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Contents

SYMPOSIUM ON BUILDING SCIENTIFIC KNOWLEDGE FOR THE PUBLIC THROUGH SCIENCE EDUCATION IN BRUNEI DARUSSALAM

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Introduction to the Symposium

In December 2007, the Faculty of Science, Universiti Brunei Darussalam, was entrusted by the regional office of the Islamic Educational, Scientific and Cultural Organisation (ISESCO) in Tehran, Iran to hold a symposium in collaboration with the Ministry of Education. The symposium was organised with the aim of promoting an understanding of new scientific and technological developments to the public.

The objectives of the symposium were to produce simplified textbooks and material on scientific concepts to enhance the public's understanding of the latest scientific and technological developments, to encourage various agents who are responsible for promoting scientific knowledge in society, and to play an effective role in stimulating a general interest in scientific development. The symposium was also aimed at encouraging scientific curiosity through the promotion of scientific activities by organising exhibitions and science museums. The symposium also hoped to raise the understanding of concepts in science by the general public through the preparation and publication of simplified books on new and important scientific concepts, to give access to simplified information by implementing free access programs which will be organised jointly with international scientific internet services, and to spark public curiosity about science and technology through the support of the activities of scientific clubs and internet clubs.

The symposium was attended by 15 participants from Brunei Darussalam and 7 participants from ISESCO member states in the region, including participants from Iran, Bangladesh, Indonesia and the Kyrgyz Republic. The symposium was supervised by two experts, one external and one local.

The expenses of the symposium were covered by ISESCO and the World Islamic Call Society (WICS), and included the participants' allowances, experts' allowances and organisational expenses. The Director of the regional office in Tehran is Dr. Abbas Sadri, who came to Brunei with an expert and coordinated the symposium. The symposium called on presentations by experts from Tehran and Brunei as well as country reports from the representatives of each country. The symposium concluded with closing remarks from the Director of the regional office, who lauded the ability of the Faculty to successfully organise such a symposium.

SCIENTIFIC KNOWLEDGE BASE FOR THE GENERAL PUBLIC: RELEVANCE, NURTURE AND NATURE

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Abstract: The rapid development in science and technology affects not only scientists but the general public at large. Therefore there is a need for both the government and non-government organisations to "fill in the gaps" in the scientific knowledge of the general public at large. Otherwise, the general public will become illiterate in science. This paper is therefore divided into three sections: (1) the relevance of scientific knowledge to the general public; (2) How to nurture scientific knowledge within the general public? and lastly; (3) How to nature science within the general public?

The Relevance of Scientific Knowledge to the General Public

Scientific knowledge is no doubt one of the most reliable and trustworthy types of knowledge to emerge in modern times. Scholars and policy makers will be constantly challenged on how to disseminate information to the general public about the ever-changing and ever-increasing nature of scientific knowledge. Government and non-government organisations, to some extent, are expected to play an important role in the equitable distribution of scientific knowledge. Otherwise, society will be split into classes, ranging from the knowledge-based to no-knowledge-at-all.

Issues on new edible products in the form of genetically modified foods, bioethics, gene therapy and biological weapons are a few of the concerns raised by the general public.

The recent rapid technological advancement has required all the senior academics at the National University of Singapore to attend refresher courses in bioethics (Ling; personal communication).

Emphasis on the K-society has been around for some time, but the need to acquire knowledge, especially in science, is becoming more relevant nowadays.

Scientific discovery is the basis of the many technological advancements that we see today. Newsweek (Silver, 2007) has written about "The Year of Miracles," an excerpt of which is as follows:

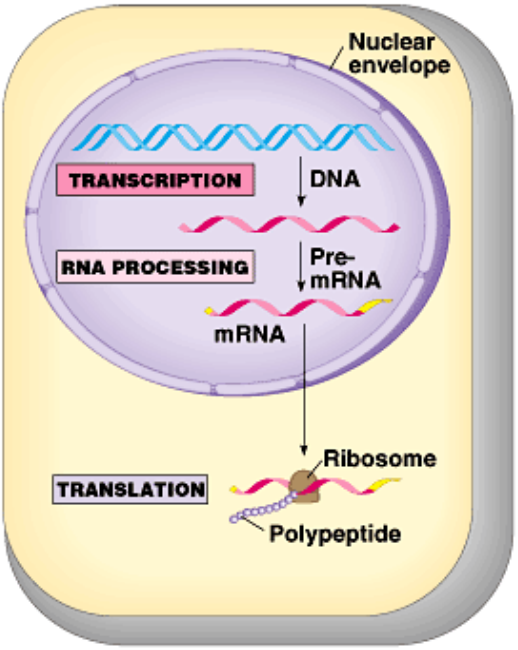
"The year 1905 was an *Annus Mirabilis*, or Miracle Year- a rare historical moment in which key flashes of insight suddenly made the field of physics take off in new directions. That was the year Albert Einstein presented four papers that turned the conventional wisdom about how the universe works, from the infinitesimal realm of atoms to the vast reaches of the cosmos, upside down. During the next several decades, Einstein and a handful of other brilliant physicists went to shape the 20th century and lay the foundation for all its technological accomplishments."

A century later, the year 2007 is shaping to be another Annus Mirabilis. This time biology is the field in transition, and the ideas being shattered are old notions of genes and inheritance.

The reason for the latter is the availability of new technology and research, which enables scientists to understand that genes are no longer responsible for inheritance, rather a result of an incredibly complex interplay among the basic components of the genome, scattered among many different genes and even the vast stretches of "junk DNA" once thought to serve no purpose.

The 20th-century dogma is now blown apart by the new scientific discoveries (Figure 1). Gregor Mendel's work on peas and inheritance in 1900 led to the discovery of the "gene" as the fundamental unit of heredity.

Figure 1: The roles of transcription and translation in the flow of genetic information in a eukaryotic cell (Campbell and Reece, 2002).



(b) Eukaryotic cell

Our Encounters with Science

Our encounters with science on a daily basis are with genetically modified foods, gene therapy, bioethics, biobusiness, biological weapons and biofuels. These areas except biological weapons and biofuels will be explained separately:

Genetically modified foods

Genetically modified foods (GMFs) are foods that result from genetic manipulation or modification. They are also associated with the term "frankenfood." All genetically modified foods appearing on the market are derived from plants. Countries such as those in Europe

have tried to stop the marketing of GMFs (Zohrah, 2006). The concern of many is the effect, if any, that genetically modified organisms or foods may have on their health and environment. The change in genetics may be to improve taste or to increase shelf life or crop resistance to insects. Health concerns include the perceived risk of introducing new allergens causing food allergies to consumers. The general public has to be educated before consuming GMFs. Brunei Darussalam through the Department of Agriculture has published a book called "Genetically Modified Organisms – Frequently asked questions on genetically modified organisms."

