprecedented potential and new threats. Which of the two will prevail in reality largely, if not decisively, depends on education and educational institutions. Here lies the risk. But it is here that there is hope, too!

New Education for New Society

Scientific and technical progress and the global spread of technologies developed in the most advanced countries of the world constitute one of the main arguments in favour of the leading role of education in today's world and especially in the coming 21st century.

The level of technological development is indicative nowadays not only of the economic power and living standards of a particular country, but also of the place and role of this country in the global community, the scope and prospects of its economic and political integration with the rest of the world. At the same time, the level of development and utilisation of modern technologies is determined in different countries not only by the development of their material resources, but, to a large extent, by the degree of 'intellectualization' of society, i.e. society's ability to produce, consume and apply new knowledge. These developments, in turn, are tightly linked to the level of educational development.

The Report of the International Commission on Education for 21st Century 'Learning the Treasure Within' submitted to UNESCO stresses the crucial role of fundamental and thorough knowledge in allaying some major tensions which, although far from being novel, will pose a formidable challenge in the 21st century. These challenges include:

- The tension between the global and the local: people need gradually to become world citizens without losing their roots while continuing to play an active part in the life of their nation and their local community.
- The tension between the universal and the individual: culture is steadily being globalized, but as yet only partially. We cannot ignore the promises of globalization nor its risks, not the least of which is the risk of forgetting the unique character of individual human beings; it is for them to choose their own future and achieve their full potential within the carefully tended wealth of their traditions and their own cultures which, unless we are careful, can be endangered by contemporary developments.
- The tension between tradition and modernity, which is part of the same problem: how is it possible to adapt to change without turning one's back on the past, how can autonomy be acquired in complementarity with the free development of others and how can scientific progress be assimilated? This is the spirit in which the challenges of the new information technologies must be met.
- The tension between, on the one hand, the need for competition, and on the other, the concern for equality of opportunity: this is a classic issue, which has been facing both economic and social policy-makers and educational policy-makers since the beginning of the century.
- The tension between the extraordinary expansion of knowledge and human beings' capacity to assimilate it.

- The tension between the spiritual and the material: often without realizing it, the world has a longing, often unexpressed, for an ideal and for values that we shall term 'moral'. It is thus education's noble task to encourage each and every one, acting in accordance with their traditions and convictions and paying full respect to pluralism, to lift their minds and spirits to the plane of the universal and, in some measure, to transcend themselves.

The historically unprecedented combination of changeability, fast growing technosphere and new risks and contradictions in the development of human civilisation set the task of searching for a new global world order. Many modern thinkers contend that humanity is undergoing a phase of cultural transition. It is characterised by the following significant factors. First, humanity is striving to forge a new basis for unity. It involves not only a single world market or a unified political order. It embraces a growing spiritual unity within diversity of peoples and cultures. Second, a new image of science is taking shape. Science attempts to find a new basis for universality by overcoming the traditional alienation of the natural sciences from the humanities. Third, the relationship between the artificial and the natural i.e. between the human civilisation and nature is being redefined. And, finally, fundamental restructuring of education is taking place worldwide. To meet the requirements of the cultural transitional period, the educational sphere absorbs and passes over to the younger generation the characteristic elements of this transition, such as new humanism, a new image of science, and a new understanding of relationship between civilisation and nature.

There is no country today capable of solving these universal problems on its own. To accomplish the task it is necessary to unite the economic, intellectual and cultural potentials of the entire world community. Therefore, I believe it will not be an exaggeration to assert that creation of an educational system capable of preparing people to live in the changing world is one of the crucial and urgent tasks of modern society. Education is the only saving grace in overcoming the global crisis of modern civilisation, creating necessary conditions for its survival today, and its sustainable development in future.

Hence the questions: What will the 21st century education be like? What demands shall be made on education to help people adjust to the new, swiftly changing conditions of their life? What can be done today to meet those demands adequately?

These questions are a matter of serious concern for academics and state- and public leaders in different countries who are grappling with the task of modernising and reforming their national educational systems – key institutions in developing the individual and society in the 21st century. Such a society can be referred to as Learning Society.

