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Report – Seminar

“Role of Education, Science & Technology in National Security”

**in collaboration with
University of Management and Technology (UMT), Lahore**

July 28, 2016



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Seminar Report

“Role of Education, Science & Technology in National Security”

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Proceedings Covered by

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The Institute of Strategic Studies Islamabad

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The Institute of Strategic Studies was founded in 1973. It is a non-profit, autonomous research and analysis centre, designed for promoting an informed public understanding of strategic and related issues, affecting international and regional security.

In addition to publishing a quarterly journal and a monograph series, the ISSI organises talks, workshops, seminars and conferences on strategic and allied disciplines and issues.

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Pictures of the Event





Seminar Programme

Inaugural Session (0930-1125 hrs)

0930-1000 hrs: Registration and Arrival of Guests

- 1000 hrs: Recitation from the Holy Quran
- 1005 hrs: Welcome Remarks:
Ambassador Masood Khan, DG, ISSI
- 1015 hrs: Opening Remarks:
Dr. Hasan Sohaib Murad, Rector,
University of Management and Technology, Lahore
- 1025 hrs: Keynote Speaker:
Dr. Muhammad Latif, Adviser,
Research & Development,
Higher Education Commission, Islamabad
- 1035 hrs: Keynote Speaker:
Dr. Mujahid Kamran, Vice Chancellor,
Punjab University, Lahore
- 1045 hrs: Keynote Speaker:
Mr. Pervez Butt, Former Chairman,
Pakistan Atomic Energy Commission
- 1055 hrs: Keynote Speaker:
Dr. Imtinan Elahi Qureshi, Executive Director,
Commission on Science and Technology for Sustainable Development in the
South, *COMSATS*
- 1105 hrs: Keynote Speaker:
Engr. Muhammad Asghar, Rector,
National University of Science and Technology,
Islamabad
- 1115 hrs: Address by the Chief Guest:
Honourable Rana Tanveer Hussain,
Minister for Science and Technology
- 1125-1140hrs: **Tea Break**

Session II (1140-1400hrs)
**Role of Education, Science & Technology in
National Security:**

- Chair:** **Dr. Shaukat Hameed Khan**, Coordinator General, COMSTECH Ministerial Standing Committee on Scientific & Technological Cooperation
- 1140 hrs: Keynote Speaker:
Dr. Hafeez Hoorani, Director General,
National Centre for Physics, Quaid-i-Azam
University, Islamabad
- 1150 hrs: Keynote Speaker
Dr. Zabta Khan Shinwari, Secretary General,
Pakistan Academy of Sciences, Islamabad
- 1200 hrs: **Dr.. Zafar Iqbal Qadir**, CEO,
Taleem Foundation, Islamabad
- 1210 hrs: **Dr. Habib -ur-Rehman**, Vice Chancellor,
Mirpur University of Science & Technology,
Mirpur Azad Jammu and Kashmir
- 1220 hrs: **Ms. Maria Jabeen Awwal**, Undergraduate Student,
Dept. of Government and Public Policy,
National Defense University, Islamabad
- 1230 hrs: **Prof. Dr. Jameel -un- Nabi**, Dean,
Engineering Sciences, Ghulam Ishaq Khan Institute
of Engineering Sciences and Technology, KPK
- 1240 hrs: **Dr. Zareena Kausar**, Assistant Professor,
Air University, Islamabad
- 1250 hrs: **Mr. Faisal Mushtaq**, CEO,
The Millennium University College, Islamabad
- 1300 hrs: **Dr. Mumtaz Hassan Malik**, Dean and
Professor University of Management and
Technology, Lahore
- 1310 hrs: **Dr. Adnan Haider**,
Chairperson, Department of Electrical Engineering,
University of Management and Technology, Lahore
- 1320 hrs: **Q & A**
- 1340 hrs: Remarks by the Chair
- 1350 hrs: Concluding Remarks:
Ambassador Khalid Mahmood, Chairman, BOGs,
ISSI
- 1400 hrs: Vote of Thanks by Rector, UMT and DG, ISSI

WELCOME REMARKS

Ambassador Masood Khan

In his welcome remarks, Director General ISSI, Ambassador Masood Khan, said that there is a strong nexus between education, science, technology and national security. He recalled the achievements of the Muslim scientists and scholars who made impressive strides in the field of science and technology. Muslim scholars excelled in the disciplines of Mathematics, Physics, Chemistry, Astronomy, Biology and Philosophy, and that the renaissance of the Islamic world was in a way, a preamble to the European renaissance. Prior to the advancements in Taxonomy, the scientific and philosophical disciplines were all interconnected, thus well-rounded scholars were produced. Likewise, national security is also viewed as a multi-dimensional concept that requires a robust approach to be tackled comprehensively. In order to handle security and all its diverse parameters, it is imperative to invest in scientific and technological advancement in Pakistan. He recollected the golden era of the 1960s when basic scientific disciplines in Pakistan were introduced and consolidated. This decision was instrumental behind the self-sufficiency of Pakistan in nuclear expertise. He stressed that the real steel is manufactured not in ordinance factories, but in universities and educational institutes.

Importance of academia and pedagogy was highlighted by the Director General. He acknowledged the efforts of Hasan Sohaib Murad, Rector of the University of Management and Technology (UMT), Lahore in revolutionising the campus in terms of bringing the scientific and business communities together. An interface needs to be developed between all academic, business and government sectors so that joint ventures can be carried out in complete harmony. He also pointed out that all the ground-breaking discoveries in science being carried out in Pakistan need to be patented, copyrighted and documented into the international scientific community. Scientific Diplomacy must be employed to help revitalise the scientific relations of Pakistan with other countries. Taking pride in Pakistan's nuclear capabilities, he emphasised that without investing in indigenous scientific expertise; we cannot maintain or refine our nuclear programme.

