Keynote Speech

Creativity and Innovative Mind: Key to Learning in the 21st Century

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Introduction

Thank you Mr./Mme Chairperson. Thank you very much Dr. Tang for your informative and thought-provoking presentation.

Ladies, and Gentlemen, I am very honored to be here to participate in this valuable meeting to discuss the future of education beyond 2015. I am particularly happy to be standing here, because in addition to my expertise of biotechnology, I have published a book, called “Evolving Universities” in the midst of higher education reform in Japan. Currently, being in charge of Science & Technology and Innovation for Science and Technology Policy of Japan, I wish to look at evolving aspects of what we face in the 21st century, as a policy-maker, as a scientist, and as a reformer of education,

As we are discussing issues of 21st century, I would like to start by sharing an interesting application of technology, supporting Basic Human Needs in Bangladesh. In this country in South Asia, collaboration to assist BOP (bottom of pyramid) has been quite popular. Health sector is not an exception. By Grameen Phone initiatives, village phone ladies, who are village health care ladies, are playing a key role to improve health of rural communities. Since 2006, 15,000 medical consultations were provided every day by 200 medical doctors with call center applications (Kitsuregawa, 2012). Patients use cellular phones to consult their medical conditions. However, without medical testing devices at patient sides, providing continuous medical care was found difficult. This is where technology comes in. A suitcase package with medical testing devices and remote audio/video
communication devices was developed by information technology experts. Village phone lady (medical staff) visits a patient with the suitcase in remote areas. IC card system is used for storing medical testing results at patient sides. The pilot study was conducted this year for 600 patients, and the preliminary results show the number of middle risk patients had drastically decreased. This type of integration between technology and Basic Human Needs was not possible in the 20th century.

As illustrated in this effort, “Innovation” has become a key to live and survive emerging issues in the 21st century.

Background- changing environment, changing world

First of all, let’s look at where we are now.

In 2025, the world population is estimated to increase from 7.0 billion in 2011 to 8.0 billion, and two thirds will live in Asia. Asia becomes the biggest producer and exporter to the world, with continuous growth of emerging nations. Asia catches up with the U.S. and Europe in the area of research as well. Multiple reports by European Commission and National Academies of the United States recognize the rise of Asia (EC, 2009; National Academies, 2010).

From a different perspective, I wish to touch upon Global Innovation Indicator (GII). In 2007, top 10 innovation leaders are dominated by high GDP countries. In 2009 though, countries with GDP ranking lower than 10th began to join the top 10 innovation leaders. (Sweden, Singapore, Denmark, Korea, Switzerland, Netherlands). Further, top 10 innovation leaders in 2010 are occupied by countries with GDP ranking lower than 10th. Similar trend can be seen in 2011. The top GII nations, namely, Singapore, Switzerland, Sweden, share similar characteristics. They all live with constraints, and strive for survival. For example, Singapore, lacking in water resources, developed national strategy to become global hub for human resources for innovation. Reserving access to water resources was nation’s top priority, and innovation was crucial outcome for urgently needed demand. GII –rising countries have evolved in a similar manner,
transforming such challenges to opportunities.

In the current world we face multiple constraints ranging from climate changes/natural disasters, demographic changes, to energy and resources security. And such challenges, I call it Grand Challenges, have become threats to sustainable growth. We need to address that innovation is the key to induce solution to such Grand Challenges globally and locally. Generations in the 21st century will have to live and face more and more complicated world, and thus, I believe fostering innovative mind is vital for the next generation.

