

The Direction on Liberal Arts Education of University in the 4th Industrial Revolution Era

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Abstract

In spite of the rapid change of the technology, the university education cannot escape from the traditional form of classroom teaching. University education is assessed through listening the same content of lecture, completing the same assignment and test at the same time, same place. To prepare for the 4th industrial revolution, it is investigated to reorganize the curriculum(32.5%), strengthen the lifelong education(21.4%), expand the compulsory education(17.6%), expand the innovation school(13.7%), expand the educational finance(10.4%) as the field of education which need to be strengthen. The change of the education is essential to prepare for the 4th industrial revolution which creativity, collaboration, fusion, problem solving are the core ability.

In this thesis, it is to be compared that the subjects opened in liberal arts of domestic and overseas university in this 4th industrial revolution and Basic Liberal Art Education Curriculum is promoted for the smooth management for preparing the future and taking the action to the change.

Stereotyped and inflexible frame should be changed to 'Structure', 'Recognition', 'Attitude' for making the base of 'Diversity', 'Personalization', 'Flexibility' which are needed to uplift 'Imagination', 'Creativity' for education of the future and the new era.

▶ Keyword: 4th industrial revolution, Liberal Art Education Curriculum, creativity-interdisciplinary type human resources

I . Introduction

Daniela Rus, the head of Seoul forum 2017 MIT computer science and CSAIL emphasized on coding education for 4th industrial revolution [1]. Coding which make program with computer language is the foundation of all fields related to 4th industrial revolution such as internet of things, big data analyze and artificial intelligence.

Thomas Frey, the best futurologist of the world, said that the demand of the fundamental change in university increases because of 'the reduction in the number of students, growing university tuition and education, which do not connect to recruitment'[2]. After 15 years, about

half of the university will close up and the biggest reason is the competitiveness.

In the wave of 4th industrial revolution, approaching rapidly, current education system is hugely renovated to coexist human and technology. Segmentalized education considered each diversity and aptitude should be introduced instead of standardized education focused on the mass production method in past industrialization.

Korea has the best ICT infrastructure and the high passion on education. How to prepare for the 4th industrial revolution era and what education do we take?

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• Received: 2017. 09. 27, Revised: 2017. 10. 10, Accepted: 2017. 10. 18.

• This paper was supported by Research Funds of Kwangju Women's University in 2017(KWUI-063)

One of the core factor is to develop the creative fusion ability and software(SW) education are the center of it.

Recently the hot issue heating the education circles is 'Software Education and Computational Thinking.' Coding is legally adopted to middle school course and it will be included to the practical course in high grade of elementary school gradually from 2019(Seoul Economy, 24 Aug,2017).' Developed countries like United Kingdom, the United States, France, etc already regulate the SW education as the fundamental education[3]. The United Kingdom designated the year of 2014 as 'The Year of Code' and obligate the S/W education for 5~16 years old. The United States also has developed and operated the curriculum related to the 'Computer Science' in their K-12 course.

'Liberal Arts Education' have derived from the word from Latin 'Artes Liberal Artes'. Those words are also used in Korea: 'Liberal Arts Education', 'Freedom Education', 'Humanities Curriculum', 'Liberal Arts Basic Education', 'Fusion Liberal Arts Education' and etc[5]. Why Liberal Arts education? Many think Liberal Arts education light or just to study miscellaneous knowledge. Furthermore, there is the view that major course is important and Liberal Arts course is for their remaining credit.

'Liberal Arts Education' means to form 'Beautiful Human', "Self-making of psychological ego which is created by oneself(J. G. Fichte); " Self-making for human's beauty itself, training attitude of self-reflection based on the self-making and formation of relationship towards the other and the world"(K. W. Humboldt). Also Liberal Arts Education purposes "realization of kind and exemplary personality which based on the knowledge and character, regardless of the certain occupation"(K. W. Humboldt). Therefore, the point of the Liberal Arts education is "to develop the inner ability of human nature to knowledge"(J.H.Pestalozzi) "" and cultivation the ability to understand the reality and handle it on their own"(F. Paulsen)[6].