I believe that the distinguishing features of this evolving educational system shall be:

- Shift of emphasis from 'teaching' to 'education'.
- Greater focus on fundamental knowledge and development of an individual's creative potential.
- Utilisation of the new information and communication technologies in educational innovations for development.

To Educate or to Teach?

Present-day educationalists often use these terms interchangeably as if they were absolute synonyms. In fact, 'educating' is not identical with teaching, the difference lying in the quality of the result achieved. 'Teaching' is geared towards transfer of particular and therefore limited knowledge and skills. This approach has a long-standing tradition. The contemporary version of this type of school instruction can be defined as an algorithmic-instructive method. The use of this method in conjunction with modern information technology has not helped free up talents and aptitudes of school students so far, which is indicative of the fact that teaching as a form of transferring and accumulating knowledge is naturally handicapped. In other words, traditional teaching as a form of communicating knowledge is running out of potential. It is high time we looked for new solutions.

In this context 'education', if broadly treated, may release new resources of comprehensive development of an individual and help the progress of science. To this end, the information block of science should be divided into a few intersecting units. One of them is the traditional communication of knowledge about the universe arranged in an orderly manner. We call this kind of knowledge 'knowledge as description' for it contains information about individual objects studied, and as such either sidetracks or completely excludes the idea of holistic knowledge. But there exists another kind of knowledge, 'knowledge as an instrument' which incorporates cognition strategies and shapes thought adequately reflecting the whole of the environment, and not just its individual objects of study. This type of knowledge cannot be confined to a single science framework. It is trans-scientific for it rests on the methodological groundwork and meets humanitarian ideals. 'Knowledge as an instrument' opens up new opportunities to create a holistic picture of the world in which 'knowledge as description' is reflected. The former cannot be automatically assimilated. Nor can it be just passed on by the teacher to an inactive student, for it is generated by the student himself/herself as a result of his/her inner creative activity. It is the product of evolution and self-orderliness of the human intelligence. The teacher's role is to awake the student's intellect and to show him/her models of holistic thinking.

Unlike traditional teaching, education aims at mastering 'knowledge as an instrument' and forming a holistic picture of the world, thus shaping the versatile mind to respond adequately to the non-classical complexity of the world. It is this type of knowledge that will enable an individual to perceive himself/herself as an integral part of the environment responsible for his/her harmonious relationship with nature and to

appreciate science as a tool to achieve such harmony. The new educational paradigm can consequently be defined as a logically connected triad 'From a holistic world to holistic knowledge, and via it to a holistic personality'.

The new educational paradigm reflects, in my view, certain important requirements of human civilisation on the threshold of the 21st century. Successful development of democracy and market economy, attainment of certain harmony among an individual, society and nature appear feasible on the basis of broad fundamental and integral education that will enable people to cope with constant change throughout their lifetime. Advancement of general standards of education, elimination of narrowly focused psychological principles so often applied to education may help society achieve more stability, foster greater tolerance in relations between people, and ensure genuine freedom of thought and action enjoyed by an individual.

Towards Fundamental Knowledge

Among the priorities associated with implementation of the new educational paradigm I would single out those related to the 'fundamentalization' of education.

These important issues, in my opinion, could be divided into two main groups. The first group of issues refers to the global and indigenous problems in the development of human civilisation.

It may be relevant to consider the fact that in the process of development an individual, society, the world community, and civilisation as a whole reveal their essential, or fundamental, qualities and features. In this context, it is important to set up an educational system, supported by a relevant structure, that could help identify, follow up and introduce to students the most recent scientific developments that address those fundamental qualities. Moreover, students' attention should be drawn to the most essential – fundamental, stable and lasting knowledge that lies at the core of the currently available scientific picture of the world. This includes the world of outer space, the world of a human being and society, and the world of human civilisation as well as fundamental global processes unfolding therein.