**Evolution of S&T Policy, New Education Principle**

Such changing environment, apparently influenced policy shift of Japanese government. In the previous Science and Technology (S&T) Basic Plan of 2006-2010, the focus was on priority disciplines, such as life science, ICT, environment and Nanotech. However, as Japan had faced our grand challenges of natural disasters of tsunami and earthquake as well as nuclear power crises last year, we realized that the grand challengers remained unresolved through discipline-oriented approach. Reflecting this first-hand experiences, and with our commitment to strive for revitalizing our people and country, the 4th S&T Basic plan (2011-2015) shifted its focus on issue-driven approach, promoting an integration of S&T and innovation performance (CSTP, 2011). Various types of science and technology with **diverse approaches** are the ground expected to create **new values** to take action against our Grand Challenges. These new values are more than just an invention, rather, it is to serve as a solution to the social problems, and thus need to integrate knowledge of diverse disciplines.

**“Zest for Living”**

Communicating such Grand Challenges to the citizens, particularly to next generation is our crucial responsibility. Facing global and local constraints, children cannot be passive in learning, but instead, have to nurture the minds to bring about innovation to the society.
Here, I wish to illustrate the new education principle that Ministry of Education (MEXT) instituted in 2004 (MEXT, 2004). The practical skills to cope with today’s rapidly changing society – skills for the self-sufficient individuals to socialize and cooperate with others – called “Zest for living”. It stands on the belief that the balance of three aspects of “knowledge 知”, “moral 徳” and “body 体” is basis for learning. *Solid academic prowess* is an ability to acquire basic knowledge, to learn and think themselves, to make decisions by searching, trying to reach the solutions. A *well-rounded characteristics* promotes own self-control (discipline), mind to cooperate with the sense of empathy. This goes with *healthy body*, physically and mentally. These three elements do not function independently but instead intertwined together. The “zest for living” is hence, deeply connected with both mind and body. It is based on the philosophy that the balanced approach between acquisition of academic knowledge/ skills, and fostering sense of judgment, critical thinking and expression. Such need is more and more evident for the children to live in knowledge-based society. Furthermore, this principle emphasizes that fostering zest for living is only possible with the collaboration among schools, families, and communities. Although the importance of this principle was agreed, the level of implementation is another story. During the first phase of introducing this principle into school curriculum, the following five issues were identified (MEXT, 2009): 1) lack of shared understanding on its meaning and needs among stakeholders; 2) overestimating self-reliance of students; 3) lack of integration of problem-solving approach into regular subjects; 4) insufficient lesson hours to introduce interactive and experience-based learning; and 5) underestimating tangible decline in the educational functions of the family and communities. These lessons were studied for revised guidelines and new curriculums implemented in primary schools starting 2011 (2012-middle school, 2013 high schools).

**Discovery Skills for Innovative Mind**

Now discussing education beyond 2015, in relation to innovation, the question is how to develop individuals with innovative mind. I would like to
briefly refer to modified “Disruptive Innovation Model” (Dyer, Gregersen & Christensen, 2011). Skills to be innovative is said to be more than cognitive skill, and both sides of the brain are needed to create new ideas. Such skills, called discovery skills consist of four action skills.

**First, Questioning skills:** People with innovative mind constantly ask questions to challenge the status quo, using “Why?” “Why not?”, and “What if?” “What if” questions often provoke discussion, by deliberately imposing constraints – what if we have this kind of constraint and to think it through, to lead to intriguing original ideas to move to the next step?

**Second, Observing skills:** Careful observation helps to look out “uncommon” surprises. People with innovative mind are curious to know “how this is uncommon”, and “how this is different from what is expected. Of course, observation is not merely a visual ability. When going through diverse experiences, you fully utilize multiple senses, then you will notice more than what you visually see. My belief is useful information is often hidden, you have to dig in to find the surprises driving your five senses.

**Third, Experimenting skills:** Experiments help to answer questions on “What if?”. It is to try out new ideas by creating prototypes and using pilots. Whether it is intellectual exploration, physical tinkering, or engagement in new surroundings, it is, most of the time, the best vehicle to lead to clues to success, by constructing interactive experiences.

In addition to these skills, creating **Diverse Network** lead to unexpected perspectives. Developing network among different countries, industries, age, races, and social status, and through communicating with people on other side of your social network, epoch-making ideas are being produced.