The Liberal Arts Education before the liberation of Korea was the process of introducing the 'Liberal Arts education' and after liberation the year of 1945 by introducing the ideology and system of American way, American model can be adopted in process. On the other hand it can be from now on 2017 through experiment of 50 years in the late 20th Century for founding the Liberal Arts Education to meet the circumstances of Korea[5].

[Table 1] According to the report 'Analysis on technical competitiveness level of countries of information and communications' Korea has overtaken to China in

major areas. China has plan to expand 3.9444 trillion to more than 172 trillion at government level[7]. This is the result that IITF surveyed 5287 experts who belong to the industrial site and academia-research institute on online.

Tyler Cowen, the professor of department of economy in George Mason University emphasis on the 'cognitive ability which work in harmony with machine, representing the AI is necessary in this 4th industrial era'. Also he advised 'to study Science·Technology·Engineering· Mathematics or to take the major course.' helps to be corresponded with the right people changing by time to time.

In Seoul Form 2017, it says 'The person of talent who will lead the 4th industrial industry cannot be focused on only science·technology·engineering but also prepare for Liberal Arts knowledge like the laws of nature, philosophy and art'. Education course should be reformed 'by combination of high-tech scientific technology and basic study to respond to it'[8].

Table 1. ICT competitiveness gap by major sectors as of 2016

Field	USA	Korea	Europe	Japan	China
Base SW computing	0	1.9	1.1	1.2	1.8
Radio · satellite	0	2.1	0.7	1.0	2.0
Mobile communication	0	0.6	0.6	0.8	1.1
Overall average	0	1.5	0.8	0.9	1.7

Lagging behind the United States(Unit : Years)
Data :Information Technology Promotion Center
Sources : Donga Ilbo, 2017.8.14

The biggest bank in Swiss(UBS) ranked the countries that can adapt well to the 4th industrial revolution at the report 'The effect of the 4th industrial revolution' before the opening of the annual general meeting of the world economy forum(Davos Forum). Korea has ranked at 25th and USB calculated by getting a weighted average of five factors: labor market flexibility, level of technology, social overhead capital(SOC) and legal protection. Korea ranked 83rd of 139 countries in the labor market flexibility, the report takes the 'labor market flexibility' as the factor and it should be flex enough to adapt to labor market which be of help to the economy in the 4th industrial revolution at large[9].

In the instruction of this paper, it describes the importance and necessity of university education, the meaning of the Liberal Arts Education of university, standard model and history of Liberal Arts Basic Education in the 4th industrial revolution era.

In the body, it will be analyzed that which field of talented person and ability would be needed and what does the university educates for these. The targets are top 10 universities according to the university assessment from JoongAng Ilbo in 2016 and 6 woman's universities in Korea.

First, analyze the educational objectives about the Liberal Arts course of each university in Korea, required credit of Liberal Arts course for the purpose and exclusive institution.

Second, analyze the information and communications technology(ICT) in the Liberal Arts course system by area·university and current state of the required Liberal Arts course opening related to the 4th industrial revolution and online lecture course.

Table 2. Adaptation of the Fourth Industrial Revolution to the Fields of Innovation

Overall ranking	Nation	Skill level	Educational system	Labor market flexibility
1	Switzerland	4	1	1
2	Singapore	1	9	2
3	Netherlands	3	8	17
5	USA	6	4	4
25	Korea	23	19	83

Sources : Yonhap News Agency, 2016.1.21

In conclusion, it suggests education paradigm and direction of the Liberal Arts Education in university in the 4th industrial revolution era.