SESSION I

Inaugural Session

The Inaugural Session was addressed by eminent speakers including: Dr. Hasan Sohaib Murad, Rector, University of Management & Technology (UMT) Lahore; Dr. Muhammad Latif, Adviser, Research & Development, Higher Education Commission (HEC) Islamabad; Dr. Mujahid Kamran, Vice Chancellor, Punjab University, Lahore; Dr. Imtinan Elahi Qureshi, Executive Director, Commission on Science and Technology for Sustainable Development in the South (COMSATS), Mr. Pervez Butt, Former Chairman, Pakistan Atomic Energy Commission (PAEC) and Mr. Muhammad Asghar, Rector, National University of Science & Technology, (NUST).

Dr. Hasan Sohaib Murad

Acknowledging the auspicious presence of the guests and speakers, Dr. Hasan Sohaib Murad thanked the ISSI for collaborating in the organisation of such an event that represented partnership between academia and the government. He expanded upon the holistic concept of security and how it entails not merely the defense-related activities, but also other concepts such as national security, economic prosperity, food security and literacy rate in the population.

Security, he said, means being able to care for the population, to educate them and strengthen the national character. He mentioned that Pakistan has the 6th largest population, while only a two-third are barely literate. Only one quarter of the population goes to high school, thus a large portion of the population remains uneducated which is a huge risk for security. Continuity of state and strengthening the national fabric is the true definition of security.

Dr.. Murad explained that seminars such as these are platforms that show our resolve that we shall not miss any opportunities to educate our population. This is important as now as it has become a security imperative to enhance the capabilities of our young and growing generation by equipping them with knowledge. As far as scientific knowledge is concerned, awareness needs to be created among the general masses for choosing basic sciences as academic subjects. Security is the concept that links education, science and technology with

sectors of business development. He stressed the importance of educating the population by the government as the right of all citizens. He ended on a positive note of aspiring to join hands with like-minded people and institutions to consolidate Pakistan's national security paradigm.

Dr. Muhammad Latif

I deem it an honour to deliberate on this very important topic. I would focus on the role of education in general, and that of Higher Education in particular, in the establishment of National Security. A sustainable national security can only be achieved by placement of education at the priority list of every government. It is through informed information matrix that a comprehensive strategy can be adopted to root-out injustice, poverty, disease, and insecurity from a society.

The World has invested heavily into education, and resultantly, been able to wrench their masses out of the shackles of poverty. Humanity at large has benefited by getting access to education, and through scientific and technological development. Pakistan is no exception to that. Investment into Education is sure to bridge the gap between Pakistan and the developed nations.

While, we might discuss about political willingness required to achieve the state of National Security; we need to acknowledge that in order to change the scene of current security situation, replacing it with the peaceful and a secure future - we need to realise that all sectors of the society, including Education sector has to prioritise and adopt a well thought-out, comprehensive strategy to keep pace with the world. The investment of Government of Pakistan in higher education sector has almost doubled during the last three financial years. The goals of the VISION 2025 to create a society committed to progress, prosperity, and a just democratic social order, calls for sustained and well-planned efforts in basic, vocational, technical and higher education.

I am happy to share with you that the Higher Education Commission (HEC) has adopted a focused strategy to streamline higher education in Pakistan, which leads to enhanced national security. To achieve this strategic mission, three core strategic aims were identified which included enhancing Equitable Access to Quality Higher Education; Technology Readiness to launch information and communication technologies (ICT) embedded

educational programmes; and creating a culture of Research and Innovation in our higher educational institutions.

HEC is geared towards development of the higher education sector through preparing knowledgeable, skilled and competent human capital that is able to compete internationally, while promoting quality basic and applied research to find sustainable solutions to critical problems in energy, water, food security, and environment.

It is through encouragement of the Government of Pakistan that the number of universities has increased over the last decade. Furthermore, centres of excellence are established at many universities. Specialised centres for advanced studies have been established at NUST and UET Peshawar for Energy; UET Mehran for Water Resources; and Agriculture University Faisalabad for Agriculture Sciences and Food Security. HEC plans to set up new Centres for Advanced Studies and Research in Nano Technology, Material Sciences, Micro-Electronics, Climate Change, Marine Resources, Biotechnology, Pharmacology, Space Sciences and Civil uses of Nuclear Technologies. These centres will develop new graduate programmes of study and research to prepare a critical mass of competent human resources to produce new useful knowledge needed to indigenously solve prevailing problems in these areas and ensure national security.

CPEC promises to be a game changer in the socio economic development of Pakistan and the region. Higher education sector has to play a critical role in preparing and providing competent, skilled human resources to fully participate in all the phases of this transformative mega project. HEC plans on undertaking the necessary reforms of the programmes offered by our universities of engineering and technology to fully participate in this programme. Higher education institutions of Pakistan need to build bridges of intellectual collaboration with Chinese higher educational institutions. To supplement the infrastructural highways envisioned in CPEC, HEC is planning to open new information and skills super highways through establishing new institutions of higher education in the newly opened areas in Baluchistan, FATA, Gilgit/Baltistan and other under-served areas.

We need to harness human capital, broadening their vision by extending opportunities of foreign academic collaborations, while at the same time strengthening the university infrastructure. The HEC realises the role played by education, in general, and that of Science and Technology in particular, towards achieving the national security. The organisation has

encouraged and extended opportunities for young scholars to complete higher education at foreign universities in the developed world. We have now started getting the final product back to our country, and there are now many foreign qualified graduates working in our universities in the fields of Humanities, Arts, Culture, History, and Science and Technology.

The HEC supports research in context with the Impact Factor score of the research; however, the organisation is emphasising the research support by aligning it with immediate national requirements, so that the Impact Factor of academic research gets translated into impact on the society.

