

CHAPTER 9

Pioneering Intellectuals and Innovation of Higher Education

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And no one pours new wine into old wineskins. Otherwise, the new wine will burst the skins; the wine will run out and the wineskins will be ruined. (Luke 5:37)

CHALLENGES FOR HIGHER EDUCATION IN THE 21ST CENTURY

The 21st century is transforming the social modes of human civilization at an unprecedented scale and speed. Digitization is changing the world. The massive transformation of working behaviour, production systems, home automation, energy utilization, social and political systems, to name a few, are under way. This mirrors phenomena derived from the advent of electricity in the late 19th century. Now, due to exponential development in semiconductor technology, big data can be easily collected and accumulated in cloud computing systems, while information processing has reached lightning speed. Even though we still have to wait several decades for the full-scale revelation of the massive influence of AI on human civilization, the so-called “narrow AI”, i.e. rule-based approach AI, is forcing humans to confront the deep learning revolution.

When AlphaGo defeated the Go world champion Lee Sedol in 2016, humans first noticed the shocking impact of AI on the future of human civilization. When narrow AI evolves into general AI, it will infiltrate all realms of human society. Man will be combined with machine in the near future. More than a decade ago, Ray Kurzweil (2005) predicted a new

breed of human beings and of an unprecedented civilization in his book, *The Singularity is Near*, and is quoted as saying “I have set the date 2045 for the ‘Singularity’ which is when we will multiply our effective intelligence a billionfold by merging with the intelligence we have created.” Yuval Noah Harari (2017) also claimed in *Homo Deus* that the difference between the present humans and the new humankind to appear around the 2050s is much greater than that between Neanderthals and present humans.

Applications of AI will be pervasive in the future society. Due to the prevalent use of AI in medical diagnosis and treatment, in addition to DNA analysis, for instance, the human life span will exceed well beyond 100 years. Human society will be more closely linked and networked. Cyberspace will be the venue for work, as well as a playground for humans. Traditional powerhouses will erode rapidly due to SNSs and the so-called cyber democracy. Powerholders will no longer be able to monopolize secured information, as we have experienced in the case of WikiLeaks. Everyone and anyone will be able to easily access information when needed. Time and space will be transcended in an unprecedented scale.

Education is not an exception, especially higher education, in this revolution of human civilization. The traditional way of teaching and learning shaped in the 20th century needs to be modified. Rapid economic growth and industrialization is greatly indebted to mass education, especially to higher education. Professional skills and specialized knowledge provided by higher education institutions have enabled college graduates to obtain better jobs, which has led to mass production and subsequently an affluent consumer society. Well-digested and highly specialized knowledge transferred from professors to students in classrooms has been applied effectively to the workplace. Transmitted knowledge and skills have allowed the maximum utilization of human capacity in the 20th century.

Starting from the 1970s, however, the introduction of computer systems and factory automation in the workplace began to change business operations as well as the production system on a profound scale. Human workers could not but yield to computerized and automated machines, so companies began to downsize human resources. In the 21st century, artificial intelligence has even rendered many human resources obsolete. The value of professional skills and knowledge owned by human workers is diminishing. Computer systems and artificial intelligence have belittled human capacity. Working hours have been shortened, and jobs need to be shared with other workers, as well as with machines. The gig economy is challenging the conventional, rigid labour system. Kai-Fu Lee predicted such a phenomenon in *AI Superpowers: China, Silicon Valley, and the New World Order* and stated that “...within 15 years, artificial intelligence will technically

be able to replace around 40 to 50% of jobs in the United States.” (Lee, 2018). Moreover, explicit knowledge in specialized fields will be rendered useless within a short period of time. Harvard researcher Samuel Arbesman empirically verified this claim in his book, *Half-Life Facts: Why Everything We Know Has an Expiration Date*. He found that half of the professional knowledge in a given field becomes obsolete within a decade. For example, the half-life period of physics is 13.07 years; economics 9.38 years; math 9.17 years; religion 8.76 years; psychology 7.15 years; and history 7.13 years (Arbesman, 2013).