II. LIBERAL ARTS EDUCATION OF UNIVERSITY

1. Requirement Comparison of Liberal Arts Education in Domestic and Overseas University

University Harvard, Yale and etc focus on their interest field after studying broadly in basic studies like history, psychology, science at the undergraduate course. Harvard university announced that they will renew the Liberal Arts course for undergraduate students in 30 years in 2007. Students have to take one of lectures in 8 fields: art and interpretative understanding, world of physics and science, various society of the world, America in the world and etc. University explained "Not only subject of

the study is important but, to deal with the problem of the era is the pivotal point from now on, especially biased view towards America"[10].

Most of the Liberal Arts courses are set in University of Seoul and Postech.

- Students intensely take Liberal Arts course on 2nd, 3rd grade in Korea

- Class for filling up the credit of graduation

- Equal development of human resource due to the Liberal Arts education requirements

- Take it on every semester for 8 semesters at MIT

- Humanity is important as chemistry and biology

- 264 Liberal Arts courses of humanities-Arts-Society

The reason why MIT opened the various Liberal Arts course is because of the importance of the humanities refinement to study science and to lead the fusion era. Barry Johnston, professor of chemical Engineering department of MIT explained "To study chemical, those basic studies should be known: chemical, biology, physics and math but above all humanity is the most important"[11].

Students in MIT take Liberal Arts course among △ Humanity △Arts △Social science. Incredibly, offered Liberal Arts courses are diverse and profound even we cannot believe that students in college of Engineering take those courses. Art includes music, composition, documentary, act, photograph, architecture, game and etc.

Unique Liberal Arts courses in MIT: 『Humanities』 - Design and development of learning games, cities in movies, justice, the way to India -Modern indian culture and society, writing for bilingual students, decision, game and rational choice and etc. 『Arts』 - photograph of France, the Problems regarding discrimination against blacks problem; research introduction of blacks, script analysis, drawing for designer, science in the movie, etc 『Social Science』 -City to city, Economy of incentive, strategy and information, gender, health, and society, race·ethnicity·American policy etc

Followings are the course related to Information and Communication Technologies in University of California, University of Philadelphia, University of Waseda, University of Tokyo:

- University of California, Irvine(UCI)[12]

- Concepts in Programming Languages I(4)

- Compilers and Interpreters(4)

Table 3. College of Engineering Comparison of requirements for completion of Liberal Arts

UNIV.	Condition of Liberal arts	Liberal arts Courses
S.N.U	19 ~ 21 Grades (common : 7~9Grades)	<ul style="list-style-type: none"> - Language and Literature: 40subject·40Kinds - Culture and art: 41subject·41Kinds - History and Philosophy: 71subject·70Kinds - Politics and Economy: 7subject·27Kinds - Human and Social: 29subject·29Kinds
POSTECH	36Grades (common : 16Grades)	<ul style="list-style-type: none"> - Practical cultivation : 40subject·28Kinds - Humanities and Social Sciences: 127subject·69Kinds
MIT	<ul style="list-style-type: none"> - Arts, Art & Society Science field 8semester, A t h l e t i c 2semester - Courses are free choice 	<ul style="list-style-type: none"> - Humanities : 125subject·113Kinds - Art : 78subject·69Kinds - Social Science : 61subject·51Kinds

Source: Dong-A Ilbo, 2017.4.3

- Language Processor Construction(4)
- High-performance Computers and Program Optimization(4)
 - University of Pennsylvania
 - Department of Fashion ; computer integrated management
 - Liberal Arts Courses in University of Waseda
 - Department of International Liberal Arts Studies ; Computerized Society
 - Department of Commerce; Computational Approaches to Complex Systems and Networks
 - University of Tokyo, Japan (<http://www.u-tokyo.ac.jp/> ko/)
 - Programming
 - Intelligence and Mechano-Informatics
 - Creativity Engineering Project I, II, III
 - Robot System Project
 - Introduction to Computer Science1, 2
 - Robotics

In the innovation class of University of California realizes the innovative product as a team project. the fusion project like a collaborative project that 4 Universities: Stanford, Brown, UC berkley, UCSD and etc and 2 companies: qualcomm, Imac from Belgium participated easily connects to the business foundation. Recently Hackathon culture which creates sparkling idea in the short period of education like project spreads all over the United States.