The HEC aims to enhance the current research funds allocation from PKR 2.5 Billion to PKR 10 Billion by 2025. Furthermore, there would be a shift of 50% of total research funding from Basic to Applied, Problem Based research. In addition, the Basic Research would be addressing thematic areas.

The researchers at universities are encouraged to develop academic linkages with the local industry. To consolidate these efforts, Office of Research Innovation and Commercialisation (ORIC's) and Business Incubation Centres are being established in universities.

HEC is aiming to set up Five (05) Research and Technology Parks, one in each province, so as to accelerate the emergence of knowledge-based economy. Pakistan's major business houses are to be motivated to further invest in universities devoted to innovative R&D activities. In addition, the universities are encouraged to increase the numbers of collaborative research with relevant industries in the country, and adopt new programmes with an aim to formulate and review curricula which adds value to the emerging areas.

In line with Vision 2025, the HEC encourages the opportunity of presentation and sharing of research by Pakistani research community at international academic forums. There are specialised programmes to provide opportunities for showcasing of research at national as well as international level. HEC would ensure that in near future, all of the research faculty rises to internationally acceptable levels and gets opportunity of foreign exposure. The HEC is extending access of internationally renowned publications and journals to all the Pakistani institutions of higher learning. These efforts are bound to ensure that the development in scientific and technical areas confirm the overall national security.

Dr. Mujahid Kamran

Dr. Mujahid Kamran emphasised that the topic of the seminar was an issue of utmost importance. He said that formal education is now agent of social mobility and social transformation. If delivered properly, it can bring about a change in the attitude of people who have been formally educated. In recent years, a new phrase, *knowledge economy* has been added to the existing literature. This phrase implied that knowledge is the ultimate source of the wealth of nations.

In the ultimate analysis, knowledge is the greatest weapon which creates all further weapons. Proper education must impart a problem solving attitude instead of filling the brains of students with endless pieces of information. Communities and sectors of society need to understand the importance of education. When communities prepare on a daily basis for encounters and challenges which are multidimensional in nature, only then they can achieve a status of dignified nations. When nations avoid the sense of wonder, it is the beginning of their downfall. Unless national self-respect takes a decision to make a mark on the international scientific community, it is useless.

He read out the GDP growth rate and per capita income of certain countries in comparison with Pakistan and highlighted the difference between the rates of expenditure of other countries on education. Pakistan fares better on the scale of military expenditure than it does on the educational index. Research and Development sector is ignored in Pakistan in comparison with other countries that spend lavishly on this sector. However, he said that the positive thing was that the number of research publications from Pakistan has been increasing steadily following the support by the government. Things can change if continuity of funds and patronage of the state keeps supporting the cause of academia. Until and unless we allocate appropriate funds towards R & D, there can be no consolidated progress in the country.

Quoting Alfred North Whitehead, he said, “The race that does not value trained intelligence is doomed.”

Mr. Pervez Butt

Mr. Pervez Butt stressed upon the importance of ‘engineering’ as an extremely significant discipline of study. He gave the example of American universities where the governmental,

scientific and technical institutes inform the universities of their need for experts as per disciplines. National organisations in Pakistan, he said, need a professional pyramid as their hierarchical structure. He stressed the importance of appointing the right and relevant heads of organisations that have the appropriate degrees and know-how to settle all specific or collective problems that may arise. He mentioned Pakistan Council of Scientific and Industrial Research (PCSIR), Machine Tool Factory, Water and Power Development Authority (WAPDA), and Pakistan International Airlines (PIA) as organisations that could have done wonders for the country in their specific national roles, but fell short of their assigned goals. The reason, he said, was the appointment of irrelevant figure heads in leading roles in organisations of such crucial national significance. He reiterated that appointment of appropriate individuals to specific positions is important for making informed decisions that could be beneficial in the academic, as well as the political arena. Pakistan Atomic Energy Commission (PAEC) has been the only organisation where a proper professional pyramid has always been followed which is reflective from its auspicious efforts for the country.

The vacuum left by indigenous organisations invites private and foreign agencies to establish foothold in our country. He urged the respected educationists and the related governmental organisations to help establish engineering and scientific organisations in the country to create jobs. The example of NUST University was given by him as a centre of innovative excellence referring to their programme of producing electricity from bio-waste. He underscored that science and technology, and engineering in particular, can perform numerous activities which can create jobs in the community. Therefore, this becomes a function of economic security. He urged that education be given primary importance and that special focus be kept on developing engineering and all its subsequent disciplines.

Dr. Imtinan Elahi Qureshi

The fourth keynote speaker was the Executive Director, Commission for Science & Technology for Sustainable Development in the South (COMSATS), Dr. Imtinan Elahi Qureshi. National security has a very broad context, it has several dimensions and various multifaceted issues involved in it. In order to even barely scratch the surface of these issues, a much longer session is required. The theme that he chose expand upon is the projection of Pakistan's soft image through utilization of science and technology. Interactions carried out between the individuals of different countries in the field of science and technologies are the means through which a certain image of the country can be enhanced. If these interactions

are benign and positive, they help in creating an image that defies pre-existing negative notions of the world community regarding Pakistan. He further expressed his knowledge regarding the projection of the soft power of Pakistan. He suggested that the latest technical and scientific advances must be used to build a soft and constructive image of Pakistan. Pakistani scientists are affiliated with several international scientific projects. Thus, he suggested that due respect must also be given to our national scientists. These talented individuals represent Pakistan at the global level due to their consistent efforts in the field of biotechnology, nanophysics, chemistry and several other disciplines. He commended the exalted scientists, the physicists in particular who are currently representing Pakistan at CERN, the most prestigious European centre for research in the world. The unique efforts of COMSATS as a one of its kind organization in leading the countries of the South in the field of science and technology were also highlighted by him.