In 2006, more than 100 million hectares of genetically modified crops were planted by 10 million farmers in 22 countries (Service, 2007). Over the past 11 years, biotech crop area has increased more than 60-fold, making GM crops one of the most quickly adopted farming technologies in modern history.

Gene therapy

Gene therapy is aimed at treating and curing genetic diseases and illnesses that were once considered untreatable. Specific genes that cause the diseases have to be located first before gene therapy can be used for the treatment of patients. The therapy involves the insertion of genes into the human genome that correct a problem with the person's original genes. Diseases such as Parkinson's diseases, cystic fibrosis and Down's syndrome are caused by genetic problems. Again, patients (the public) have to be educated on the use of viruses as genetic vectors for treatment.

Bioethics

Ethics refers to making a decision and taking an appropriate course of action based on what is right or wrong, moral or immoral. Bioethics is the application of ethics to biology. A huge obstacle to resolving ethical problems in biology or the life sciences is the difficulty of separating human emotions from factual information. There are concerns about stem cell research, the human genome project and germ-line gene therapy. Much of the controversy surrounding stem cell research is over the process of extracting stem cells from human embryos or aborted fetuses. Revealing human genome information raises questions about the right to privacy, and germ-line gene therapy poses concerns about the prior informed consent of future generations.

Biobusiness

Biobusiness based on the biological or life sciences alone creates an estimated 50% or more of the Gross Domestic Product (GDP) of some countries, accounts for more than 25% of global GDP (US$9 trillion) and employs no less than 40% of the global work force (Shahi, 2004). The biobusiness spectrum includes the biomedical, agri-vertinary, food-related and industrial sectors. Therefore, entrepreneurs need to learn basic life science before embarking on businesses of this nature.

How to Nurture Scientific Knowledge Within the General Public?

It is very important to nurture young people to appreciate science. Science can be made interesting through interactive science lessons, science camps and competitions. When students leave schools, colleges and universities, they become part of the general public. Their interest in science will stay with them not because they are scientists but if they are life-long learners.

Nurturing young and adult individuals with scientific knowledge is feasible. Key indicators can be used as arbitrary measures of the success of the nurturing process. Brunei Darussalam first introduces science at primary school level. Science textbooks in primary school contain colourful illustrations, and the discussion on each topic is often interactive. The Princess Rashidah Young Nature Scientist Award is an annual competition, organised by the Department of Forestry, Ministry of Industry and Primary Industries. It aims to inculcate a love of the forest and the natural environment in the younger generation.

The Ministry of Education promotes science indirectly to the general public through its Science, Technology and Environment Partnership unit (STEP). Although its activities are confined to school students, nevertheless it can also stimulate interest within the general public.

The Faculty of Science at Universiti Brunei Darussalam has been promoting science and technology to the general public for the past four years through its "UBD Science and Technology Week." The theme varies from year to year. The theme in 2007 was "Nurturing talent through science and technology." The response from the general public was overwhelming.

Institut Teknologi Brunei Darussalam seeks out inventors in science and technology from the general public through the Crown Prince CIPTA Award.

The Ministry of Culture, Youth and Sports promotes natural history education through its Brunei Museum Department. Tasek Merimbun Heritage Park is known for its diverse flora and fauna. A gallery exhibiting the flora and fauna of Tasek Merimbun is open to the general public.

There are also non-government organisations which contribute to the "filling of gaps" in scientific knowledge by organising conferences on fast-growing areas of science, for example bioinformatics. The Oil and Gas Discovery Centre is very active in exhibiting new technological advancements, to educate the younger generation.

How to Nature Science Within the General Public?

In this context, "naturing science" means developing a "culture" of science in a society. The question here is: How to create a society literate in science? Naturing science may be a second phase in science popularisation, with nurturing science being the first phase.

Deoxyribonucleic acid or DNA is no longer foreign to us. Humans of all ages know what DNA is. It is popularised through the media and television series, for example "Crime Scene Investigation" or CSI.

It is not easy to nature science or to make it a culture in society. Ways of nurturing and naturing science may include the following:

- By making science simple to understand (in layman's terms);
- By updating scientific knowledge all the time (through national science bulletins);
- By stimulating interest through continuing adult education.

In conclusion, all organisations, be they government or non-government, have a vital role to play in promoting scientific knowledge to the general public. Nurturing scientific knowledge is not a difficult task to carry out. However, naturing scientific knowledge within the general public will, without doubt, present the most hurdles.

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COUNTRY REPORT OF BRUNEI DARUSSALAM

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Introduction

The knowledge of science is very important for the maintenance and development of human beings especially in the modern era, which gives priority to a knowledge-based society. For Muslims, scientific knowledge contributes to a better understanding of the knowledge of Islam, which is derived from the holy Quraan and the tradition of the prophet, peace upon him. Islamic practices which were first shown by the prophet, peace upon him, can be explained scientifically. A good example of scientific knowledge is the prohibition by the prophet of drinking raisins which were soaked in water at room temperature, during his time in the desert of Arabia, if bubbles appeared on the surface of the drink. The formation of bubbles can be explained by the production of carbon dioxide gas due to fermentation of the raisins which produced carbon dioxide and alcohol as its main products. Alcoholic drink is prohibited for Muslims to drink, as is mentioned in the holy Quraan. The adverse effects of alcoholic drink to human health are well known today through scientific discovery. Amongst these effects is cirrhosis of liver.

The knowledge of science can be disseminated through various agencies, including government institutions and non-government organisations. The fact that the literacy rate in Brunei is almost 100% means that we can use schools to educate the students who will eventually become members of the public and join adult society. Non-government organisations as well as other departments in the government can encourage those people who might miss the opportunity to study science in school but develop an interest in science later in their lives.

Facts about Brunei Darussalam

The total population of Brunei Darussalam, as estimated in July 2007, was 374,577. The proportion of the population between the ages of 0 to 14 years is 27.8% and the ratio of males to females is 1.06 (53,512:50,529) while the proportion in the ages between 15 and 64 years is 69%, with the ratio of males to females at 1.01 (130,134:128,488). The population which is over 65 years makes up 3.2% of the total, with a ratio of males to females of 0.91 (5,688:6,226). The average life expectancy at birth for the total population is 75.3 years. The average life expectancy for males is 73.12 years while for females it is 77.59 years.

The literacy rate in Brunei Darussalam is 92.7%. The literacy rate is defined as those of the population who can read and write at the age of 15 and over. Splitting the literacy rate into genders, the male literacy rate is 95.2% while that for females is 90.2%.