2. Liberal Arts Education of University in Domestic and Overseas

2.1 The Purpose of Liberal Arts Education of University in Domestic and Overseas and the required course

According to the identity and the purpose of Liberal Arts Basic Education of university in Korea Liberal Arts Basic Education Institution, they offer the standard model, saying “Liberal Arts Basic Education includes building the basic knowledge which is required for university education in general and the ability of self-studying. And it contributes for building the healthy values and an outlook on the world and it is the education required for students beyond the various professionalism”[6].

These days, Liberal Arts Basic Education is getting emphasized due to the 4th industrial revolution and globalization.[Table4] did comparative analyze about the purpose of Liberal Arts education, required credit of Liberal Arts education, exclusive institution of Liberal Arts education. The targets are top 10 universities according to the university and 6 woman's universities in Korea. The purpose of Liberal Arts Education is different by each university and required Liberal Arts education courses and credits are also different depend on the importance of the area.

University of Seoul offers the 208 courses(207 sorts) △Languages and literature △Human and Society. Many of these forms of the subjects are ‘The understanding of ◇ ◇’ ‘The understanding of culture in ○○’ ‘Introduction of △△ theory’. There are

lectures titled ‘Parents Education’ ‘Marriage and Family’ in Liberal Arts courses at both University of Seoul and Hangyang.

Daegu Gyeongbuk Institute of Science and Technology(DGIST) emphasized “Science is the study for human convenience at the end” “Take various Liberal Arts course makes the fusion thinking for the 4th industrial revolution”

The educating purpose of Kyunghee university is growing students to be a competent leader who would make up the society of culture and welfare. The Humanitas college dean said, “Liberal Arts Education is not accepting the preexisting truth, but it is education of consistently questioning and criticizing the state of being stuck in a stereotype.”, and he also added that, “This studying helps people grow the ability to see everything positive without having any doubt.” Humanitas College

Table 4. Educational Objectives and Delegation by Universities

* Women's: W. Grades : G.

University	Cultural Education Objectives	Area (Personal, social, community)	Liberal Arts Required (credit) <College of Humanities>	Liberal Arts Education Authority
Kyunghee	Develop excellent individuals, responsible citizens, and mature community members	Excellence, responsibility, maturity	• Core curriculum: 9Grades • Distributive : subject 12G. • Basic curriculum : 9G.	Fumanitas College
Korea	Cultivate talented people who pioneer the future by themselves and make their dreams come true	Freedom, justice, truth	• Common culture : 4G. • Core cultivation : Department Designation of 3 areas • Year 1 Seminar	Basic Education Center
Seoul	Cultivate talented people with open minds with the right thinking and practical wisdom	Thinking, Wisdom, Service, Creation, Ear, Coexistence	• Foundation of discipline : 14G. • The world of study : 15G.	Basic Education Center
Sungkyunkwan	An educated person with sensitivity and intelligence	Personality, intellectual, public person	• Sungkyun tenacity :4Grades • Focus culture : 16G. • Balanced cultivation : 9G.	undergraduate college
Yonsei	We share the values of Christianity, Creativity, and Connectivity,	Self, intelligence, convergence	• Cultural essentials : 24G.	undergraduate college
InHa	Cultivating creativity and human-like character that actively cope with future social changes	Cultivation of humanity, improvement of basic ability, merging and combining, thinking and practice	• Cultural essentials : 15G. • Core cultivation : 9G.	Frontier College
Chungang	Autonomous educators, practical professionals, experimental creators, practitioners	Self, development, autonomy	• Common culture : 14G. • Core cultivation : 15G.	DaVinci College of Liberal Arts
Korean Foreign Lan.	Fostering future-oriented global fusion talents with creative ability, caring and communication skills	Human literacy, creativity, global	• Basic cultivation : 14G. • Core cultivation : 12G.	Minerva Liberal University
Hanyang	Educated, professional, practical, global, service-oriented	Creativity · Sharing	• Core cultivation : 25G.	Creative Convergence Education Center
Ewha W.	Strengthening customized education of consumers, strengthening multifunctional education and self-directed culture education	Love, harmony, balance	• Cultural essentials : 29G.	Hawkmae College of Liberal Arts
Kwangju W.	To cultivate human resources capable of growing through sound humanity and intelligence cultivation	Creativity, elegance, personality	• Basic cultivation : 13G. • Deepening cultivation : 9G.	Cultural Center
Duksung W.	Fostering creative intellectuals with virtue	Personality, virtue, practitioner	• HUMART : 4G. • Academic foundation :10G. • Academic convergence:18G.	Basic Liberal Arts College
Dongdeok W.	Raise students' personality and improve their ability to participate and adapt to society and the world	Intelligence, virtue, educated person	• Cultural essentials : 8G. • Core cultivation : 22G.	Faculty of Liberal Education
Sungshin W.	Cultivating a creative holy culture that contributes to the nation and society	Educators, professionals, practitioners	• Common culture : 11G. • Core cultivation : 12Grades	College of Liberal Education
Sookmyung W.	Develop leaders with intellect, personality and global competence	Personality, intelligence, service spirit	• Cultural essentials : 12G. • Cultural core : 15G.	Basic Liberal Arts College