Engineer Muhammad Asghar

The final keynote speaker of the first session was Engineer Muhammad Asghar, Rector NUST who used a captivating power point presentation for his allocated speaking time. He grouped science, technology and education as elements of 'knowledge ecosystem'. Knowledge has transformed the concept of security in the present day world altogether. He stressed that the multi-dimensional problems today require resolution through multi-pronged approach instead of a singular plan of action. He recalled the golden era of Islam as the formative period of scientific discoveries. The chronological sequence of scientific discoveries in terms of Islamic and European civilizations was elaborated in the presentation. He took the audience through the different phases of the industrial revolution, from the invention of the first steam engine to the development of biotechnology that took the world by storm. His presentation covered the major historical events that took place over the course of time such as the French revolution, the world wars and the invention of the nuclear bomb.

Discussing the present global problems, he stressed that the war on terror and revolution in the civil military affairs have created a new security paradigm. ICT (Information Communication Technology) as an element of the new security paradigm encompasses all advanced networking systems. An era of *knowledge investment* has been ushered in by the intellectual community around the globe. He further expanded upon the types of security that are important to be mentioned such as food security, economic security, cyber security, educational security and other types of security. All these concepts are basically encompassed

by the even bigger concept of 'Human Security' which was presented by the gifted Pakistani economist, Mahbub-ul-Haq in 1994. He enlisted different problems that countries face in the present world in form of a conflict spectrum such as general nuclear war, limited conventional war, terrorism, non-state actors, natural disasters, climate change, poverty and human rights violation. In the end he mentioned the different roles that the universities and academic institutions can play in the new knowledge ecosystem. These are the development of human resource, undertaking cutting edge research, promotion of entrepreneurship, serving communities and to play the role of a think tank in order to tackle the wicked problems arising every day.

Speech by Rana Tanveer Hussain, Honourable Federal Minister for Science and Technology, Government of Pakistan

It gives me great pleasure to extend to you all a very warm welcome on behalf of the Ministry of Science and Technology and to say how grateful we are to the Institute of Strategic Studies, Islamabad (ISSI) and University of Management and Technology, Lahore (UMT) to convene this Seminar on "Role of Education, Science and Technology in National Security," here in Islamabad. It is an opportune time to renew contacts and discuss problems of mutual interest with guests and members from different ministries, think tanks, media, academia and other walks of life. I also appreciate all the guest speakers and participants for their hard work and preparation of useful documents for the seminar. I feel privileged to be a part of this august gathering of intellectual meeting and hope to gain a lot by mutual sharing of our experience and learning.

It is gratifying to note that the agenda of the Seminar covers a wide range of very interesting items relating to education, science and technology, especially their roles that are directly related to and influence different aspects of national security.

Since its inception, Pakistan has been facing grave existential threats and problems. It had to defend and protect its independence and sovereignty multiple times in its short history. The Pakistani nation, its leadership, military and members of the civil society had to perform the strenuous task of sustaining and development of various sectors of the state while simultaneously protecting and keeping in mind the national security interests of Pakistan. With time, the circumstances and challenges have changed in the contemporary world.

It is high time for us, as a nation, to tackle these circumstances and overcome these challenges accordingly by coming up with holistic solutions and strategies that are objective, pragmatic, and in line with international norms. The great security challenge facing this country today is combating terrorism. To safeguard our national security, we must continue to implement firm strategies to diminish the capabilities of terrorists and wipe them out. We must also reaffirm our commitment to education, science and technology in this country, and understand its vital importance to our national security as we continue with our war on terrorism. No one can negate or deny the significance of education, science and technology in this age of globalisation, where the revolution in communications and technology have

transformed the world into a cobweb, shrinking time and space and making information readily available to everyone, everywhere.

This has made the task difficult for states to protect their sovereignty and the subject of national security extremely complex and dynamic, calling upon states to revise their policies regarding latest challenges accordingly. Education provides an impetus for progress in Science and Technology. Education precedes Science and Technology. They are directly proportional in nature and complement one another in an extraordinary fashion.

In the words of Gilbert Chesterton, "Education is simply the soul of a society as it passes from one generation to another."

We can gauge the importance of education from this quote and also deduce the fact that we need to educate our upcoming generations and adopt new methods, policies and strategies. Theology also attributes utmost significance and value to acquisition of knowledge. Every religion encourages its followers to read, observe, learn and innovate. Science has equal importance. Religion and Science have always been considered to be twin sisters by Islam, and today at a time when Science has taken great strides, they still continue to be associated. Albert Einstein further endorsed this fact by saying, "Science (technology) without religion is lame, and religion without science is blind." There is not even a single state in the modern world that attained its current level of development without excelling in the field of education and pioneering in the fields of science and technology.

In fact, the apparatus of national security of all the major powers in the world today rests upon their fundamental prowess in the fields of education, science and technology, for example the United Kingdom, United States of America, Japan, China and many others. Ladies and Gentlemen, another challenge for our country is improving the dialogue and coordination between our academicians, scientists and policymakers. This is not an easy task, but it is more relevant than ever before. One of the striking developments in recent decades is the growing prevalence of science and technology in public policy issues.

Indeed, there is scarcely a public policy issue that does not to some extent turn on scientific and technical knowledge. For example, the Vision 2025 programme includes issues involving energy, environment, health care, security, economic and social development. Science and technological expertise is badly needed on these issues. But keeping up with scientific and technological developments is difficult for the political leadership and

establishment. Scientists often find it difficult to communicate effectively with politicians, and politicians often find it difficult to understand science. We need more people in politics who understand science, and we need a better dialogue between academicians, scientists and policymakers.

This will be hard to achieve since politicians and scientists come from different perspectives and academic cultures, but this dialogue is essential to the nation's well-being.