Ministry of Education

The Ministry of Education, Brunei Darussalam has made science and mathematics education compulsory in the school curriculum to ensure that all students will have a basic knowledge of science and mathematics throughout their lives. The aims of making this compulsory are to

create the foundations for a work force which is oriented to technology to cater for the needs of national development.

The important of schools for the implementation of these aims can be seen by the fact that students are the public of the future and they are moulded by the curriculum in the schools. This is especially true in Brunei Darussalam because of the high literacy rate, which means that almost all of the population are educated through school and they are the products of the school system. In school, science is one of the compulsory subjects taught from primary to lower secondary school, which is equivalent to 10 years of study. Furthermore, students can continue to study science in depth at the upper secondary level if they choose the science stream. However, the student who opts to take the arts stream can still take science as combined science or double science subjects (Ministry of Education, 1999).

Education policy in Brunei Darussalam

The national education system in Brunei Darussalam has implemented the use of the Malay language as the official national language and the use of major languages such as English and/or Arabic as mediums of instruction in schools. Education is compulsory and every student is provided with 12 years of education, which consists of 7 years of primary education including a year of pre-school, 3 years of lower secondary and 2 years of upper secondary, or vocational or technical education. Schools are equipped with facilities for mathematics, science, technical information and communications technology education to maximise teaching and learning processes as well as to enable the students to obtain knowledge and skills that are relevant and necessary for their future employment, which will be both changing and challenging (Ministry of Education, 2007).

Government Departments

Other government departments such as the Brunei Museum and the Department of Agriculture – just to mention two – also contribute to the propagation of scientific knowledge to the public through exhibitions and hands-on experience. A wide range of natural history subjects such as the fauna of Brunei Darussalam, which are presented in an exciting and entertaining style to create a realistic feeling for their natural habitats, can be found at the Brunei Museum, while the department of Agriculture has produced a book on frequently asked question about genetically modified food which explains to the public questions that often trouble them..

Non-Government Organisations

In addition to government institutions, there are a number of non-government organisations which also contribute to the dissemination of knowledge about science to the public, especially those who have left school. Amongst them are science societies such as the Society of Biology of Brunei Darussalam, the Brunei Darussalam Institute of Chemistry, the Physics Society of Brunei Darussalam, the Brunei Darussalam Association of Science Education, the Science, Technology and Environmental Partnership Centre, the Astronomical Society of Brunei Darussalam, the Oil and Gas Discovery Centre and many more. The activities of the societies include presentations about science in the form of seminars or symposia, science weeks, public talks, exhibitions and organising visits to places that are relevant to science.

Oil and Gas Discovery Centre (OGDC)

The centre is one of the most active organisations in Brunei and is sponsored by Brunei Shell Petroleum (BSP). The centre owns a permanent building which houses a considerable and distinctive exhibition on science. The exhibition more specifically covers the science behind oil and gas discovery and extraction. Its aim is to stimulate the interest of the public, especially the younger generation, in the oil and gas industry. The exhibition demonstrates that science can be fun and exciting. It also provides a hands-on learning experience through a range of equipment and interactive models which help to promote the principles and applications of sustainable development, and to support the government's aspiration to develop tourism. One of the most popular activities organised by OGDC is the "tech challenge" for various groups of students, who are given problems to be solved within a short period of time using simple materials such as newspaper, straws, paper clips and pins and so on. The difficulty of the problems is based on the age group of the students, which means that the degree of complexity increases with the age of the students (OGDC, 2007).

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ROLE OF THE MINISTRY OF SCIENCE AND ICT IN BUILDING THE SCIENTIFIC KNOWLEDGE BASE OF THE GENERAL PUBLIC: BANGLADESH PERSPECTIVE

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1. Introduction

As a low-income country faced with resource constraints, Bangladesh recognises the importance of building the scientific knowledge base of the general public. She has been undertaking various steps and measures to enhance and develop science and technology for the welfare of the general public. As in other developed and underdeveloped countries, the Ministry of Science and Information & Communication Technology (MOSICT) is entrusted with enhancing the building of the scientific knowledge base of the general public. The Ministry of Science and ICT emphasises strategic prioritisation for the building of the scientific knowledge base as it encourages awareness among the general public to overcome barriers of social, economic and geographical isolation, and to increase access to information communication technology (ICT) and education.

Contents of the paper:

2. General Information about Bangladesh

Bangladesh is an economically and technologically underdeveloped country. The history of science and technological development in Bangladesh may be divided into three periods: (i) the first period is the pre-independence period, (ii) the second period is from independence to the 1980s, and (iii) the third period is from 1990 till today. Before independence in 1971, science and technological matters were not given importance. After independence the emphasis was on rebuilding the war-ravaged structure of scientific research and development and on general scientific knowledge. In the 1990s Bangladesh devoted much attention to modern and specifically scientific and technological development. She encouraged creativity in scientific work. Even now the scientific knowledge base of Bangladesh is not advanced. She seeks scientific knowledge from other developed countries like the European countries, USA, Japan etc. The demand for science and technology is increasing day by day in Bangladesh.

The vast population is one of the main reasons for the backwardness of the economy. With nearly 140 million people crowded into an area of 147,570 sq km, Bangladesh has the

highest population density in the world. The urban percentage of the population is 22%, while the rest of the population is spread over 86 thousand villages in the country. The per-capita GDP is $456 and. the literacy rate is 62.66%, the ratio of male to female students is 50:50, and the number of Universities is 77, of which 22 are public and 54 are private. There are 6 public Universities of Science and Technology, one public Medical University, 14 public medical colleges, 14 private medical colleges, 2 public dental colleges and 5 private dental colleges (Ministry of Finance, 2006).

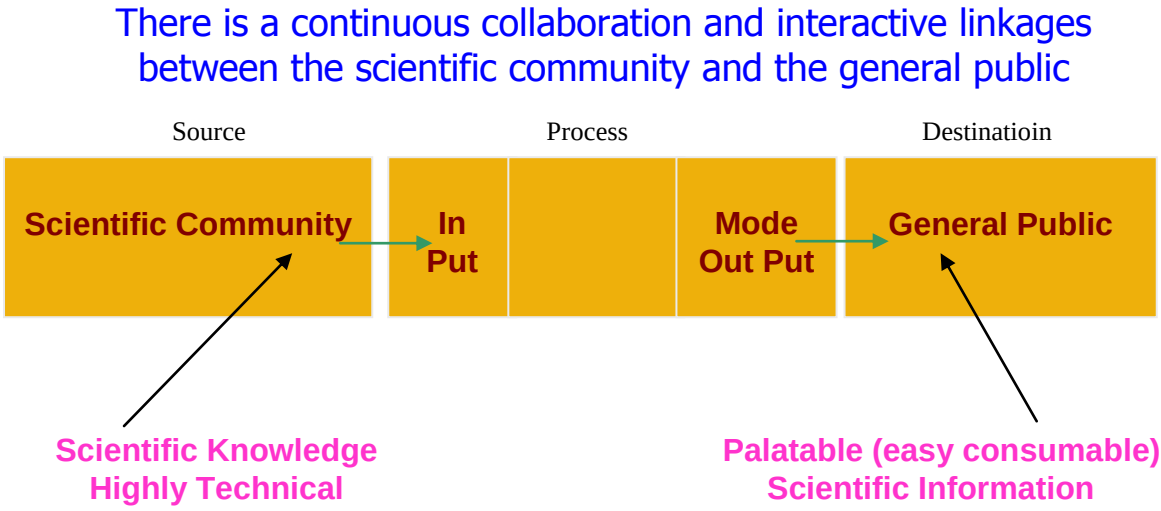
3. Objectives of Bangladesh Regarding the Scientific Knowledge Base