Source: 2016 Joongang Ilbo University revised and supplemented, 2017.3.6. Homepage of each university, Korea Basic Education Institute(http://konige.kr/sub05_01.php)

has four kinds of basic structure of education process. The four kinds are as in the following. △Core subjects for the purpose of understanding humans and the world', △The 'basic curriculum', which provides writing and civic education, △"Distribution is aiming to be subject to an interdisciplinary education', and △Free Education Based on the Education of Arts and Physical.

"We can make students' intellect and potential grow up by educating Liberal Arts. And, the Liberal Arts courses are going to be nutrients to the human knowledge and last

forever being essence of human nature." This was the word of Sungkyunkwan university. The Liberal Arts center of the university is putting △Creativity △expertise △Internationalization as the ultimate goal of the education[14].

The compulsory courses of Yonsei university are made to grow students' ability to meet the expectation of the society like globalized and intellectual talents. Also it is composed of understandings of human, society, nature, culture, and the world[15]. The university is now starting

to develop creative education process which would be the first in Korea, based on the Computer Thinking, having collaborated with the Microsoft research office. And from this process, they are raising up the future talents[16].

Yonsei freshmen who study natural science are studying the CT course as basic major core study, and the freshmen who are not are studying as core Liberal Arts study.

As for Kwangju Women's University, they have a education purpose of raising women talents with creative and expertise knowledge. In the case of 2017 year freshmen, their core liberal art courses are Understanding, discovery, communication, sympathy (which are 4credits), Communication, thinking education, information technology(which are total 9credits). Also, for their intensified Liberal Arts course, there are 9 credits, all of these courses being 22 credits in total. Beyond these subjects, the students must finish 10 credit courses of selective Liberal Arts courses to graduate.

2.2. The advent of 4th Industrial Revolution and the change of core liberal art courses

With 'AlphaGo shock' being added to the software education since 2015, the interest of universities in software education is also getting hot. As the interest and demand is being reflected, several universities are newly running liberal art courses to do with 'Computational Thinking' and are teaching or preparing to teach the subject, even to the students who do not study natural sciences[17].