Seminars like this one are a positive step towards the achievement of this goal. We must also boost federal support for education, science and technology research and development (R&D). Government, for all of its deficiencies, is a major supporter of education, science and technology R&D. Education, science and technology are priorities of this government and it is constantly striving to allocate more budget and resources for them. We need strong education, science and technology for the protection of national security. In the military and in intelligence, we must be on the cutting edge of science and technology. When you see precision bombings against the terrorists and the remarkable developments in the intelligence field, you understand how important it is to have scientists and engineers who are thinking 10, 20, or 30 years ahead to what the battlefield requirements might be.

What our scientists do at the national laboratories is integral to keeping this country strong and free. The government should make it easier for our nation's top academicians, educationists, scientists and engineers to join our national laboratories and scientific institutions so that they can serve our nation in a better manner.

Our international prestige in science and technology is critical. This is called "soft power", the capacity to get others to do what we want without coercing them. Our national security requires talented biologists, physicists, and computer specialists just as much as soldiers and politicians. Strength of great nations has always been tied to their innovations and entrepreneurial spirit. We as a nation need to make the process of acquiring education easy and encourage technical and scientific home grown expertise. Our nation must focus more attention and resources on human and educational requirements for national security. It is a matter of the highest importance that we develop highly skilled people. To do this we must reverse the negative trends of the teacher shortage and the decline in science and math education in this country.

Otherwise, we will be unable to maintain our position in the international arena. We should keep in mind that the vision, creativity, innovation, and entrepreneurial spirit of the academic, science and technology community represent the very best of this great country. If we want to change the condition of our country and that of our future generations, we *have* to educate them and gain prowess in the fields of science and technology. We now face the challenge of combating terrorism and safeguarding our national security. Strengthening the dialogue between policymakers, educationists, academicians and scientists and boosting federal support for science and technology is crucial to our national security and the future of our economy. We know a new world is coming. The scientific and technological communities of this country will play a big role in building that world, a world of greater peace, prosperity, security, and freedom.

SESSION II

“Role of Education, Science & Technology in National Security”

The Second Session of the seminar, “*Role of Education, Science & Technology in National Security*,” was chaired by Mr. Shaukat Hameed Khan, Coordinator General of Ministerial Standing Committee on Scientific & Technological Cooperation (COMSTECH). The other speakers included Dr. Hafeez Hoorani, DG, National Centre for Physics, Quaid-i-Azam University, Islamabad, Dr. Zabta Khan Shinwari, Secretary General, Pakistan Academy of Sciences, Islamabad, Dr. Zafar Iqbal Qadir, CEO, Taleem Foundation, Islamabad, Dr. Habib-ur-Rehman, Vice Chancellor, Mirpur University of Science & Technology, Mirpur AJK, Ms. Maria Jabeen Awwal, Undergraduate Student, Department of Government and Public Policy, National Defense University, Islamabad, Professor. Dr. Jameel-un-Nabi, Dean, Engineering Sciences, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, KPK, Dr. Zareena Kausar, Assistant Professor, Air University, Islamabad, Mr. Faisal Mushtaq, CEO, The Millennium University College, Islamabad, Dr. Mumtaz Hassan Malik, Dean and Professor UMT, Lahore and Dr. Adnan Haider, Chairperson, Department of Electrical Engineering, UMT, Lahore.

Mr. Shaukat Hameed Khan

The Chair in his opening remarks said that, there is no end to innovation and it continues to evolve with time, as science changes. In the 21st century, applied sciences are very important and formed the basic backbone of the recently Sustainable Development Goals. Economic growth depends on new type of worker, meaning development of human capital is of utmost importance especially in Pakistan.

He said that national security meaning war and science go hand in hand and one cannot exist without the other. Mr. Khan also said that in Pakistan there are misplaced priorities, as the budgetary fund allocated to HEC is insignificant. Pakistan produces very few number of Ph.Ds and do not have a single university in the top 500 in the world. Without sufficient educational infrastructure, efficiency in various sectors will also suffer in the country. Productivity indicators in Pakistan are very low due lack of science and technology, compared to other Muslim countries like Turkey and Malaysia. Unfortunately, there is no research funding in the private sector either.

Pakistan needs to escape the trap of “Low Skills, Low Productivity, Low Expectations” by bringing about convergence of social and technical capabilities. It needs to work towards building its social capital and capability to ensure a collective competence that increases productivity both within the country and the region. It is essential to reform the institutions and structures of the state so that the instruments of government focus on the entire spectrum of human capital, especially secondary education through extensive vocationalisation. New talent must be encouraged, and Pakistan must strive to become a knowledge economy. Education is a sector where government can aid the private sector. Secondary education and vocational training needs great attention for which communication between scientific community and the civil society needs to be upgraded.

Dr. Zabta Khan Shinwari

Dr. Shinwari talked about biology being an important field. He said that biological warfare has gained great importance in the current world, especially in the sphere of national security. Also, climate change is becoming an important issue as it can destroy agriculture of a country, which can have economic consequences. Furthermore, we should be aware of the biological innovations and systems being developed, especially in the western world. As a developing country, Pakistan needs to focus on biological as this can be very useful both for the civil society and the armed forces. Biological systems, especially synthetic biology, is the in thing in the field of biology. This will help to eradicate mass pandemics in the world. The government needs to invest more in this field, especially in the field of agriculture and water security. He said biological agents can also be used to eradicate the menace of poppy fields in the border areas of Pakistan.

Mr. Faisal Mushtaq

Mr. Mushtaq spoke about innovation in education which is important for strategic security of the country. He said that three important pillars of the society are education, health and security. Literacy is the most important thing to gain strategic security which will lead to scientific base that will help the defense complex. Technology use is very important and those countries which do employ this will be left behind. The world has become more millennial with the use of social media. Pakistan is one of the biggest producers of raw materials like cotton and dairy products, but lack the industrial base and technology to make use of these raw materials. Literacy is the first line of national security and without investing

in it, Pakistan will lack proper security to defend its citizens. Research and innovation is very important to develop a scientific complex in the country. Increase in literacy rate will lead to increase in national security of the country.