Today scientific knowledge is not confined to scientists and researchers. Government plays an important role in the dissemination of scientific knowledge. The government provides support and opportunities for scientists and researchers to develop science. The objectives of Bangladesh in relation to the scientific knowledge base are as follows:

1. Improving the overall scientific knowledge level of the general public;
2. Co-operation between scientists and various agencies on science and technology;
3. Co-operation and collaboration with other nations on science and technology;
4. Different programmes at the national level for building awareness of the scientific knowledge base; and
5. Making available easy and simple information and knowledge on science and technology to the general public.

4. Process of Building the Scientific Knowledge Base in Bangladesh

Some questions arise. Where is this knowledge generated? What is transferred? What is the destination of this scientific knowledge? Of course the MOSICT plays an important role in the generation and transformation of scientific knowledge. Scientific communities generate or produce science and technology for the nation, and MOSICT transfers this knowledge to the general public for the welfare of the state as well as the people. If people use science and technology then the purpose of technological development will be fulfilled. There is a continuous collaboration and interactive linkages between the scientific community and the general public.



5. Roles of the Ministry of Science and ICT in Building the Scientific Knowledge Base

The Ministry of Science and ICT is entrusted with the development of science and technology. The Ministry of Science and ICT plays a basic role in giving direction to the tendencies, motives, outlook and awareness of the building of the scientific knowledge base of the general public. The Ministry's role is to co-ordinate, standing in the middle between scientists and the general public.

Under this Ministry, there are 6 organisations:

1. Bangladesh Council for Science and Industrial Research (BCSIR)
2. Bangladesh Atomic Energy Commission (BAEC)
3. Bangladesh Computer Council (BCC)
4. Bangladesh National Museum of Science and Technology
5. Bangladesh National Scientific and Technical Documentation Center (BANSDOC)
6. NOVO Theatre

In Bangladesh, development of the scientific knowledge base of the general public is not only dependent on the Ministry of Science and ICT. Other Ministries like M/O Education, M/O Information, M/O Livestocks and Fisheries, M/O Cultural Affairs and M/O Industry also participate.

The objective of the Ministry of Science and ICT is to **e**stablish a highly scientific knowledge source at the national level. The Ministry identifies the sources of scientific knowledge in the country and also selects the means of processing and the destination. The scientific communities are important sources for building the scientific knowledge base of the general public. They might be individual scientists or scientific/technical organisations which include universities, industries, the World Wide Web (Internet), Wikipedia etc. To process and promote research and development in scientific and technological knowledge, the Ministry of Science and ICT is developing an effective national infrastructure at the interface. The Bangladesh government has formed a National Council for Science and Technology (NCST) under this Ministry. The NCST is a national body. Under the guidance of NCST, the Ministry plans, designs and also executes the building of the desired scientific knowledge base for the general public. The Ministry collects as inputs highly technical and scientific knowledge, and as an output of the process produces various forms of palatable scientific information for dissemination to the general public (Ministry of Science and ICT, 2002a)

Using established and effective means of collecting scientific knowledge as input through networking with the highly technical scientific knowledge sources, the Ministry screens the scientific knowledge and decides which would be most appropriate for the general public. In the process of screening, the Ministry place emphasis on the national interest. For instance, the Bangladesh government gives priority to public health, the environment, natural disasters and a general awareness of health issues (such as AIDS and HIV). The Ministry adopts various selection modes for effectively promoting awareness of the scientific knowledge base. These modes of selection include TV, the internet, cell phones, print media, bulletins, newspapers, prayers in mosques, CDs and audiovisual devices. Due to the adoption of these modes, the general public has now become conscious of the positive side of scientific knowledge. In Bangladesh, the government uses these modes to alert people of impending cyclones, food shortages and other natural calamities. Cell phones, TV, newspapers, prayers in mosques etc. were used recently in the case of the cyclone that hit Bangladesh in November 2007.

To popularise scientific knowledge within the general public in the country, the Ministry of Science and ICT performs some routine functions every year. These are as fellows:

(i) Science fairs, exhibitions, seminars, symposia etc. on science and technology at district and sub-district levels;
(ii) Awards of fellowships to university and college students and researchers at different research institutions;
(iii) Provision of research and development grants to science and technology related projects;
(iv) Provision of grant assistance to science clubs and institutions for the enhancement of science and technolog;, and
(v) Provision of grants to secondary schools and institutions for the enhancement of science and technology.

6. Achievements

To promote research and development in science and technology, the Ministry of Science and ICT has been able to bring about a positive change in this country. Because of the Ministry's continued persuasion and efforts in this field, a number of measures have been taken at the national policy level which are mentioned bellow:
(i) Formulation of a National Policy on Information Communication Technology in 2002 (Ministry of Science and ICT, 2002b);
(ii) Enactment of Information Communication Technology Act in 2006;
(iii) Formation of a National Task Force on ICT and Biotechnology;
(iv) Adoption of an e-governance initiative in selected areas; and
(v) Creation of a High-Tech park

To increase the awareness and popularity of scientific knowledge within the general public the Ministry of Science and ICT has extended its programmes countrywide. Notable amongst these programmes are
(i) Extending Internet facilities for rural people;
(ii) Expanding computer facilities to rural areas; and
(iii) Nurturing the young ICT sector.

Popularisation of the building of the scientific knowledge base of the general public is not only dependent on the Ministry of Science and ICT. Other ministries like the Ministry of Education, the Ministry of Information, the Ministry of Livestocks and Fisheries, the Ministry of Cultural Affairs and the Ministry of Industry play an important role in the distribution of scientific knowledge to the general public. But the Ministry of Science and ICT provides the major support and opportunities to scientists and researchers for the development of science, and with the help and suggestions of scientists the Ministry makes scientific knowledge easy and palatable for the general public. The general public has been using different kinds of technology due to the advance of science and communication technology.