There is, however, another group of reasons pointing to the need of fundamentalizing education. It is derived from an understanding, increasingly shared by the world community, of the priority of personality in the educational system. In line with modern thinking, to nurture a broadly educated personality a number of interconnected tasks should be solved. First, it is crucial to harmonise the individual's relations with nature by helping him/her obtain a scientific picture of the world and knowledge of factors influencing the biosphere and the Universe as a whole; understand the place of the human being in his/her natural environment and on this basis approach environmental problems and, on a broader plane, those of the 'noosphere'. Second, it is important not to lose sight of the social nature of human beings, and therefore harmonious socialisation should be accompanied by cultural assimilation through the study of history, literature, art, law, philosophy, and economics. Third, modern people live in a densely saturated information environment. So the task facing the educational system is to teach him 'to

navigate' in it, to create the prerequisites and conditions for continuous self-education. And, last but not least, it is necessary that an individual should achieve sort of inner balance, or harmony. This uneasy task may be facilitated, among other things, by a certain body of knowledge in psychology and physiology and through deeper acquaintance with literature and arts. Thus, the task of both solving the global problems of humankind and meeting the vital needs of an individual points to the idea of fundamental education.

The following question would be relevant: What lies at the basis of the 'fundamentalization' of education? Apparently, the emphasis is on fundamental sciences. However, before we get to the issue of fundamental education, it appears necessary first to develop an integral perspective on fundamental sciences per se. The fragmentation and differentiation of sciences in the 20th century have reached a point where specialists working in different areas of what used to be a unified field of science no longer understand one another. It should be conceded however that more recently integrational and interdisciplinary approaches have been playing a more prominent role. And yet they are not very common. So, scientists and educationalists' task is to identify the integrity of each of the fundamental sciences, then try and reveal the integrity of the natural science as a whole with the entire body of humanitarian knowledge and, finally, at the next stage, to synthesize the principles of integral fundamental education.

One of the key tasks of this new stage of educational development is overcoming the traditional alienation of the natural science from the humanities. The two culture components should enrich each other to ease the search for establishing holistic culture at the new stage of the civilisation development. I believe that at the core of this new type of holistic knowledge there is a specific historical era which has brought it to life in all its unity. Russian philosopher G. Fedotov said:

School loses its effect and a book is devoid of meaning in the absence of culture. Being the structural basis of the human mind, culture is composed of a multitude of otherwise disconnected elements. Neither a single element per se, nor the sum total of these elements makes up culture. Literacy and all noble and useful knowledge in history, literature and mythology lie dormant... they remain worthless, unless a miraculous revival of genuine culture takes place.

The new knowledge being conceived, it is here that the complex interaction between the global phenomena engendered by the world civilisation and the centuries-old cultural traditions of each nation takes place. The departing century has clearly shown that in the great history of times and peoples there is neither small culture nor small nation; only together will they constitute the supreme value of the world civilisation and the basis for the sustainable development of the world community. Scientific knowledge as a constituent element of culture comprises objective data of the world, whereby a human being possessing cognitive power acts as a collective explorer of its laws. Consequently, science can be identified with culture as the content of the former and as the reflection and source of a human being's potential to use his knowledge of the Universe via education. On the other hand, it is necessary to point out that cultural milieu is moulded and reproduced by people who are not just trained but Educated. A Personality comes to life and evolves as a result of these interactions.

Apparently, the specifics of the new educational system should also be expressed in the fact that this system must be capable not only of equipping the student with knowledge but also, in view of the steady and rapid growth of knowledge in our era, of shaping the demand for continuous independent assimilation of this knowledge, for learning the skills and habits of self-education, and of developing an independent and creative approach to knowledge throughout the individual's active period of life. Education should ultimately become such a social institution, which would offer the individual various sets of educational services encouraging on-going learning, thus securing for most people the possibility of post-university and additional education. For this purpose, it is necessary to diversify the structure of educational programmes according to the student's aptitudes and to construct the educational trajectory best suited to his/her educational and professional abilities. It should not be forgotten that the process of cognition must give people the joy of acquiring a new understanding of the world, the purport of life, and their own place in life. It follows that of the major educational problems of the late 20th and early 21st century, the key is finding a relevant organisational structure of the educational system and its institutions which would secure transition from the principle 'Education for life' to the principle 'Education throughout life'.