Dr. Zafar Iqbal Qadir

Dr. Qadir started off by talking about education and national security. He said that national security is about creating a state of mind and includes social, economic, political and cultural safeguarding of the rights of the citizens. Insecurity on the other hand is where people feel their civil and social liberties are under threat and there is a lack of justice for them. Education seems one simple tool that has the inherent capability of taking all these national security issues head-on. One primary purpose of education is to impart to the students a sense of responsibility. This, in turn, secures essential social stability for desired social change that would lead to satisfy most security dimensions. That is how societies survive and progress in peace.

Education is a comprehensive process involving individual and social change in an ethical framework. It is commissioned to bring about preferable or desirable social change; a change in the institutions, instruments, processes, systems and individuals of society. Looking at the regional perspective, one would not undermine the role of Muslim scholars who came from Arabian Peninsula and sowed the seeds of value-based knowledge in India through a chain of “Madaris” or religious institutions, which were focusing equally on language, logic and literature; and were producing balanced human beings by and large. On the other hand, the missionaries and clergymen, who had come from Britain in considerable numbers, felt concerned to influence the local intelligentsia through the English system of education, training and grooming of our human resource as a community asset that guarantees equitable access to opportunities, resources and value for money. Commitment, trust, reciprocity and networks are the key features of social capital. Networks that connect the community to broader regional, national or global linkages can bring in new resources and share local innovation to stimulate broader political and economic gains.

Education is the only process, which, if guided and institutionalised in an appropriate direction, can bear the fruit of responsive and even creative formation of social capital. Enlightenment also leads to socio-cultural integration for social mobility; it leads to eventual elimination of small group loyalties and gelling them into national spirit. National aspirations,

economic growth and developmental trends energize a society to stimulate change for social well-being. There is the demand for universal education with the resolve to create job opportunities and fair competition. However, it may also be argued that all these positive changes have their negative impacts, too, and the state institutions are put to greater strain to manage a more demanding population and to solve problems of higher magnitude, in addition to supporting dispersed rural society.

Technological advancement of the present day has no historical precedence. Technology may be used to harness the mind and control the thought process. The power of information technology is an established fact. Those who are still at the doorsteps of modern technology and have yet to enter this era are rather groping in the dark and uncertainty. For such nations, educational reforms are but inevitable in order to bridge the barriers of time and space; and to try to catch up with modern advancements in science, perhaps just enough to be able to preserve their sovereignty and attain a reasonable standard of living.

While state has undertaken a number of initiatives like delegation of powers through 18th Amendment to the constitution, up-gradation plans by HEC, NADRA, BISP and Youth Employment Schemes to safeguard the boundaries of national security, and the contributions made by some civil servants in their private capacity remains no less in terms of their impact on balanced human development, social pride and economic prosperity. Orangi Pilot Project, Rural Support Programmes, Akhuwat Trust, Rescue-1122, Taaleem Foundation and MediBank stand tall among all.

Taaleem Foundation is one of the few initiatives on the part of a few committed philanthropists from the civil service, who devoted their spare time to help fight the menace of illiteracy, poverty and alienation in their private capacity; and lead the masses to wisdom-based secure way of life. The experience has been a great success in educating and engineering social change by way of ICT-enabled and value-loaded educational content and its conduction in the remotest districts of Pakistan. The “e-School” product of Taaleem Foundation has been the most innovative solution to educating the masses at school level in the known knowledge mapping around the world today. Just to quote a simple example: During the Bugti turmoil in Balochistan, the school of Taaleem Foundation operating in the heart of Bugti tribe never shut down even for a single day. This not only reflects the trust in the system of schooling, but also the trust in value-based security paradigm that the

organisation was inculcating among the masses. While every area of the country can benefit by such activities, the under-privileged areas deserve it the most.

In conclusion, Dr. Qadir stated that purposeful and compatible education would lead the country towards economic growth, and create a situation that will provide social, food, water, political, judicial, external and internal security. All of these are compatible and interlinked with each other and will help to create a national security paradigm for the country.

Dr. Habib-ur-Rehman

The next speaker of the session was Dr. Rehman who talked about the paramount importance of science and technology for national security. As a nation, Pakistan lacks in application of education, and as a nation it has to be realised that science is very important and political will is required for its implementation. The main purpose of our efforts should be on how education is imparted to the students. Science and technology should derive the national security and vice versa.

He further stated that research and policy initiatives need to be taken for the future, so that the country can produce students who are well-versed in sciences. Rapid scientific and technological (S&T) advancements have placed a strain on security strategies. It is essential to train and educate our future leaders to understand the link that exists between strategy and science. Synergy between strategy and science & technology should be embedded into the curricula of the institutions to address new threats and opportunities. The education of our armed forces future leaders needs to keep pace with this ever-changing strategic and technological reality.

Dr. Rehman said there is a need to identify threats to national security both internally and externally. It is a national requirement to recruit, develop and retain a cadre as part of the national security force who can think strategically about potentially “game changing” disruptive technologies, and employing that force as part of national strategy and policy. These game-changing technologies are truly transformational, exponential force multipliers. S&T developments should best support the national security strategy. It is essential to recognise emerging technologies that can alter strategies, while at the same time advance technologies that enable strategies and supporting military technology to dealing with possible threats areas; missile defense, long-range conventional strike, electronic warfare, cyber and indirect fires on land. Pakistan must invest in the brain power to make smart

decisions in S&T including technological advances and strategic changes, a digitised battlefield, counter-pandemic military operations, anti-satellite technologies, and unmanned combat vehicles of all types. New battlefield realities and emerging strategic systems for ensuring national security must be taken into consideration. For further application of science in the country, serious effort is required in all aspects of our national endeavour to ensure the national security of the country.