The education system in South Korea (hereafter Korea) is standing at a critical crossroads. Facing a massive challenge to higher education, the Korean situation is even more serious because hard work, long study hours, rote memorization and cram schools used to be symbols of success in education. The unusual growth in the number of college enrolments has contributed to providing high quality human resources enabling the rapid economic growth of Korea. In the 1960s, only 6% of Koreans went to college. The number rose to around 12% in the early 1980s and has now reached 70%. Well-educated human resources equipped with specific knowledge and skills acquired from higher education have been and are still essential for the success of the Korean economy. From the least developed economy in the 1960s with a less than US\$100 GDP per capita, the Korean economy has achieved prosperity as an economic superpower. As the world’s 12th largest economy, with more than US\$30,000 GDP per capita — a feat which has been achieved within five decades — Korea is one of the leading exporting countries of semiconductors, smartphones, home appliances, automobiles, steel, ships, refined oil and chemical goods, among others. However, the Korean economy is starting to face the limitations of rapid economic growth. Korean society now urgently needs to reformulate its system from a speedy catch-up economy to a front-running economy. Observers have claimed that one of the main challenges to this social and economic system reform of Korea is the transformation of its traditional educational system.

Due to this great challenge to higher education, we need to prepare for an innovative education system for the 21st century. The knowledge obtained from textbooks and classrooms is no longer effective for global economic competitiveness. Moreover, it cannot be monopolized by conventional higher education institutions as knowledge can simply be found, collected and accumulated in cyberspace. Memorized knowledge is not a power or capacity for professionals. Explicit knowledge is no longer a sufficient condition and is now limited to being a necessary one for human resources. It is the right time for us to change not only the content of specialized knowledge but also the methods of how to acquire it.

INNOVATION OF HIGHER EDUCATION FOR THE FUTURE

21st century higher education is confronting a massive transformation of pedagogy. Teaching methods have evolved in various unconventional ways in tandem with media technology development. The contents of knowledge, subject fields and majors are continuously changing and expanding. As a result, alternative educational institutions have drawn the attention of pioneering intellectuals and students. In the US alone, Singularity University, Minerva Schools and the Olin College of Engineering, to name a few, have aggressively innovated their curricula to nurture future leaders. They have experimented with pedagogy and knowledge content in unconventional ways. The Olin College of Engineering focuses its education on project-based learning of real-world problems. It emphasizes collaboration, interdisciplinary perspectives and state-of-the-art technology. Minerva Schools underscore diversity, multidimensionality and practical knowledge to face global uncertainties of the future. To benchmark the world's leading cities' problem-solving methods, students are required to spend one semester in different locations such as London, Seoul, Berlin, Buenos Aires, Taipei, and Hyderabad, in addition to San Francisco, where its main campus is located. Singularity University has also structured its curriculum so students can prepare to meet the world's most urgent problems. The commonalities found in these education systems are flexibility, a pioneering spirit and experimentation.

The conventional education system is facing a great challenge to deal with future global problems effectively. The traditional 4-year bachelor's degree may no longer appeal to students and the degree itself may not be worthwhile for a student's career. Students may prefer a nano degree or a microdegree for a specific subject which can be obtained in a short period of time to a bachelor's degree. A four-year residence requirement and high tuition and living costs are already a burden for college students. Rapidly changing new ideas, cutting-edge technology or newly emerging knowledge can no longer be obtained from conventional curricula. Instead, students may opt for short-term residence, intensive courses, flexible semesters, joint degrees, combined academic programs, internships and globally networked campuses.