Finally, securing the perception of the modern scientific picture of the world requires educational innovation in the most important matter: the content of education and its structure. I would compare the content of the present-day education with Ariadne's clue that may lead us out of the labyrinth of demands and pressures of everyday life.

The new socio-economic situation also makes it possible to find a new resolution of the eternal controversy over basic education and vocational training. The emphasis laid on training students in particular speciality reflects the level of understanding of social security in the previous decades. Today the situation is different. Specific knowledge and narrow professionalism as products of quality education leading to success in life tend to give way to broader development of an individual's creative potential. As the notion of development based on the predominant use of an individual's abilities to do physical work is being supplanted by that relying on the use of the individual's cultural and intellectual potential, education is gaining pre-eminence. Social security can be guaranteed only to a comprehensively educated person capable of doing different jobs in order to meet the requirements of the latest technologies and the market. Specificity of the new educational system should consist in its ability not only to transfer knowledge to the student, but to enable this student to keep abreast with new ideas and discoveries, and foster his ingenuity through self-education.

Why does Education need Information and Communication Technologies?

When discussing educational innovations for the developing of society and its economy in the 21st century, we should recognize that they are hardly achievable without effective utilisation of new information and communication technologies.

State-of-the-art of information technologies enables their successful application in education and allows tapping into the creative potential of the student. It is the new information technologies that will help us develop an open educational system. The

open educational system will bring about dramatic change in the technology of obtaining knowledge owing to a more efficient organisation of students' cognitive activities. These changes are effected through the use of computers and their very important didactic characteristic of individualising the classroom work without disrupting its entirety, via programmed and adaptable curricula.

The age of new information and communication technologies does not eliminate the most difficult problems which the world of education faces now and which have to be solved irrespective of whether the new technologies are adopted or rejected. One of them, for example, is reconstruction and reorganisation of school space and school time, the management of this space and time, the reorganisation of teacher training, curricula, the content of education, and so on. Nevertheless, training and development, social and professional requirements, globalization of communication, economy, and political projects of building a new society heavily rely on the introduction of information and communication technologies into education. Education is currently confronted with the issue of choice among many readily available technologies and the challenge of solving a different kind of problems that may follow in the wake of the technologies' introduction. The alternative, however, is to chronically lag behind these developments and, in effect, fail to meet the challenges of the 21st century.

Information and communication technologies give all nations a new chance, which they cannot miss. As part of addressing the educational challenges of the 21st century it is appropriate to define the tasks of education as a system and the teacher as its main agent. To this end the interaction between the two domains – that of education and of information and communication technologies – should be specified too, with a view at a thorough revision of the very basis of education. If this task is accomplished, education will regain its capacity for improved and efficient training, thus meeting the real social and economic demands, both current and anticipated, and will enhance the chances of young people for successful social integration.

Future educational systems are going to place a special premium on the study of latest developments in the area of information technologies and computer science, as well as issues of practical application of such developments and prospects of further research. These technologies are instrumental in optimising (mostly via introduction of computer-aided systems) various information processes that have gained importance in various areas of society's life in the past decades. Thus civilisation is gradually moving towards the construction of 'informatization' society, in which not so much material resources but, increasingly, information and scientific knowledge will be the objects and results of work of the majority of employed population.

Rapid development of informational sphere of society is dramatically altering the structure of work and employment, and produces new occupations and jobs. This effectively changes the requirements to the educational system. Besides, availability of personal computers and other electronics and telecommunications appliances and systems opens up new possibilities for home-working for a widening spectrum of professions and trades, including academics, writers, journalists and other information

workers, as well as people in various business-related occupations and services. New work opportunities are being created for the disabled and retired, as well as people with caring responsibilities, and in particular women. The effect of these new opportunities is considerable, since need for such flexible working arrangements is felt by many people all over the world.