Role of universities is very important. They need to be made independent and accountable and need more investment especially in the fields of sciences. Effective measures are needed for all national threats and for that, a curriculum should be developed and distributed in all institutions, and should be taught in all universities. He also said that our researchers should make use of the national resources of the country to solve internal issues by developing links between different institutions, and collaborate with each other. Finally, he said, that scientific strategy drives security, therefore, it requires more investment to development strategic human capital resources. Science and technology talent should be harnessed from within the government, academia, and from the industry. Research centres need to be established on need basis to address questions and present options.

Ms. Maria Jabeen Awwal

Ms. Awwal spoke about the youth perspective on the topic at hand. The major powers have prioritised educational institutions as it is very important, and focus is required on how to improve the educational system of Pakistan. She said there is a need to revise the curriculum in the universities and make the students aware about new innovations in the world. Reforms are also needed in secondary and higher education and make the students more aware about the subjects they are studying, especially the science subjects. There is a need to get rid of the rote system from the educational institutions and more practicality needs to be induced. Critical thinking is very important especially in the youth, and they need to be provided more resources to innovate.

Professor. Dr. Jameel-un-Nabi

Professor Nabi started off by saying that national security is a multifaceted field and contains many aspects. The term suggests a predominantly military aspect but has broader meaning in the post-modern world. Economic, political, environmental aspects are important. Over the last two decades, cyber-security has become extremely important. Military security,

social coherence, politically stable institutions and economic growth through eradication of poverty are the four main milestones of national security. If these elements are absent, it will lead to chaos in the country. Stakeholders for science and technology and national policy – the Federal and Provincial Governments (and all their subsidiary departments whether technical or non-technical), need a more proactive approach.

Greater R&D is required within the country which can be done through both long-term and short-term strategies and will help the policy makers. He said that disaster management, space issues and natural resource depletion are three core elements. In Pakistan, there is a disconnect between political and economic institutions. Given Pakistan's complex internal (and external) politics, there is often a divide between politics and economics. The economically optimal solution may not necessarily be the best political one. This therefore, already makes it incumbent that quite often we have no choice but to start off with a sub-optimal solution whether we like it or not. The Kalabagh Dam would be a case in point. He stated that Pakistan is a disaster prone country facing environmental issues and needs a proper disaster management strategy. The space race is becoming very important as many countries are competing over it, but Pakistan lacks behind in this race. Resource depletion is another important issue and Pakistan needs to look at renewable sources of energy. National security should not override national liberties, but complement the safety of the citizens. But, there is a need to be vigilant. Pakistan has to increase the budgetary amount for scientific development. The geopolitical factors are a key factor in determining which aspects of national security take precedence. However, every aspect of national security comes at a cost. Pakistan has had to spend a substantial portion of its annual budget on military matters and military technology, thereby leaving other aspects extremely underfunded. CPEC is a great economic opportunity for Pakistan and it needs to take full advantage of it.

Dr. Zareena Kausar

Dr. Kausar stated that the role of science and technology is very important in national security, but there is a need to know where it is required and why it is required. National security encompasses both internal and external factors. Role of education, science and technology is vital in a society. Traditional and technological solutions for national security including security on borders to secure them from external intrusions and security of streets from internal terrorism, along with educational projects are proposed. Implementation of technological and educational projects will add to the national security of the country.

National security is not an isolated and local issue, but is a global issue. International community and those who harm Pakistan are increasingly interconnected. Pakistan faces an array of threats, which include Cyber-terrorism, Bio-terrorism, Radiological terrorism, natural disasters and nuclear proliferation. These threats are elevated by the use of information technology and other emerging technologies by terrorists. The border security involves three areas: Land border security; Waterfront Security; and Aerial Security. Technology has revolutionised each of these fronts, creating secure and safer international borders.

Land Border Security:

The most commonly used instrument for border security is visual sensor network. These networks are useful in applications of surveillance, tracking and environmental monitoring. A visual sensor network is a network of smart camera devices capable of processing images of a scene from a variety of viewpoints into certain form, and is more useful than the individual images. The network generally consists of the cameras and possibly one or more central computers, where image data from multiple cameras is further processed.

Waterfront Security:

In order to limit the approach through waters, underwater sensor networks form the basic shield. This shield comprises of: A towed cable; a fiber optic cable placed within and running the length of the towed cable; electric circuitry and network device. When a disturbance is reported on the sensor cable, the network alerts a computer placed in the central position which then using data from other sensors gauge the type of threat respond effectively.

Aerial Security:

To protect the nation from missile attacks, deployment of multilayered missile defense system is proposed. This is a two-tiered system consisting of: Interceptor missile (for high altitude interception); Short-range missiles (for lower altitude reception). Such two-tiered shields are able to intercept any incoming missile launched 5000 km away.

Technology needs emphasis as it is a vital tool to overcome threats to national security of Pakistan. Technology can be used for spying, communication, defence, biometric and disaster management by the government. Pakistan needs to channel its energies towards new

technological innovations which can help it in the short-run and long-run to develop a military sector which can help in national security. Different countries are already working on technological advancements especially in the military field, and Pakistan should not lack behind. Defense sector uses all kinds of latest technology for its day to day working. It Ranges from Computer Servers to Heat Seeking Missiles.

Missiles Technology:

It is a self-propelled guided weapon system. Missiles have system components: Targeting, flight system and engine. Missiles are used for different purposes: Surface to Surface; Air to Surface; Surface to Air. Smart missiles are proposed to be developed and used which include capabilities of: Infrared, radar, laser, GPS and parameter sensing technologies.

Armoured and Nano Technology:

In last decade, many soldiers have been killed or injured by roadside bombs. An intensive research needs to be devoted to improve the body armour worn by troops sent into the conflict zones. Ceramic material is used in making of military armours.