The content of study in higher education should neither be limited to majors or traditional liberal art courses. Courses like design thinking, creative thinking, social problem solving, multidisciplinary courses and problem-based learning will replace content-based learning. In addition, team teaching, group discussion, experimental research and internships in the real world will substitute the simple instruction of concrete knowledge by professors in the classroom. In this light, professors will have to conduct classes in quite a different way from the traditional way of instruction. Flipped classes will prevail in higher education, in which students prepare

for class by watching video clips of lectures outside the classroom in advance and later engaging in problem solving and discussion in the classroom. MOOCs, YouTube, TED and other online content are already being utilized. Attaining simple knowledge is no more important than mere thinking. Real world problems are more urgent than abstract ideas and concepts. Moreover, knowledge creation needs to be more valued than knowledge transmission in higher education institutions. In this sense, universities may compete with the business sector in creating state-of-the-art technology and knowledge. Companies in Korea, like Samsung Electronics, have more PhDs in its research labs than those at universities.

In 21st century higher education, we should not overlook the significance of the human relations capacity of students. A mature attitude and personality are important for future leaders. As more and more work is conducted through collaboration, human relations and group sensitivity have become more essential than the acquisition of specialized knowledge. In Korea, more than 30% of new employees in major companies are reported to leave their jobs within a year because they cannot endure the social conflict arising from human relations in the workplace, even though they were hired through intense competition.

Social responsibility and social value are other issues that higher education institutions should seriously consider. As the consumer reputation of corporations and of brands have an enormous impact on product sales, companies have begun to consider social responsibility in earnest. Business ethics and corporate responsibility have become non-negligible factors for the success and survival of corporations. Profit maximization can be a short-term goal for corporations, but if a company emphasizes the social value of the firm and its products, it can achieve long-term profit and growth. Consumers can easily surveil a corporate's activities scrupulously, because they can readily access relevant information in cyberspace. Additionally, collected information can be easily diffused among consumers through SNSs. If a company attains an unfavourable social reputation, it will detrimentally affect its sales. Not only business organizations, but governments, civil organizations and even universities are vulnerable to public criticism without exception. Thus, future social leaders will need to hone their social sensitivity and social responsibility.

VISION AND EXPERIENCE OF KOREA UNIVERSITY FOR EDUCATION INNOVATION

For education innovation, we need to modify our vision of student education which is based on the provision of professional knowledge. We need to expand our vision to encompass knowledge creation and social values. The

key virtues for future leaders, whom we have to teach, are not limited to expertise and advanced knowledge, but should include embracement, external focus, clear thinking, imagination and courage. In short, future leaders educated in higher education institutions need to be social innovators with a broad vision. They should develop the capacity to solve social problems effectively. They can no longer secure life-time careers by simply carrying out given tasks. Rather, they have to identify problems incessantly and to discover unique ways to solve those problems.

Korea University's motto of education is liberty, justice and truth. Korea University has emphasized not only academic knowledge based on the value of truth, but also individual freedom based on the value of liberty and social engagement based on the value of justice. To apply such a vision to future education, it is necessary to broaden our vision from academic ability to other social values. Students need to acquire a pioneering spirit as liberal individuals in order to be future leaders. There is no right answer to many social problems so students should find solutions on their own. Challenging uncertainties, risk taking and seeking out unpaved roads are their missions for the future. In addition, they should develop social responsibility. In the future society, everything is interrelated. Man cannot live alone. In workplaces, modes of conduct are operated not individually but in a team. Individual excellence and survival of excessive competition will not guarantee success in the future.

With this vision in mind, Korea University has innovated its educational system in various ways. The following are some examples of initiatives it has recently implemented. From recruiting talented students to maintaining a knowledge creation eco-system, the challenges are pervasive. However, without such trials to advance education, the future of higher education in Korea and beyond will remain in dire trouble.