The current high level of information technologies allows their use and application in many routine processes of educational information processing. When applied in conjunction with information technologies, the modern educational systems may also take on part of the teacher's responsibilities, for instance, monitoring the students' progress. Modern means of communication spanning the world provide access to computer-aided systems of education both to an individual student and a group of students almost anywhere in the world. Thus on the basis of corporate telecommunications networks run by educational facilities there have been created dispersed bases of educational technologies, which by utilising such infrastructure are made available for distance learning at any place within the educational environment. In fact this helps solve the problem of qualitative change in the information environment of the educational system, as new opportunities are created for providing education to and upgrading knowledge of practically every individual as well as for facilitating the development and accumulation of aggregate public knowledge.

Creation and expansion of common interactive information milieu has always been and still is an important and effective condition of progress in any society. From a historical perspective, common information environments have contributed significantly to the acceleration in humanity's development, and represented a decisive factor in improving most spheres of human activity (physical, spiritual, professional, cultural, and others). Exchange of knowledge, joint efforts to advance our understanding of nature, as well as the development of science, technology and culture continue to contribute to the task of improving the quality of human existence. Therefore, creation of a universal interactive information milieu may be considered as a strategic target for the introduction of modern and future information technologies in all spheres of human activity.

Through application of new information technologies in education humankind seeks to effectively resolve some long-term problems and thus respond to the challenges of the 21st century by achieving:

- Greater effectiveness and higher quality of the educational process;
- Intensification of research at educational facilities;
- Reduction of time and improvement of conditions for additional education and adult education;
- Extension of operational ability and effectiveness of management at specific educational facilities and the educational system in general;
- Integration of national information educational systems into the world network that will considerably facilitate access to international information resources in the sphere of education, science and culture.

It should be noted, however, that wide-ranging and intensive application of technologies in education might entail certain negative effects. Therefore, research into possible psychological and physical side-effects of educational use of information technologies should continue alongside the development of technologies themselves. Additional health care provisions to cover both physical and mental health of students must be carefully considered and put into effect.

Interfacing National Policy and Global Tendencies in the Use of Information and Communication Technologies in Education

Presently we witness tremendous efforts on behalf of most governments to modernise their countries' educational systems on the basis of information and communication technologies perceived as key to such a modernisation.

Some countries consider technologies a vital component in upgrading the quality of education through changes in curricula, introduction of training in new skills and wider scope of knowledge. In other countries information technologies are utilised mainly to ease access to education for various groups of population, or used for a narrower purpose of facilitating self-education through programmes broadcast via radio and television. Still other countries emphasise reliance on technologies as a means of transforming the educational environment or satisfying specific needs of different categories of students.

No matter which aspect of the use of information and communication technologies is currently more prominent in this or that country, it appears that, on the whole, most national plans to introduce information technologies in the educational system would have:

- to take into consideration specific national economic, social, and cultural conditions;
- to borrow from similar plans and experience of other countries (particularly those with a comparable economic and social framework);
- to ensure a fit between the desired scale of introduction of information technologies in education and available technical, financial, and human resources;
- to develop comprehensive action plans for various levels and agents within the educational system;
- to take into account the consequences of the information and communication technologies application and use as they could be experienced by various categories of students, educators, the educational system and society as a whole.

It becomes increasingly apparent that those who determine educational policy should develop a better perception and understanding of the new realities that, on the one hand, spring from the vigorous growth of information technologies, and, on the other, are dictated by social needs. In this context, the questions to ask are: What is the potential of new technologies in solving common human problems? and Can these technologies co-exist with national and cultural variations?

These questions are coming to the fore as a global information community is emerging. I believe it is reasonable to maintain that a successful and balanced development of this global community can be ensured only if this community is built on solidarity and respect for human dignity, serves common interests, and is a product of united efforts of all nations and social groups.

For such global information community to become reality, effective mechanisms of information exchange should be developed to inhibit erosion of national and cultural identity. Inasmuch as not only technological, but, more importantly, cultural aspects of providing educational services and products through new technologies become an issue of serious concern, one may consider drafting a Programme of Information Ecology. Such a programme could offer protection to the cultural diversity of the world similarly to the programmes on environmental protection that aim at sustaining the biological diversity of life on the Earth.