Bionic Hornet:

Nanotechnology may also be used to update weapons. One of such application is known as bionic hornet

Biometric Technology:

It is referred to identification of humans by their characteristics or traits. It is science of measuring and analysing biological data. It measures and analyses human body characteristics such as DNA, finger prints, eye retinas, voice patterns and facial pattern.

Finally, she added that scientific development is the way of the future and indigenous research needs more funding. The education sector should be made more aware of these changes and also involved in scientific innovations. The research in areas of unmanned ground and aerial vehicles and powered exoskeletons is undergoing in Mechatronics and Electronics disciplines in universities of Pakistan. These are emerging technologies which may be applied for national security of the country. Keeping in mind the present security issues of the country, different technologies are identified in areas of border and inland

security. Emerging technologies used in the world are presented for spying, communication, defense and disasters. Nano and bio technologies are also introduced ranging from hornet to armors. Exoskeleton is a technology useful in harsh environment and condition. The development of these technologies is a need of the time to secure the nation from street war and terrorism, as well as to protect borders of the country. Education at all levels is also identified as first step to secure the nation and the country.

Dr. Mumtaz Hassan Malik

Dr. Malik talked about economic security of Pakistan. This involves agriculture and textile which are two main features in the case of Pakistan. Textile industry is the largest industry of Pakistan, but Pakistan's contribution in the global textile trade is very minimal, about 1.5%. He said that Pakistan is the 4th largest producer of cotton, but its usage is not efficient. Agriculture yield is not increasing in Pakistan compared with the international world; this is due to lack of technology usage, poor handling and insufficient storage facilities.

He further said that textile industry is divided into two parts one is conventional textile and other is technical textile. In technical textile, Pakistan lacks behind and there are different sectors of technical textile on which Pakistani government needs to focus as it will help it to increase its textile export volume. The textile industry can also support the agriculture sector in Pakistan by adopting agro-technologies from the textile sector. He said both the industries are interlinked and can benefit each other and the country on the whole. In the end, he said that different research institutions can work together to improve economic activity, this can be done through better linkages between universities, think-tanks and different ministries.

Dr. Adnan Haider

The final speaker of the session, Dr. Haider talked about the potential of students and faculty in the country. He informed the audience about various scientific and technological advancements taking place in the West, and what Pakistan can learn from them and how it can implement some of these innovations in the country to improve the national security. He said that primary education was really important because at a young age the children can be inclined towards sciences and its study. This in the long run will produce a better skilled human resource well-versed in science and technology for the country.

Selection criteria for recruitment in Armed Forces and law enforcement agencies should be reviewed. There should be induction of foreign qualified Professors in civilian units of Armed Forces and law enforcement agencies. Grade 6-12 students' curriculum should include chapters about homeland security, defense, histories of various countries, success and defeat stories of Armed Forces, and history of wars. Conflict resolution problems should also be included at the college level curriculum to understanding international or national conflict or issues of war. Achieving operational advantage over potential adversaries depends on investment in technology. The current impact and widespread influence of technology in our world stems directly from increased consumer demand and better manufacturing techniques. It is also the product of earlier scientific research, which in turn depended on investment, whether by the public or private sectors. To understand, counter, and protect against such threats, we need to be able to use effective investment in defence and security science & technology to access and deliver technology into our future systems and equipment to provide operational advantage.

Whilst we need to adapt and use more civil technologies to meet our defence and security needs, there remain areas of technology development where the market is weak, including Chemical and Biological Defence (CBD) and counter-measures for counter-terrorism (for example, electronic surveillance). These will continue to require focused investment in science & technology beyond what is provided by civil commercial markets. In addressing the challenge facing us as an intelligent customer for science & technology in defense and security, we should prioritise investment towards providing timely and effective advice to decision-makers. This includes maintaining a lean, skilled in-house workforce. We should also shape our expertise and access to expertise in developing, and assessing markets and keeping up-to-date with the latest developments. We must develop tools and techniques to assess, integrate, and evaluate our equipment and systems requirements.

He also said that different language,s especially those of our neighbours and our provinces should be taught in our education institutions, as this will help to build nationalism in the country. He also added that different outside agencies were using various technological advancements, and Pakistan should also use them to improve its national security. In order to achieve best value, we must access the results of the much wider and more extensive civil investment in research and development for use in country's defence and security. This will drive down costs, influence other markets' investment, and expose new technology solutions

to defense and security requirements. Access is available through both tracking technology development and engagement with the greater range of suppliers active in the wider civil markets for technology. These suppliers are vital to helping the Government achieve this goal and we must improve the communication of our needs and of our willingness to invest in these innovators.

Concluding Remarks of the Chair

The chair in the concluding remarks said that lack of institutional capacity is one of the issues in Pakistan, but Pakistan has made strides from 1947, but still, more needs to be done. The educational institutions need more funding, especially in the higher education with regards to science and technology. Muslims have not made any significant contributions to the scientific world over the last 200 years. Education is one of the foundations of Islamic culture and we need to find a balance in Pakistan between religion and sciences in the country, so that we can develop human capital for the country which would also ultimately help the national security of the country. This needs transparent and accountable investment.

Concluding Remarks of the Chairman BoG ISSI, Ambassador Khalid Mahmood

Ambassador Khalid Mahmood thanked the audience and the speakers for their participation in the seminar. He said that science and technology is a strategic issue and the concept of security is very wide. National security is a holistic and dynamic concept and high literacy rate can aid the state in achieving a fool-proof security by developing linkages between the state, industry and the society. Strong development and institutions based on education should be carried out. Education, especially scientific education needs more prioritisation, and the focus should be on implementation and innovation. This can be done through right government policies, which creates an environment for students to be attracted to the sciences. It is imperative for Pakistan to make linkages with developed countries with regards to science and technology to achieve sustainable development in Pakistan. Science can be constructive and destructive, but we need to focus on the constructive part which is necessary for the national security of Pakistan.