As for the Han Yang University, compared to the 2013-2015, the core part of change in the liberal arts' courses in 2016-2019 is the establishment of the 'Software', and the change of naming in the courses like 'Future Industry and Business. Those characteristics reflect the fact that 4th industrial revolution is on its way, and how should we deal with thee rato open the job market more easily for the students. Also in the e-learning class, where we can find the main tendency of the current era, the university opened the courses like 'System Hacking Practice '(Hacking Security Department), 'Information Retrieval and Big Data '(Information and communication Engineering) to take for students.

In the educational graduation requirements, the universities can add the 'Software' course in the core liberal arts subjects.

As for the InHa University, the university made the mandatory basic liberal arts by raising the credit of the

subjects from 10 credits to 15.

『Year 1 Seminar』, one of the Korea university's liberal arts, is the common core course for students' adaption to the university and growth of their potential. From this, the university is hoping students to get the ability to learn the liberal arts on their own by adapting, and grow up as talents with responsibility and rationality (Korea University homepage).

In 2016, Sungkyunkwan university newly made 'Computing thinking and coding SW'(1st semester), 'Problem solving and algorithms'(2nd semester) for freshmen, and are looking forward to grow the talents with blended knowledges and ability to use software[17]. In 2017, the special thing of Sungkyun Personality· Liberal Area's minimum needed completion of courses is that the students must finish the course of Creativity and Reason(2credits), Software Basics(4credits), which are in the Focus culture 'Creativity and Software' field and which are needed studies in Intelligent ultra-connection era.

Joongang University started to manage 'Computational thinking and problem solving' as freshmen mandatory course in 2017, and Ewha Women's University started new liberal arts course which is called 'Computational thinking and programming'.

Sogang university is newly running the 'Computing Thinking' course and the course mainly help students solve problems using basic Programming language and computer thinking.

The following shows that the domestic six women universities are changing by suggesting the core liberal art courses which are needed to grow talents in the era of 4th Industrial Revolution.

- Ewha Women's Univ. ; Science and technology
- Kwangju Women's Univ ; Information Technology and the Fourth Industrial Revolution(3)
- Dongdeok Women's Univ. ; Using 3D Program (1 semester), From data to knowledge, Data and information world, Digital Contents and UX Design (1 semester)
- Dongdeok Women's Univ. ; Utilizing computer(2), Web page creation and utilization(2), Multimedia production and utilization(2)
- Sookmyung Women's Univ.; Securing Connected Society and Privacy(3), Understanding Computer Science(3), Introduction to Statistics(3), Modern Society and Science Technology1,2(3), Science·Human and Future(3) Take one or more courses
- Sungshin Women's Univ. ; Internet of Things and the

future of society(3), Understanding and Utilization of Big Data(3), Understanding of brain science(3), Introduction to programming for non-science students(3), Genetic Science and the Future(3) Take one or more

Like these examples, the universities are strengthening the liberal arts education with mixed or business initiating education. As the 4th Industrial Revolution, represented by AI, Big data, IoT is getting closer, the universities' concerns are getting bigger as well. The purpose of the universities is to help growing up the talents who 'meets the expectations of the on going era'. Now, the universities are in danger in and out. First of all, the population of new generation is decreasing, and it causes less freshmen. However, we can call the crisis as new opportunity, and the universitie shave to prepare for the tomorrow and they are planning for the innovation and change. The keyword of the change is 'people'[18].

In the past, we needed the 'T type' talents who are working only in one field. But now we need the 'π type' talents who have wide foundation of studies. 'π type' talents are talents with '4C's which are 'Creativity, Challenge, Collaboration, Care'[12].

2.3 Current state of the university liberal art courses' on-line lectures.

Is there any need of off-line lectures which have same contents? The advancement of internet and digital technology Table 5. Status of online course management by university made the customized service to each individual.

MOOC, which appeared as global educating environment, has been put into attention since 2012, served 4500 programs (in 2015), and the applicants are counted close to 35million[2][19]. In Korea, K-MOOC of the domestic lifelong education organization, and the SNUON of the Seoul National University are well known examples of MOOC.