New Literacy for Information Society

In spite of the fact that at the turn of the century literacy for all – children, youth and adults – is still an unaccomplished goal and an ever-moving target, all of us should concentrate on the next steps towards creating information society. New social demands and the new world around us shaped by the new information technologies and models of action call for New Literacy for Information Society. As a substitute for the old meaning of basic literacy (reading, writing and arithmetic), new ones may be presented as finding information by searching written sources, observing, collecting, recording, etc.; communicating in hypermedia and involving all types of information and media; designing objects and actions; creating hypermedia essays on the basis of all types of information technologies.

The great saga of human knowledge contains pages that are unique, and I would first list among them those, which contain examples combining the potentials of the human mind and technology. The invention of printing raised the institutions of general education to a previously unattainable height. It is the first and perhaps the highest ever stage in the information revolution. But I presume that it will not be an exaggeration to contend that considering the amazing standards and prospects of application offered by information and communication technologies in education, we are on the threshold of the next stage of the educational revolution, which will entail a dramatic shift in all the spheres of human existence.

With respect to this issue I would like to remark that transition to cyberspace shifts some basic educational reference points: from the linear to matrix presentation of information, from live mathematics to image-bearing, semiotic and linguistic mathematics, to mathematics of thinking and communication. Parallel to education as a means of preparing students for life, cyberspace is developing as an alternative educational milieu. The basic works of Vygotsky, Piaget and Bruner gave rise to the term 'interiorisation' of physical objects, which suggests our creating 'psychic' equivalents of the latter as 'conceptual' models to be further used to construct variants of our own

internal reality or virtual realities. Cyberspace prompts a reverse process, which could be called 'exteriorisation', whereby models of the physical world are conjured up in the human mind and then let out into cyberspace.

Thus we should proceed on the understanding that it is necessary to develop in an individual a very special perception of his or her habitat, which would comprise both objects of the physical world and the ideas of these objects in the human mind as well as the system of ideas in information space. It is the most interesting and mysterious interaction that is going on between the psychic space and cyberspace. I would like to add in this respect that computer technologies facilitate educational opportunities and assist an individual in perfecting his perceptions. Computer technologies have become instrumental in the rapidly developing art of filming the world's masterpieces, thus making them available to millions of people throughout the world. Colourful pictures of works of architecture, sculptures and paintings, grouped thematically and accompanied by cleverly made up texts and beautiful music make a strong emotional effect on the student, develop his/her artistic taste and at the same time enable the student to learn more about culture, arts and the history of mankind. These circumstances demand in principal new pedagogical approaches taking into account that the new information technologies are better suited for adapting didactic to the mode of thinking which operates by association rather than via direct and consecutive notions.

In order to exploit effectively those opportunities, such new fields as computer psychology, computer didactics and computer ethics shall be better explored and employed by educationists. On the other hand, already at this stage developers of new and promising information and communication technologies shall be oriented towards the practical application of the results focusing not only on their technical possibilities, but also on broader cultural, educational and ethical goals.

Ethical, Legal and Moral Issues

Already the initial appearance of information and communication technologies in educational settings urged specialists to comment on the ethical, legal and moral norms of applying such technologies to learning.

Their attention was focused on value-charged computer systems, on the role of computer technologies in imposing certain values upon the oblivious recipient, and on the need to develop reflective attitude to the values translated by means of the computer technologies. The interest in the ethical issues has increased to a considerable extent due to the Internet, since the global nature of the Web not only opens up new and exciting opportunities for the generation and dissemination of knowledge, but also increases the danger of conflict between values and standards espoused by different cultures. In the decades to come, many more people will get access to the Internet. They will go online to search for or offer information, to shop and pay, to advertise products and services, exchange thoughts and express themselves politically or artistically, to convince others, deliberate and entertain themselves. The Internet offers wonderful opportunities to reach out to our fellow human being, but the darker side of human nature finds its way into cyberspace, too. It will not take very long before the full spectrum of reprehensible

or outright debased moral behaviour is represented online: aggression, violence, crime, deception, brutality, rudeness, and so on. Before the turn of the millennium, we have already witnessed the first signs of cyber-warfare, cyber-terrorism, identity theft, etc.