First, the admission system has been reformed. In Korea, high school graduates can enter college through several ways. The main way is based on the College Scholastic Ability Test (CSAT). Another is through special admissions such as an essay test administered by individual universities coupled with CSAT scores. The recent change in the admission process at Korea University focuses not on scores but on the attitude, problem-solving skills and discussion capacity of applicants. Not based on CSAT scores, but based on high school performance, applicants are selected in advance as candidates. Six admission officers evaluate six different areas of the applicant's records which varies from academic performance, to leadership, personality, extracurricular activities, social engagement and community service. They select three times more candidates than the admission quota. Professors and admission officers then intensively interview the selected applicants. They observe a one-hour group discussion among applicants and evaluate the quality of the applicant's discussion and problem-solving skills. In addition,

four examiners ask questions based on a problem set given to the applicants and discuss issues for at least 15 minutes with each individual applicant.

Korea University has also recently changed the name of its Admissions Office to the Center for Talented-Student Discovery. It has exerted intensive efforts to select high quality students from all over the country. Evaluation based on academic scores was the conventional means for admissions. However, the evaluation system of in-depth interviews and discussion allowed applicants to enter based on other competencies and their potential to become successful leaders. This innovation was confronted with furious opposition from cram schools mostly located in Seoul, at which students take private lessons to obtain better CSAT scores. This innovation in admissions enabled public high schools to become more competitive. Almost 1,000 high schools can now apply for 3,000 spots, which consists of 85% of freshman enrolment at Korea University. This change has influenced high school pedagogy from rote memorization to discussion on various social issues in the classroom. High school teachers have begun to understand that creative thinking and ideation are more important than rote learning.

Second, Korea University has restructured its academic semester in a more flexible way. Traditionally, the academic year of Korean universities is comprised of two semesters starting from March and ending in February. A typical semester lasts for 16 weeks including mid-term and final exams. The Korean Ministry of Education defines one course as 48 class hours per semester. Most Korean universities run their semesters for 16 weeks, 3 hours per week and students usually take 6 courses in a semester. Korea University has allowed professors to organize their teaching flexibly within a limit of 48 class hours. For example, professors can organize their semester in 8 weeks at 6 hours per week, or in 10 weeks at 5 hours per week. This allows them to incorporate more discussion and problem-solving sessions. In this arrangement, it is also possible for world-renowned foreign professors to come and teach an intensive course.

Due to the flexible semester, professors can allocate time more effectively on research. They can also utilize the extra time to engage in globally networked research. For example, they can spend more than six months for research abroad every year. However, this comes with a requirement to reorganize the course curriculum. While teaching hours in the classroom can be reduced, time for discussion and problem solving such as through team projects needs to be increased. Professors also need to guide students in what they should prepare for the class by themselves in advance such as accessing video clips and required readings. The university provides support such as teaching fellows who lead tutorials and assist faculty.

In order to facilitate such courses, the university has set up an infrastructure called the NEMO (network module) lecture system using 5G broadband

on campus. Lectures can be accessed by students on smartphones anywhere on campus so they do not need to attend the class in person. They can even download lectures on their PCs anytime within a week. Students, instead, must participate in discussion sessions and problem-solving sessions in groups led by teaching fellows or the professor. For instance, a NEMO course will consist of two 75-minute lectures and one three-hour discussion and problem-solving session a week for eight weeks in total for one semester.

Third, global leadership programs have been enhanced. Merit-based scholarships have been abolished and in their place, Korea University is now granting scholarships to global leaders. For instance, full scholarships are granted for students for an eight-week summer Chinese language program through which 100 students are provided with full tuition, living expenses and round-trip airfare to China. A similar program for Spanish is conducted in Mexico and for Japanese in Kyoto, Japan. Additionally, in 2015, Korea University established the Nordic-Benelux East Asian University Consortium. Professors and students can apply for a university-funded joint research project or for an academic experience project at participating universities.

In addition to more than 1,000 students going abroad as exchange students every year, Korea University has joined the Venice International University (VIU) global universities network. The VIU consortium is comprised of 18 member universities, each of which can send up to 20 students per semester to stay at VIU as exchange students. Curricula are determined one year ahead by an academic council organized by delegates from member universities. Each member university can also dispatch one visiting professor per semester. Most courses are related to global and current issues through which students can raise awareness in addition to academic study.