7. Conclusion

Even now Bangladesh's position with regard to the scientific knowledge base is transitional. The adoption of different kinds of measures and policies on science and technology is becoming popular with the general public. Under the Ministry's continued persuasion, Bangladesh will become more advanced in the fields of science and technology in the near future.

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KNOWLEDGE MANAGEMENT AND SCIENCE IN KYRGYZSTAN

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Abstract: The principal aim of this paper is to provide a summary of the current status and trends in the development of scientific knowledge management and e-learning (both infrastructure and superstructure) in Kyrgyzstan. ICT education is one of 3 priorities of the National Strategy "Information and Communication Technologies for Development of Kyrgyz Republic". The structure of problems of electronic knowledge management (KM) systems development and united information research and educational space creation has been considered. The following aspects of the KM problem have been examined: organisation and legislation, subjects of scientific activity, financing science and research projects, e-learning and KM integration. The author's experience in the area of university research and education networks confirms the importance of the KM role.

Keywords: Kyrgyzstan, knowledge management, education and science institutions, National Science Academy, Ministry of education and science, e-learning.

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1. General Information about Kyrgyzstan

Area: 199 thousand sq. km
Population: 5.14 mln (2006), comprising men – 2.54 mln; women – 2.6 mln.
Urban population: 1.8 mln
Rural population: 3.34 mln
Capital city: Bishkek (population 1 mln),
Political system: Republic,
Languages: Kyrgyz (national), Russian (official)
National currency: som.
There are 51 institutes of higher education, plus a National Science Academy.
Number of students: 231095 (in 2005/2006).
Number of doctoral students: 2368.
Number of professors: 727, number of associate professors: 2121, research staff: 3419.
There are 2052 schools with 1167245 pupils (National Statistics, 2006).

Over the past few years, implementation of e-learning and knowledge management systems has been gaining a particular importance for Kyrgyzstan. After the USSR broke up and Kyrgyzstan gained independence significant changes occurred in the system of higher education. A lot of new universities and institutes of higher education were created. Now their overall number has reached 51. The number of students has noticeably increased as well. On the other hand the mass departure of professors and other specialists from the republic has been evident. This has led to a sharp lack of high-qualified teachers at institutes of higher education.

Figure 1: Map of Kyrgyzstan

2. The Structure of Problems of United Information Educational Space Creation and Electronic Knowledge Management System Development

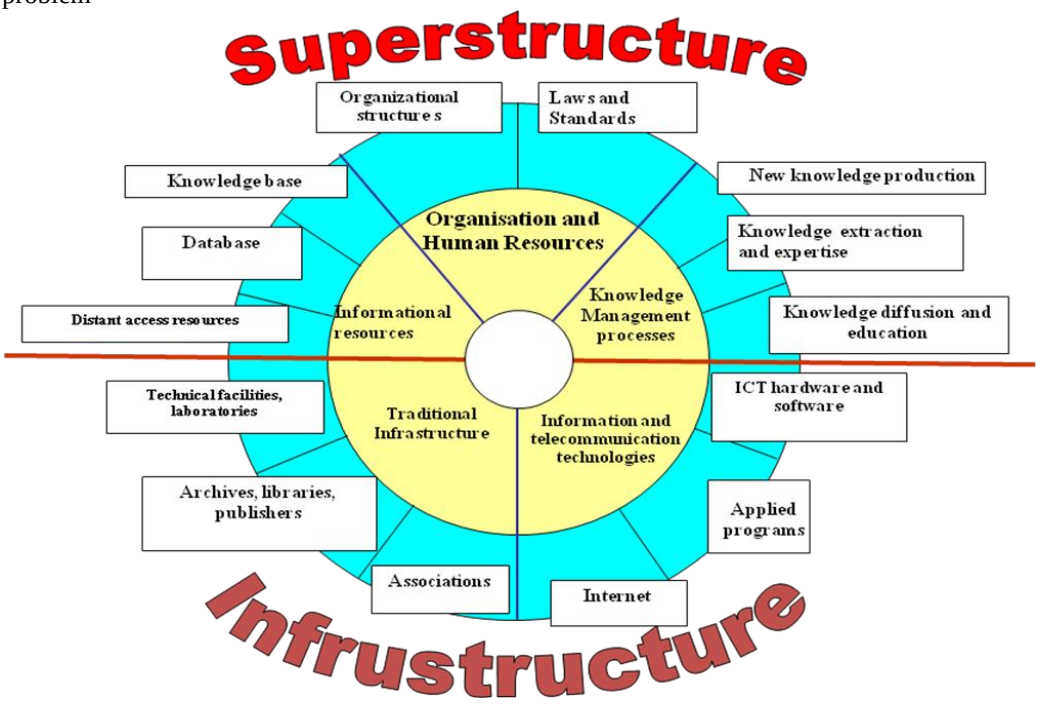
In the structure of electronic knowledge management, the infrastructure and superstructure have unconditional importance. Infrastructure refers to technological resources, while superstructure is focused on knowledge (see Figure 2). The infrastructure of a system includes traditional infrastructure and ICT infrastructure: computers (servers, workstations), network equipment (routers, hubs, etc.), communication channels, software, protocols, etc.; in other words, everything that allows users to organise information interaction and get access to various information resources (Zhivoglyadov and Yampolskaya, 2007). The infrastructure of a system is dependent on two sectors: information technologies and telecommunication technologies.

Superstructure includes organisation, laws, informational resources, e-learning courses, knowledge bases, management processes, etc.

The following purposes of knowledge creation and management systems should be emphasised:

- creation and development, gathering and accumulation of information materials which have significant educational and scientific value;
- extraction of knowledge from leading experts and teaching staff;
- structuring and systematising the knowledge gathered ;
- creating conditions for existing knowledge base updates and continuous update of these conditions;
- spreading educational, scientific and popular scientific information; and
- providing informational interactions between users and granting the users access to information resources created by local and foreign specialists.

Figure 2: The structure of the united information, research and educational space creation problem



3. The Kyrgyz Republic's National Strategies

3.1. The National Strategy "Information and Communication Technologies (ICT) for Kyrgyz Republic Development"

In 2002 the National strategy "Information and Communication Technologies for Development of Kyrgyz Republic" was ratified by the decree of the President of the Kyrgyz Republic (ICT Decree, 2002). The priorities of the National Strategy are the following: e-government; e-economy; human resources development and e-education**.**

The National Plan for realisation of the National ICT Strategy has been completed, but serious difficulties related to its implementation occurred. In spite of these difficulties, significant progress had been made. Consider 2004 in comparison with 2001. The number of employees using ICT increased in the sphere of government by a factor of 5, and in the sphere of education by a factor of 7.5, while the number of system administrators and software engineers rose by 28-33 per cent. These two spheres accounted for 59 per cent of the total number of computers at organisations in the Kyrgyz Republic (the sphere of government 31 per cent, and sphere of education 28 per cent).