The Internet breaks the territorial borders of nation states, makes inadequate geographical boundaries as delineations of jurisdictions. The Internet constitutes a truly international and global realm of action where it is practically impossible to impose successfully national laws and regulations. Another question in moral thinking about the Internet relates to the need to twist and stretch the traditional concept that we are accustomed to using when thinking about information and communication technologies. Practically orienting ourselves in this domain we easily use such new expressions as cyberspace, virtual reality, communication, virtual community, and information privacy as if we were already clear about the meaning of 'space', reality, 'virtual', 'communication' and 'community'. The use of expressions that have the prefixes 'cyber', 'virtual' and 'informational' suggests that we know what we understand by them. But this is misleading, since in fact their function is to indicate that we want to talk about 'a new sort of community', 'a new sort of space', 'a new sort of reality' thus taking out a mortgage on future reflection about the nature of those new phenomena. But at the same time the evaluation of individual action on the Internet departs from evaluations of real world action. So there are some problems concerning our knowledge about the moral status of what one is doing online, what the consequences of her/his actions are given the interdependencies in networks and the concurrent actions in a casually non-transparent network environment. Individuals may simply be unable to predict consequences of their individual actions. That is why specialists in different fields of application of the Internet more and more urgently focus their attention on the following general problems: jurisdiction and protection; application, individualisation and, certainly, moral ignorance. I am convinced that all these problems expect their discussions and solutions in the foreseeable future.

So, communication technologies based on the Internet, tele-networks and intellectual computer systems open up new opportunities for both teachers and students. At the same time amalgamation of these networks and systems makes up the basis of 'infosphere', the planet's new thinking and infrastructure. The infosphere envelops the whole of civilisation and fills its every pore. It also shapes its own, rather exclusive world and a community of those initiated. The makers of the infosphere share a new way of thinking, new ethical norms, and transformed culture of understanding. The advance of infosphere makes us face the phenomenon of super-biological and, probably, super-psychological change in a human being. The computer and information technologies do not merely enhance intellect, they designate new dimensions of the human mind. Live communication, inseparable from information technologies, binds these dimensions together to produce an orderly system of the new culture.

Learning without Frontiers

State-of-the-art of the information and communication technologies allows us to consider practical implementation of the principle 'Learning without Frontiers'.

In my view, there are two main obstacles that we have to overcome in order to create educational space without frontiers: geography and varying capacity of transmitting and perceiving the same information by different people, particularly those with special needs.

The present level of development of information and communication technologies provides a realistic basis for creating a global system of distance learning, which will help overcome the first barrier of space and time in the 21st century. Regardless of the physical distance, new information technologies ensure the kind of direct communication between the teacher and the student, which has always been characteristic of full-time education as well as its undeniable advantage. In future the development of distance education shall result in the set-up of the so-called electronic distributive libraries and universities as a basis for a single educational space serving the world community.

The explosion in the information and communication technologies is one aspect of globalization affecting all countries. Policy-makers at various levels and across a range of sectors, including education, believe that new technologies can make a significant contribution to solving all kinds of pressing problems both in social and economic areas. This in many ways explains the fact that distance learning is being increasingly recognised and adopted in many countries as an effective method of raising the overall educational level of their population; of providing training and development opportunities for employees, or as a way of addressing particularly adverse economic, social or demographic situations.

It is worth mentioning that development of distance learning has been closely following the evolution of the means of mass communication. Today distance education is going through a new phase, employing new information and communication technologies. The upward trend in number of students who combine work and studies is supported by rapid development and wide-ranging application of various electronic means that enable high quality distance learning. They include: personal computers; advanced multi-media appliances; satellite communication systems; educational facilities, including cable television; readily available telephone lines, including cell phones; and global and regional networks.

By present time there have been advanced many theories of distance learning. I would propose that most of them need revised conceptualisation of didactic, psychological and methodological principles of constructing the educational process.

Development of distance learning has a special meaning for those people who due to various reasons are unable to obtain education through other standard methods. It is of particular significance for people with special needs. New information technologies as well as man-created artificial intellectual environment have the capacity to, at least partially, return to many people the kind of abilities and communication possibilities that they may have been deprived of by nature, environmental disasters, military conflicts, or human violence.