The specific contents of Online Course or Blended Learning of several universities, which can be different in the usage of Offline, online course, or blended learning, are as in the following in [Table 5]. Korea university is running one online course(MOOC) and four blended learning courses. Sungkyunkwan university is managing courses like 'Basic Liberal Arts 4, Basic Humanities and Social Science 7, Balanced Liberal Arts 24, Other Liberal Arts 7' as method other than off-line lectures.

Online courses of each universities related to the Information and communication technology are as in the

Table 5. Status of online course management by university

University	All courses	Non-offline courses		
		Online course	Blended Running	Sum
Kyunghee	535	8(3)	0	8
Korea	1172	1	4	5
Sogang	258	0	0	0
Seoul	523	2(1)	2	4
Univ. of Seoul	230	0	0	0
Sungkyunkwan	2056	36(3)	6	42
Yonsei	387	0	6(1)	6
Ewha Women's	366	18(3)	0	18
Chungang	212	5	0	5
Hanyang	294	35(4)	14	49
Kwangju Women's	196	20(4)	0	20

*() Indicates the number of online courses related to ICT

following.

- Kyunghee UNIV. ; Current and future community through network technologies(3Credit/3hr), Evolution of wealth △game and network(3/3), meeting of science and art culture(3/3)
- Seoul UNIV. ; Computer Concept and Practice (3/2/2) △Polyp Learning
- Sungkyunkwan UNIV. ; Information Communication Ethics(1/2), Computer Documentation (1/2), Computer Data Processing(1/2)
- Yonsei UNIV. ; Computational thinking and problem solving (3/3) △Polyp Learning.
- Ewha Women's UNIV. ; Big Data World, Principles and Applications(3/3) △K-MOOC Lessons, Offline Synchronization, Animation (3/3) △K-MOOC Course
- Hanyang UNIV. ; Planning, production and editing of UCC, understanding of green IT, understanding of copyright and smartphone, basic computer programming (b-learning)
- Kwangju Women's UNIV. ; Technology Revolution and ICT, Data and Information Society, Software and Coding Practice, Spreadsheet Utilization

All of these MOOC, which are the class beyond off-line, can be finished by only participating on-line while the classes are opened. In addition, they are composed mainly of the off-line lectures even if it has education method utilizing MOOC Platform and On-line[5].

3. Cognitive research related to the 4th Industrial Revolution (KOFST & KWU)

This thesis had analyzed and contrasted the survey result of Korea Federation of Science and Technology Societies(KOFST)and Kwangju Women's University (next

K Women's UNIV; KWU) about 'Cognitive research related to the 4th Industrial Revolution'. There sult of there search of KOFST, where 2345 people of Korea Science and Engineering Academy, Korea Engineering Academy, Science and Technology Association, Korea Industrial Technology Association University professor in science and technology, showed the high interest in the 4th Industrial Revolution and the people of the organization had put R&D and education innovation the utmost important assignment of today. Also they had great expectation in new government's policy plan and thought of IoT, ICT, and AI as the main assignment and as representative keyword of the revolution.

As for KOFST, much of the people who are now-working in the area of science technology participated, and it turned out that the interest toward the revolution was highest in the age of more than 50s. This age group had lived with the history of science technology innovation in the past, and they may feel more empathy toward the new government's policy innovation than the younger generations. The answer as interest degree of the various age groups were as follows, younger than 30s(59%), 30s(21%), 40s(28%), 50s(34%), older than 60s(17%). And the age relative distribution of Korean researchers is as follows, 30s(59%), 40s(28%), 50s(11%), older than 60s(2%). And the following is the result of the survey of 217 KWU students about the 4th Industrial Revolution.

These followings are the analysis result of the common three questions from the survey from KOFST and KWU.

1) How much is the interest facing the 4th Industrial Revolution?