3.2. Country Development Strategy (CDS) for 2007 – 2010

In the field of informatics, during the implementation of the National Strategy adopted in 2002, "ICT for the development of the Kyrgyz Republic", one of the main priorities became the establishment of "e-government" (Development Strategy, 2007). The following tasks were addressed: (i) the first stage of the state's internet portal has been implemented, it has information about the directions of activity and services provided by the public

administrative organs; (ii) all central organs of public administration have developed their own web sites and posted them on the internet; (iii) a network of public access to information for citizens in rural and remote areas has been created (a total of 91 centres).

The objective of the telecommunications sector is to build a modern high-tech and competitive national data transfer network based on the application of advanced innovative technologies and at the same time providing guaranteed and equal access for the population to the informational resources in the country, as well as integration of the national network into world information space.

Within the framework of the CDS in the field of education, the implementation of the following projects is proposed:

(i) Project "Education-2". Implementation period 2007-2011. Partner: Asian Development Bank. Amount of Project: 15.5 mln USD.

(ii) Project "Vocational education". Implementation period 2006-2009. Partner: Asian Development Bank. Amount of Project: 10 mln USD.

(iii) Project "Access to base education of disabled children". Partner: Asian Development Bank. Amount of Project: 1 mln USD.

(iv) Project "Development of early childhood on community level". Implementation period 2003-2009. Partner: Asian Development Bank. Amount of Project: 10.5 mln USD.

(v) Project "Rural education". Implementation period 2007-2010. Partner: World Bank. Amount of Project: 15 mln USD.

(vi) Project "Improvement of quality and access to education". Implementation period 2007-2010. Partner: UNDP. Amount of Project: 2 mln USD.

4. Kyrgyz Republic Legislation

Laws related to science and education:

- Law "About science and national scientific-technical policy bases" (1994);
- Law "About obligatory copying of documents" (1997);
- Law "About library affairs" (1998);
- Law "About copyrighting and adjacent rights" (1998);
- Law "About protection of legal computer programmes and databases" (1998);
- Law "About informatisation" (1999);
- Law "About scientific-technical information systems" (1999);
- Law about National Science Academy of KR (2002);
- Law "About education" (2003);
- A new law project "About education" is under Jogorku Kenesh (parliament) consideration

5. Organisations and Finance

5.1. Ministry of Education and Science of the Kyrgyz Republic

The functions of the Ministry of Education and Science (MES) of the Kyrgyz Republic (KR) are:

- Elaboration and realisation of the national science and innovation policy;
- Coordination of the fields of science and innovative technologies;
- Control and monitoring of the national science and innovation policy.;

- Organisiation of research work and control of projects with durations of 2 to 3 years;
- Supervision of independent expert boards under the MES KR; and
- provision and distribution of budgeted financial funds according to the results of expert evaluation.

The functions of the independent expert boards under the MES of KR are:

- Project selection;
- Provision of expertise on national special-purpose programmes involving scientific and innovative projects;
- Monitoring of project realisation;
- Elaboration of proposals to perfect the national policy on innovation; and
- Evaluation of the activity of scientific research institutes

5,2, Financing science and research projects

There are several sources for financing:

- NSA financing is the highest level of research institution funding and appears as a single-line item in the Republic's budget: It covers:
  a. research institution financing;
  b. basic and applied research programmes financing; and
  c. NSA infrastructure financing.
- Financing of science and research projects from the state budget through the Ministry of Education and Science.
- Special contract financing.
- Support of single scientists or groups by the means of marking out grants from the sources of different funds.
- National and international funds with different purposes and orientations: science and research or social projects, scientists' internships, participation at conferences, provision of information, access to the Internet, and access to e-libraries.

Science financing out of the national budget accounts for 0.12% of the country's GDP, while education financing accounts for 4.9% .

Table 1 breaks down the financing of the research activities of higher educational institutions.

Table 1: Financing by science field for 2006 (according to MES KR)

#	**Field**	**% of the total funding**
1	Basic and humanitarian sciences	43,8 %
2	Technical sciences and new technologies	18,1 %
3	Medical science	35 %
4	Agricultural sciences	3,1 %
	Total	**100 %**

The state today is not able to provide full funding of educational institutions, which forces the educational system to search for off-budget funds, but the imperfection of the legislation does not allow for effective use of additional financial means.

5.3. Scientific activities subjects

Research institutions can be divided according to their organisational form and goals into academic, field and universities sectors, NGOs and associations.

The **National Science Academy** (NSA) is the main scientific centre where basic and partly applied research is performed. The NSA includes 4 departments that embrace 26 scientific institutions: including the Ilim publishing house, printing-houses, a central scientific library and a self-financed "Academ-service association".

The **field sector** is represented by the scientifically-researching sub-units of ministries and firms.

Scientific and research activity in the higher educational institutions.

There are 51 institutes of higher education in the Kyrgyz Republic. The total number of scientific and educational-scientific specialists in national institutes is 5072, including 223 Doctors of Science and 1588 Candidates of Science (PhD). In non-governmental institutes these numbers are 321, 26 and 148 respectively.

NGOs and associations are represented by officially registered organisations and associations that perform scientific and educational-scientific activities.

The number of workers engaged in scientific research and collaborations is 3420, and the number of educational-scientific workers who carry out scientific research is 1620 (according to 2005 data)

5.4. National Science Academy

The National Science Academy of the Kyrgyz Republic (NSA KR) is a higher governmental scientific institute which unifies NSA members, scientific workers, specialists, service staff and other workers of the NSA. The NSA embraces 26 scientific institutes, 1880 researchers, including 140 Doctors of Science and 324 Candidates of Science (PhD).

The ratio of budget to non-budget finance is 1.7: 1.0.

The departments of the NSA include the NSA presidium, a physical-technical, mathematical and mining and geological sciences branch, a chemical engineering, medical-biological and agricultural sciences branch, a Public Sciences branch, the South branch, the "Ilim" publishing house, and the "NAS news" magazine

Scientific activity is organised into projects of 2 to 3 years duration. The results of this activity are evaluated at institutional and central academic council meetings; then expert evaluations and reports of the institutes are tabled at the department meetings of the Public Sciences office. A general report is presented at the Annual Common Meeting of the Academy of Science.

5.5. National Examination Board

The National Examination Board (NEB) under the government of the Kyrgyz Republic is called on to examine scientific researches' results and examine science and teaching staff.