I am confident that this is a two-way street since after demolishing the barriers of inter-human communication, so called "ordinary people" will be able to obtain a broader impression of the essence of a human being and of the surrounding world. This seems to be the major humane tendency related to the use of information and communication technologies in education and other spheres of practical and cultural activities of a human being.

Education for the 21st Century

The large scope of the processes taking place in information and communication technologies at the turn of the century, their growing role in shaping the image of the present and future of humankind lead us to search for similar examples in the century that is ending. Looking back and assessing the achievements of the present century, I shall venture to single out one very important thing: the concept of relativity laid down by Albert Einstein, Sigmund Freud and Karl Marx in the material, emotional and social worlds. Their brilliant insights gave humankind the possibility of realizing that the world is not what it appears to be, that we cannot trust the empirical perception of the concepts of space and time, of good and evil, law and justice, and the nature of human behaviour in society. They gave back to people awareness of the fact that concepts and laws reflect not only the objective reality of the material world but also the social world. Unfortunately, the past year has given us many examples of how these fundamental truths have been overlooked, causing irreparable harm to nature, the world of living things and humankind per se.

At the dawn of the third millennium humanity is striving to avoid the previous mistakes and errors and learning via education, science and culture to ensure the necessary conditions for sustainable development in the coming 21st century.

Hence the question: What shall we expect from Education in the 21st century?

The World Education Forum, held by UNESCO in Dakar last April, largely defined the contours of Education for the 21st century.

Education for the 21st century is called upon to be education for all. As our civilisation advances further people without education are ousted beyond the limit of living conditions worthy of Man. Therefore, infringement of the right to education as well as lack of quality education lead to intellectual and cultural degradation of personality which is incompatible with sustainable development.

Education for the 21st century has to have the ethical dominant at the core of its meaning. It is not just a matter of educating the new generation in the spirit of peace, mutual understanding and tolerance. I believe, that on the threshold of the 21st it is equally imperative to embrace ecological education and, moreover, try and imbue an individual with global ethics and awareness of global responsibility as standards of a new principle of humanism, for a new united and integral world.

Education for the 21st century is called upon to have a creative and innovative character. In the world where change has become a feature not only of scientific and technological progress but also of the way of life of the masses, schools and universities must pass on to the new generations knowledge accumulated earlier and prepare them for the solution of problems the individual and society have never confronted before.

Education for the 21st century has to be built on scientifically substantiated knowledge. Only on this condition will it be possible to form a personality possessing knowledge and capable of theoretical and critical thinking. Where science is subjugated to ideology, manipulative pedagogical technology or narrow pragmatism education is fraught with serious danger of deformation of human being, turning him or her into a blind functionary who has practical skills but no ability to think, and hence irresponsible.

Finally, education for the 21st century has to be multiform, adequate to the cultural and ethnic diversity of humankind, meeting the all-round requirements of social, professional and confessional groups, as well as individual cultural requirements.

I am convinced that education in 21st century will acquire a global scale and open character, that it will really be Education without Frontiers. So at the closing of the second millennium the words said by Ch. M. Talleyrand more than two hundred years ago acquire a special meaning:

Education is a truly special State, the influence of which cannot be defined by single person, and even national authorities are unable to delimit its frontiers: the sphere of its influence is immense, it is infinite...

Today this great State reveals to the world its high standards of 'statesmanship', which is capable of mediating rampant passions and intractable contradictions not by the means of weapons but intellect.

A new millennium is nearing. How will our civilisation meet this new millennium? In an attempt to answer this question I would suggest we remain mindful of the puzzling paradox: the future of humankind is the reflection of their children's present. I would like to hope that our children's present would be such that it will spare us bitter criticism of future generations, and they will not be inclined to echo the uneasy and heart-felt verdict by Albert Camus:

They could have done so much but dared to do so little. –

Awareness of this truth shall motivate and guide us in our efforts to carry out the laborious but rewarding task of educating the new generation, the future of our planet.

Thank you for your attention.