

# The Challenge of the Explosion of Knowledge for Twenty-First Century Higher Education

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Madam Chairperson, ladies and gentlemen, good afternoon. I am Hiroshi Komiyama, President of the University of Tokyo. I am most honored to be given this opportunity to speak at this meeting of OECD Education Ministers on the future of higher education. I believe that the most important challenge facing twenty-first century higher education is to structure the explosive output of knowledge of the twentieth century, and to create a new system for education. In this address, I would like to introduce from this perspective some of the educational reforms we are promoting at the University of Tokyo, and to present my opinion about the prospects for reform of global higher education in general.

In the twentieth century, technology made great strides and human knowledge increased explosively, but as the amount of knowledge that an individual can use has its limits, knowledge came to be subdivided into numerous fields.

To illustrate this, let me cite an example of photosynthesis. In 1900, our knowledge was as simple as to say that it is a process in which chlorophyll of plants converts carbon dioxide and water into carbohydrate and oxygen using the solar energy. In 2000, our knowledge is so vast that it would take me too long to explain the entire process.

The subdivision of scholarship further accelerated the explosion of knowledge, and as a result, has developed an academic environment in which little interest is shown for knowledge outside of individual areas of interest. To resolve this problem, interdisciplinary fields were created one after another in the latter half of the twentieth century, but the creation of interdisciplinary fields while preserving existing fields instead led to the dilemma of further accelerating the subdivisions in scholarship. In order to find a fundamental solution to this problem, it is necessary to integrate the subdivided fields of scholarship, to gain a bird's-eye perspective of this explosion of knowledge, and to place the structuring of knowledge at the center of higher educational programs.

This subdivision of scholarship is a universal trend that can be seen all over the world, and the University of Tokyo is no exception. Students are overwhelmed trying to learn this vast accumulation of knowledge. Today's educational system has been unable to nurture individuals with the imagination to lead the world

and carve out new fields of knowledge. To rectify this situation, it is necessary to provide students with a perspective giving a broad overview, to provide a roadmap for the systematic learning of subdivided fields, and to create an educational system that nurtures students' ability to approach problems that are as yet unresolved.

I have for many years stressed the importance of the “structuring of knowledge”, and when head of the School of Engineering, based on this idea, I established an education office to structure and clarify a system for creating curricula that provide direction to students' studies. Supporting this system is the development of information technology that allows the instantaneous analysis of relationships between subdivided fields. This system also provides a bird's eye view of the overall structure of an academic discipline as well as indicates its direction of development, all based on a vast quantity of knowledge collected through academic articles and lectures. Through the construction of this system, we hope that students will be able to push out their boats onto the ocean of subdivided disciplines, take the rudder for themselves riding out the stormy waves, and one day will discover a new continent.

On becoming President of the University of Tokyo in April 2005, I initiated several projects to promote the structuring of knowledge on a university wide scale. One of these is the “science integration project”. This project is an attempt to understand an overall view of the cutting edge of knowledge regarding human being, materials, the Earth, and space, through the harnessing of the total abilities of the university. Presently, this project is limited to the integration of natural sciences, but if this daring attempt should succeed, I hope that it would also reach to the integration of humanities and social sciences. Further, I hope that this integrated knowledge will reflect on education as well.

I also believe that the teaching of this integrated knowledge is important in liberal arts education in universities. In Japan, liberal arts programs are being closed at many universities, and they are becoming more and more specialized; however, at the University of Tokyo, we are aware of the importance of total education, and in fact we are strengthening our liberal arts programs. With this in mind, we have begun a series of “Academic Overview Lectures” targeted at first- and second-year students with the aim of providing an overview of the position of cutting edge of research in each field. In the winter semester of last year, a lecture series on the theme of “the Science of Materials” was held, including presentations by Nobel laureate Professor Emeritus Koshihara, myself and other leading researchers in this field. This semester, on the theme of “the

Formation of Society”, we have asked former President of the University of Tokyo Professor Sasaki and others to present a series of overview lectures on the social sciences. We plan to continue these lectures in four other areas: Life, the Environment and Human Being, Information and Mathematics, and Philosophy.

I believe that it is highly important for Japanese higher education system to take the lead in achieving this kind of structuring of knowledge in advance of the rest of the world.

It is because Japan is a forerunner in terms of the global problems of the twenty-first century, where such problems as limited natural resources, energy depletion, waste heat, waste materials and other environmental problems, aging population and so on tend to surface in Japan ahead of the world.

Thus, the nurturing of individuals with the skills to understand and solve these complex issues is the task that Japanese higher education is required to achieve today. If we are successful in becoming a forerunner of solving these problems the Japanese model will become a de facto global standard.

The necessity of the structuring of knowledge can be seen among universities as well. To date, universities have attempted to create many networks, but they have not always proceeded as planned. I believe that through the structuring of knowledge, it will become possible to have an overview of the problems and the academic issues, which in turn will enable a clear definition of the roles of each partner university within the network in the presence of a strong hub university to manage the network.

In April this year, with the University of Tokyo as the hub, and in partnership with leading Japanese universities, we established the Integrated Research System for Sustainability Science (IR3S), a new attempt to establish a research network in the area of sustainability science. As Executive Director of the IR3S, I intend to realize an integrated educational program that arches over the universities of Japan.

A challenge in Asian higher education is about the creation of networks to promote the exchange of students between universities over international borders. Given the tense political situation in Asia there are likely to be many problems in the establishment of such networks. However, I believe that with the structuring of knowledge, a deep understanding of the diversity of scholarship and a clear definition of responsibilities, we can create a mutually beneficial Asian educational network. The University of Tokyo is involved in

many student exchange and scholarly exchange agreements with other Asian universities, including Peking University, Tsinghua University, Seoul National University, and Vietnam National University at Hanoi. On the basis of this experience of exchange, surely it will be possible to create, together with the top universities of Japan, an educational system that spans across borders, and which could surely contribute to the peace and development of Asia. With the University of Tokyo acting as the hub, I personally will take the lead in creating such an Asian educational network.

Thank you very much.