It performs the following functions:

- Organising the state examination system for science and teaching staff in Kyrgyzstan, in particular the network of dissertational boards;
- Evaluation of dissertations submitted for Candidate and Doctor of Science degrees;
- Conferring of academic degrees,;
- Conferring of academic ranks;

- Recognition and notification of diplomas and certificates; and
- Determining the list of scientific documents recommended by the NEB for publication.

The personnel structure of the National Examination Board is approved by the decree of the Kyrgyz Republic's President.

5.6. The role of NGOs in the realisation of research

According to the research into the NGO sector in Kyrgyzstan by ФСК, АЦППГО in 2006, 9.7% of the whole sector conducts research and other types of evaluation and monitoring.

Research topics include:

1. Gender
2. Human rights observance
3. Social and political aspects
4. Cultural and economical aspects
5. Journalist rights observance

Applied research is supported by:

- (On a permanent basis) the Soros Foundation, Kyrgyzstan (and other OSI structures), UNDP (and other UN structures under UNDP administration in Kyrgyzstan), UNESCO, the German political fund of F. Eberth.
- (On a transient basis) international organisations with representative offices in Kyrgyzstan such as the Swiss Coordination Office in Bishkek, OSCE Centers in Bishkek and Osh, "Cimera", HIVOS Dutch organisation, Milleocontact, the K. Adenauer Foundation, IREX, and embassies

6. KNOWLEDGE MANAGEMENT AND E-LEARNING INTEGRATION

The brain drain, meagre salaries and insufficient university financing force teachers to work at several universities at the same time. There is a serious risk of decreasing the quality of education and devaluing the universities' diplomas. One way of solving the problem may be found in the creation and widespread adoption of e-learning systems and their use for the development of knowledge management methods. Recently the creation and use of computer networks has assumed paramount significance in the development of educational technologies and the opening of new possibilities.

The problems of transforming electronic educational institutions and implementing knowledge management procedures in e-learning systems were considered in (Zhivoglyadov, 2002; Zhivoglyadov and Yampolskaya, 2007). In the widest sense, knowledge management includes different kinds and spheres of activities, such as: new knowledge production (research and development activities), expert-analytical activities, knowledge extraction, knowledge accumulation and purposeful knowledge distribution. All these activities are typically done by universities and scientific research institutes. But the KM concept has been established and applications have appeared in leading enterprises and advanced business over the last 15 years. Modern KM has merged organically with information technologies.

One successful example is the local WEB-portal for electronic education at the KAF-Internet department of Kyrgyz National University. Created in 1997, it contains various educational resources: electronic courses, manuals, textbooks on methods, instructions and directions, and various normative documents which can be updated only by system administrators. In general, databases and web-sites with educational and other resources have already been collected. A teacher can put prepared and updated material for current classes into a directory made available for him. Demands on the quality and content of this material

are not too high. Creation of an effective e-learning system demands the development of a unified strategy based on the integration of both e-learning and knowledge management processes.

The first step in the development of models for e-KM is defining the project scope and designing context diagrams. The next steps are the analysis and modelling of different levels of investigation of the e-KM problem in detail, and the development of data flow diagrams and information models.

The models (level 0) include a set of interconnected information models for different knowledge areas: project scope management, project time management, project cost management, project quality management, project risk management, project human resources management, project communications management, and project integration management.

The creation of university research and private educational networks and systems of e-learning based on computer networks presupposes solving the following groups of problems: firstly, developing, mastering and maintaining an infrastructure of geographically distributed organisations, and secondly, creating and developing a superstructure that includes information resources, electronic courses, processes, organisation etc. The second important component of the educational network is an e-learning superstructure, which involves creating and developing the knowledge management system and accumulating information in the databases and knowledge bases (Zhivoglyadov and Yampolskaya, 2007).

CONCLUSION

This paper discusses the current status and trends in the development of scientific knowledge management and e-learning systems (both infrastructure and superstructure) for higher educational and research institutions in Kyrgyzstan. E-learning development and dissemination are vitally important for Kyrgyzstan. The experience in areas of university research and education networks confirms the importance of the KM role in improving the conditions for educational and research activity in Kyrgyzstan. Effective research and education networks must be created using knowledge management procedures. It is necessary to consider e-courses as specific tools for knowledge extraction, and e-learning systems as tools for knowledge diffusion.

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SPEECH DELEIVERED AT THE INTERNATIONAL SYMPOSIUM ON BUILDING THE SCIENTIFIC KNOWLEDGE BASE OF THE GENERAL PUBLIC, ORGANISED BY ISESCO (OIC) DECEMBER 4-6, 2007, BRUNEI DARUSSALAM

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Abstract: Knowledge is force. People appreciate it. Knowledge is not always accessible to all. Discoveries and achievements in technologies should serve the people's interests. The equal rights and availability of discoveries and inventions in science. Science is for everybody and not for the selected few. The role of the state in education and science development. The concept of "private knowledge" or "knowledge coefficient": global and national dimensions.

Mr.Chairman,
Dear participants,

First, allow me to express sincere gratitude to Regional office ISESCO (OIC) in Teheran, to Ministry of Education Sultanate of Brunei and to Brunei-Darussalam University for this opportunity to participate in such important scientific forum.

On the agenda of symposium, we submit actual topic which excites all progressive mankind. Questions of transition to a society based on knowledge and discoveries are not new. However, right now, as never earlier, they get extremely great value. It is considered, that in XXI century the leading positions in the world will be occupied by countries, whose economy will be based on knowledge.

At the beginning of this century, the humanity has come with the greater scientific and technological achievements that radically have changed a way of life. In particular, the energy sources commensurable to the natural phenomena are mastered; created computers allowing to use an intellectual opportunity of human; communication and transport systems; approached continents; developed bowels of the Earth and space.

The science became powerful industrial force, and scientific and technical potential and high educational level is a determinative of countries competitiveness in the world market. Purposeful use of scientific development is the governing factor of humankind strong growth.

According to data of United Nations experts 64 % of world wealth are necessary on a share of the human, intellectual capital whereas only 20 % make natural riches, and 16 % - to the real estate. From this follows, that in the modern world alongside with a power competition there is more capacious competition - minds and knowledge of people. Therefore, for many countries including for Kyrgyzstan, backlog from other countries on an educational level that now becomes the main resource is important not.

In this connection, it would be desirable to note the following: in second half of XXth century the youth of the former USSR on factor of intelligence (IQ) borrowed 2-3d places in the world, and now, by estimations of the international experts, our youth on the same parameter is already in eighth ten.

Now in our society problems of rational accommodation of productive forces, qualities of formation at universities, integration of student's youth into a science, preparations of experts by modern industrial trades are widely discussed.