Revolutionary advancement occurs when seemingly unrelated questions, problems, ideas are being *associated* to identify new directions. Historically-renowned discoveries and innovations came out of intersection from diverse borders – borders of technology, academic field, geography, society and culture.
These skills together foster CREATIVITY. Creativity is not hereditary ability, nor cognitive skills, but rather learned action skills. And such discovery skills cannot be developed only through learning at schools, but in communalities, families and societies.

**Examples: Discovery Skills**

Having discussed these discovery skills and need to foster creativity, let me introduce an innovation example in Africa, the story of using cutting-edge technology to improve public health. It is a story of inventing “Olyset”, long-lasting insecticidal net, widely used in Africa now. The Times magazine identified Olyset net as one of the Coolest Inventions of 2004. (According to the *World malaria report 2011*, about 216 million cases of malaria are still found and an estimated 655 000 deaths in 2010. However, malaria mortality rates have fallen by more than 25% globally since 2000, and by 33% in the WHO African Region (WHO, 2011).

Olyset is a bed net, to prevent malaria infection. Contact with Olyset net knocks down and kills mosquitoes. This net is simple but revolutionary, simple because it uses widely used permethrin, a well-known long-acting synthetic pyrethroid. It is revolutionary as advanced technology is used to incorporate permethrin within the monofilament fibers that make the durable nets.

Prior to Olyset, mosquito nets treated with pyrethroids were used for the Roll Back Malaria (RBM) Campaign, which is reportedly 50% of prevention rate. However, repeated use of this mosquito net turned out to be about 20%. Mr. Katsuma of UNICEF was always questioning why this rate was so low. Meanwhile, Mr. Ito of Sumitomo Chemical was questioning why current technology only prevents 50%, why high-tech cannot prevent this ancient killing disease. *Experiments* to develop long-lasting insecticidal net were repeated to reach close to 100% prevention rate. Mr. Katsuma made careful *observations*, visiting houses, talking to women who are in charge of household affairs, finding out simple but attractive way – selling this high-tech bed net as “Magic Power” net to spread among local communities. *Networking* was central to this innovation, expanding public-private
partnership. Sumitomo Chemical provided manufacturing technology to local manufacturer and ensured that the nets could be made on local equipment. ExxonMobil provided polyethylene resin for the nets and funded a new voucher system. WHO has monitored quality control to ensure that the nets comply with WHOPES (WHO pesticide evaluation scheme) standards. UNICEF has funded the initial purchase and distribution of nets and has worked with the Rockefeller Foundation to examine the policy implications of the nets. Now Sumitomo Chemical produces 30 million net per year in Tanzania. Massive quantity of distribution with long-term commitment was able to reduce price for mass production. This also produced local employment, spreading words of its effects to rural communities.

**Concluding Remarks**

As we face Grand Challenges of the 21st century, we need to foster next generation with innovative mind.

In concluding my talk, I wish to refer to the concept of “Medici Effect”. During the Renaissance period, the Medici gathered wide variety of experts in Florence, such as sculptors, scientists, poets, philosophers, and architects. This induced explosion of creativity. Other examples are found in Islamic Renaissance, covering large areas, including Cordoba, Tunis, Cairo, Damascus, integrating foreign academia of geography, medicine, astronomy and literary figures. The recent development in Silicon Valley is well known as technology innovation, giving massive impact on our lives, on how we communicate through innovative use of ICT.

Now, today, we have a collection of educators, scientists, economist, policy makers, ICT experts, and neuroscientists to expose ourselves to each other. I see this important gathering as intersection of innovation – to explore ideas beyond 2015 education.

The world is becoming more competitive, but at the same time, in the age of globalized and inter-connected world, it is time to transform ourselves.
References:

MEXT, “Zest for Living”, New Curriculum and Guidelines, 2009