KOFST has showed 96% of interest, and KWU showed 59%. [Fig1]

2) What is the field Korea must put 1st into account in 4th Industrial Revolution strategy?(plural answers)

KOFST's answer was Digital innovation in manufacturing (27%) and AI(26%), while Women's UNIV.'s

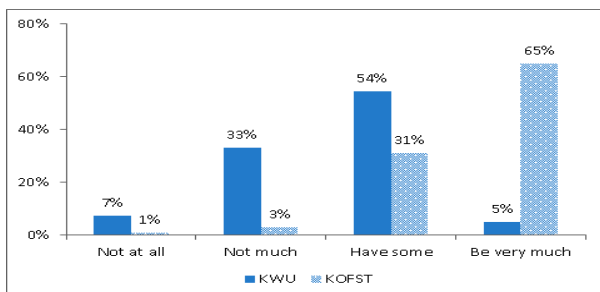


Fig. 1. Interest in the Fourth Industrial Revolution

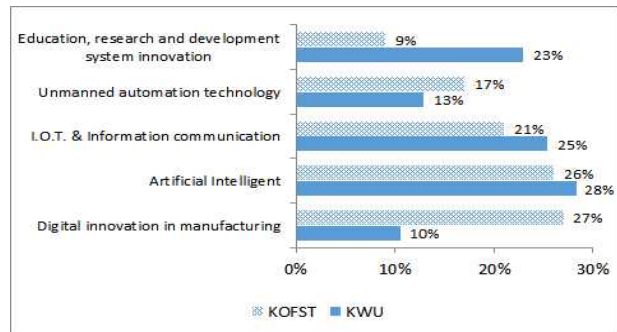


Fig. 2. Priority Areas in the Fourth Industrial Revolution Strategy was AI(28%), IoT(25%) and Education / R & D System (23%) [Fig 2].

3) What is the most needed education in the 4th Industrial Revolution(plural answers)? KOFST saw the creativity(averaging29%) the most significant in all various fields, and accentuated the importance of Convergence education(average19%) and basic science 18%). KWU students showed similar answers to KOFST in that they thought creativity(35%), Convergence Education (33%), Coding Education(17%) are crucial.

III. CONCLUSION

The talented people that 4th Industrial Revolution need are the people who understand and use the intelligent machine, and who can industrialize the products or services made by the machine. To foster the talented man for the 4th industrial Revolution, the universities in the world are making Liberal Arts Education Authority and converting the educational process to strengthen basic studies like Physics, Philosophy, Art, etc besides Science·Engineering·Technology.

The 70% of the consolidated subjects of the MIT engineering college's 3rd and 4th year students is Experiment Integration Course. The students group into teams and carry out the projects the industry entities suggest. In this process, the students learn Experiment and data analysis, presentation and report writing ability, cooperation.

In the domestic engineering colleges, the 3rd and 4th year college students must listen to a high ratio of the major subject courses. Integrated Subjects were rated as 4% in H UNIV., 7% in S UNIV., and the P UNIV. have 29% ratio each for the Integrated Subjects and

experimenting subjects. There has to be a project classes which suits the students' aptitudes or interests, and we also need Expansion of experiment-centered education and autonomy.

For coping with the 4th Industrial Revolution, it is surveyed that we should strengthen the education fields like Curriculum reform(32.5%), Strengthen life long education(21.4%) expansion of compulsory education (17.6%), expansion of innovative schools(13.7%), expansion of educational finances(10.4%)[21].

In the survey done by the KOFST and the KWU Students, the people put a great point in educating Creativity and Convergence Education, Coding Education, Basic Science suitable for 4th industrial revolution era.

In the Seoul Forum 2017 and 2017 Asian University President Conference, it is stated that the universities need close cooperation with the various industries and the education of itself has to be changed in order to foster Education and institution, Creative Information Technology Talent suitable for The Age of the Fourth Industrial Revolution.

The core liberal arts' importance is being accentuated in that the education must be changed thoroughly growing students' creativity, teamwork, the ability to cope with future consequences, and the personality.

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