Our country is at a stage of transition from one society to another, from one value to another. This process goes is rather inconsistent and non-uniformly. We have appeared before the person of devaluation of cultural wealth, deterioration of a life. The unique hope is assigned to preservation of the reached educational level of the population. Our people since olden days highly appreciated knowledge. At us, the one who is strong physically is spoken, that "can will win one, and the one who is strong on knowledge - will win thousand ".

The previous generations have left to us the powerful educational base - scientific knowledge and school system, a network of higher educational institutions, libraries, and army of scientists, teachers and teachers.

The educational system that has developed in our country since 1920 became the main achievement of Kyrgyz in XX century. If in industrially developed countries, the competent population makes more than 95 %, and in the poorest countries of the world from 10 % up to 50 %, in Kyrgyzstan this parameter makes more than 98 % of adult population.

Today by sphere of formation it is captured nearby 1 million 600 thousand person, among them 1,25 million schoolboys, 232 thousand students of 53 universities, more 70 thousand teachers, 36 thousand pupils in special educational institutions and 29 thousand pupils of technical training colleges. Thus, in Kyrgyzstan there is no other so scale sphere covering almost third of the population. Therefore, supporting education, the state supports each third inhabitant of the country. The key role of the government that is responsible to provide equal conditions of access to knowledge also consists in it to discoveries and high technologies.

We in our country attach large significance of moral and ideological role of general schools. That is why many of our fellow-citizens never walked in a mosque or church, did not consist of political parties and on government service; but there is not a man that would not walk in school. In the conditions of Kyrgyzstan, exactly school can and must give all citizens countries single valued orienteer. At schools formed patriotism, concepts, long, consciences and values that clamp society and unites people. In fact not secret, those politicians do a policy, and teachers do form by consciousness of nation, its reason and conscience. An intellectual sphere has the protracted cycle in an economy, but it brings the most stable and powerful result. Consequently, investments in education considered the mortgage of the future of country.

XX age also was age of creation, self-affirmation, output on a world level and international confession of Kyrgyz science. Pre-conditions of origin of science in Kyrgyzstan, were folded to the middle of X1X of age, when the known scientists-researchers of time opened Kyrgyzstan the world.

The national academy of sciences operates from 1954. Exactly in the academy of sciences of Kyrgyzstan, unique from the academies of the Central Asia states, two scientific discoveries of world value are carried out: devices, used in the experiments of spaces on Moon and Venus, are created, and preparations of adaptations are developed for cosmonauts.

A country got from scientists the newest technologies, devices, equipment, machines, machine tools, medicinal preparations. Technologies of receipt of materials are developed with the set properties, plasma technologies, optical and lasers technologies, technologies of extraction of gold, antimony, receipt of white salt, mineral fertilisers, stimulators of growth of plants and stock-raising. The new breeds of agricultural animals, adapted to the local terms are created. The methods of adaptation of man are developed to the difficult terms of high

mountains. Experience of introduction of Kyrgyz of science technologies appeared abroad, namely, on the enterprises of Malaysia, France, Germany, Switzerland and other of countries.

Disintegration of USSR resulted in violation of single informative space, worked principles of co-ordination and development of academic researches. The control researches and developments system, drawings on their results, has violated in behalf of national economy.

In new terms tasks got up before National Academy of Sciences, on the decision of which socio-economic prosperity of republic depends. Now the special attention spared the questions of reorganisation of science and increase of its role in life of society. Activity of all scientific establishments is concentrated on the decision of directions of priorities of science in Kyrgyz Republic.

Among them are problems of complex study, extraction and processing of minerals on territories of republic, research of natural, natural-technogen and ecological processes in mountain districts and prognostication of catastrophes; problems of the rational use, guards and reproductions of biological, power and waters resources, providing of vital functions of man, are in mountains and etc

In area of social sciences priorities are researches of problems of political, economic and social development of Kyrgyzstan, exposure of conformities to the law of development of society, revival of spiritual culture of people.

Globalisation in the conditions of post soviet states shows up dual appearance: from one side, use of foreign capital, technologies of information in the field of internal consumption, our countries; from other side is an orientation of economic development to the world market and engaged in the orbit of global expansion in trade, investments and other spheres.

Reality is such that these countries simultaneously appear engaged in globalisation processes and excluded from them. It is visible from toga, that we participate in world financial and informative businesses through development of external economic connections, and at the same time does not have an access to the high-tech productions and act part of peripheral suppliers of raw material for transnational companies.

In a similar situation developing countries run into the problem of global relative overpopulation as pre-conditions of the new mode of accumulation are in the modern measuring. In this connection characteristic for our region agrarian overpopulation finds out itself in wide scales with economic, social and political consequences. Extraordinary growth of internal and external migration of able to work population serves as one of prime examples of it in search of work. A serious signal is circumstance that 48% citizens of dropouts of Kyrgyzstan in 2006 , were made by young people in age from 14 years to 34 years.

Consequently, in such situation to knowledge an extraordinarily important value has questions of equal access. Here a key role belongs to the government. The most effective measures are needed for popularisation of modern methods of receipt of education, scientific discoveries and front-rank technologies, facilitating manual labor and allowing a man to have more than time for development of the intellectual capabilities.

Science always went ahead of public progress. She develops the rates of speed-ups and changes quickly. However, science cannot be torn off from the real life. A public policy must come from toga, that achieving science was functional and did not remain claimed society.

Modern science, both fundamental and applied, needs not only scientific researchers but also in the organisers of science. In modern terms as never before demand grows on the able organisers of science. They can be in the forefront of international cooperation by intensive development of connections with different structures, developments and realisation of the scientific and educational programs, joint projects, and organisation of wide exchange experience.

Dear Participants,

In durance vile it would be desirable to mark following.

On initiative of Kyrgyzstan's President Kurmanbek Bakiev the General Assembly of United Nations on November 26, 2007 unanimously approved resolution about establishment on 20 of February the World day of social justice.

Initiative of our country is directed on the removal of social inequality, providing of equal access to the socio-economic blessings, providing of democratic rights and freedoms. The policy of social justice supposes steady development of human potential, removal of poverty, achieving gender balance, decision of migratory questions, and counteraction distribution of drugs, fight against terrorism, extremism, and organised crime.

Kyrgyzstan, confirming principles of the social state in Strategy of development of country, considers necessary to award judgments of social problems on a global level. Annual celebration all states of February 20 the World day of social justice will allow to accent international efforts on achieving social equality.

Our collaboration within the framework ISESCO also would bring in the small contribution in realisation of this noble initiative that takes universal for all character.

I thank you for attention.

SCIENTIA BRUNEIANA

NOTES TO CONTRIBUTORS

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Vasudevan Mangalam

Department of Mathematics, Faculty of Science, Universiti Brunei Darussalam

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Dissertation or Thesis:

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