Fourth, Korea University has focused on research more rigorously. Most private universities in Korea heavily rely on tuition fees for their budget. Even though Korea University is a private university, the budget of Korea University from research funds far exceeds that of tuition. As aforementioned, knowledge creation has become more important than knowledge transfer at higher education institutions in the 21st century. Now, Korea University is not competing with other rival universities, but is competing with Samsung, SK, Hyundai and LG, the top four business conglomerates in Korea, in order to produce creative knowledge and new technology. In addition, Korea University no longer relies on government R&D funds and is raising research funds from private enterprises for developing state-of-the-art technology. Korea University has made contracts through KU (Korea University) Crimson Enterprises to develop joint research prospects collaboratively. It selected 100 top enterprises which are leading the development of world-leading technology. University professors and company researchers form a joint R&D project, in which they closely communicate and consult to develop new technologies.

Korea University has also established joint programs with the business sector. One example is a master's program with SK Hynix. Students receive full scholarships and participating professors receive R&D funds from the company. Upon completion of the program, all graduates are recruited by the company. Another example is the Department of Cyber Security undergraduate program. Thirty students enter the department as freshmen every year and receive full scholarships from the Ministry of Defense and stipends from the university. These outstanding students won the championship at the DEF CON hacker convention in 2015 and 2018. Just like the military academy, when they graduate, they become public officers in cyber security agencies.

Fifth, Korea University has attempted to transform its campus into a knowledge amusement park. University campuses need to reformulate their spaces from knowledge transmitting classrooms to knowledge creation workshops. Just like the leading IT companies, spaces should become more flexible, comfortable and imaginative. At Korea University in 2015, the Pioneer Village (π -Ville) was constructed not as a building with classrooms but as an idea incubating workspace with a motto adopted from Albert Einstein, "Imagination is more important than knowledge." The four-storey building was constructed with used shipping containers. There, students organize diverse teams and rent space to develop ideas, suggest creative proposals for social problems and incubate venture businesses. Within two years of operation, more than 60 teams have successfully completed their missions, while several teams have actually started businesses. In addition, to meet students' demand for a space where products could be tested, the university recently opened several workstations. These Makers' Spaces are equipped with 3-D printers, worktables, cutting boards and resident technicians who help out with students' work.

Another innovative building on campus will be the SK Future Hall, which is a seven-storey building comprised of 28,000 square meters to open in fall, 2019. The main function of SK Future Hall is not teaching but knowledge creation. Thus, there are no classrooms in the building. It consists of only discussion rooms, carrels, living labs and a convention hall. Every floor has a small compartment for food and drinks just like a business lounge at the airport. This building embraces the future of education that Korea University envisions.

CONCLUSION

In the 21st century, universities will have to innovate higher education on a more fundamental level. The conventional way of education is no longer valid for the 21st century knowledge society facing the fourth industrial revolution. Everything including vision, function, pedagogy, classrooms, campus spaces and infrastructure, and academic system need to be reformulated.

What is best for students and society in the future should be the major driving force in innovating the system.

To prepare for the future society, students should be educated as pioneering intellectuals rather than as specialists of a certain field. Not only professional knowledge but the ability to incubate creative and innovative ideas along with social responsibility and a mature character are indispensable elements of a future leader's quality. Social innovation and problem solving will what they will have to nurture.

In order to educate future leaders properly, colleges and universities need to transform their academic system in more innovative ways. They should eradicate conventional academic bureaucracy. Path-dependent archaic inertia should be abolished in this paradigmatic change of human civilization. New pedagogies, new education systems, flexible adaptation, new visions and values for education, and innovative academic governance should be introduced for the future. Without such endeavours, higher education institutions will have to face more severe criticism from society. They may even be abandoned by students and alternative organizations or systems may emerge to solve such problems in their place. As new wine requires fresh wineskins, universities need to shed old ways and begin anew.

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