

Suggesting Interdisciplinary Teacher Education for the Fourth Industrial Revolution: Korean Perspective

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Fourth Industrial Revolution and Education

Nowadays, Korea's interest in the "Fourth Industrial Revolution" is growing. It is the revolution that will cause dramatic changes, not only in the field of industry, but also in our everyday lives through the fusion of ultramodern technologies. In the new society, education demands new challenges that are quite different from what we have seen so far. In addition to teaching students how to understand and utilize fragmentary knowledge, we need to teach students the connection among the various curricula, and the complex relationship which changes the human ways of thinking and living. And education should provide various information for students to cope with the rapid changes in their future job market.

As technology changes, AI robots will be in charge of many things that human beings have done so far. Education should develop soft skills such as sociality, sensitivity, empathy, challenge to adventure, and networking, as well as the ability of critical thinking and problem solving.

Current Issues in Teacher Education

In order to develop the era of the Fourth Industrial Revolution continuously, it has long been argued that the educational methodology for students should be integrated rather than compartmentalized as it is now (Ministry of Education, 2012, 2015). However, there is no serious debate on how to train teachers who will comprehensively manage schools. Currently, the teacher education system trains teachers with isolated viewpoint of each subject under the compartmented department system. In the sense that the Fourth Industrial Revolution is nothing but an era of convergence, the present compartmented teacher education system should be changed. This paper intends to introduce the convergent teacher education method which Convergence Education Research Institute of Korea National University of Education has recently carried out.

Korea National University of Education

Korea National University of Education is Korea's only comprehensive teacher training institution. It trains all pre-service teachers from kindergarten to high school and provides almost all kinds of in-service training programs, and is responsible for the nation's new principal training and new mentor teacher qualification programs. As the center of Korean teacher education, it received Triple A in both graduate pre-service and in-service programs as well as undergraduate pre-service program at the evaluation for the 5th teacher training institute conducted at the end of 2018.

Being located near the Sejong city, the new administrative capital of Korea, the KNUE is accessible within 2 hours from anywhere in the country. It is coordinating perfectly not only with the Korea Institute Curriculum and Evaluation, the Korean Educational Development Institute, 17 city and provincial education offices and the Ministry of Education, but also the Korean Teachers' Associations Federation and the Korean Mentor Teachers' Association.

Convergence Education Research Institute

To present a new paradigm of convergence education for the cultivation of human resources required by future society and to nurture teachers capable of cultivating convergent talents, Convergence Education Research Institute was established in 2016 to play the role below.

Development and operation of convergence teacher education program and activity materials

It develops a variety of convergence teacher education programs to provide opportunities for strengthening the convergence capacity of the pre-service teachers, and conduct various activities-oriented education so that they can develop various convergent contents by themselves and have the ability to conduct convergence education when they become a school teacher. Students participate in a variety of courses offered at Convergence Education Research Institute and have a variety of convergence education experiences and complete credits.

Establish mentoring system for pre-service teachers

In order to nurture pre-service teachers required in the future society, it establishes a mentoring support system in cooperation with the National Council of Mentor Teachers with expertise in managing classes. If there is a request for a training course program for each department, the

convergence education research Institute invites mentor teachers who have previous research and guidance experience in the convergence education to help pre-service teachers develop an interdisciplinary teaching ability.

Hold student & teacher festival, teacher forum or workshop to support free semester system

It holds a free semester system festival where students and teachers participate together to spread the free semester system that the Korean government conducts nationwide and a forum or workshop to improve teachers' job guidance skills for junior high school students .

Support the convergence education and free semester system policy of the Ministry of Education

It conducts various in-service teacher training programs to support various policies for the convergence education and free semester system promoted by the Ministry of Education and plays a role of advising the Ministry of Education, city and provincial education offices, and each schools on convergence education and free semester system.

Development of convergence education students program and collect responses from the field,

It develops the convergence education programs that can be used in actual education field during the free semester of the first year of junior high school and collects responses from the field about whether teachers have led to a positive change in students' convergence capability.

Convergence Education Philosophy of Convergence Education Research Institute

Convergence education is to foster people who can communicate with various fields in their own positions and who have the ability to accept different ideas from themselves and connect creatively with an open mind.

For such education, it is necessary not to teach fossilized knowledge in a systematic way but to guide learners to compare and connect various knowledge by contacting situations, contexts and various preconditions in which knowledge is made. This is the only way for mutual coexistence of society members and the continuous development of society, nurturing the creativity needed in the era of the Fourth Industrial Revolution, and solving the current social contradiction that forces competition and efficiency only.

Convergence education is an education that realizes learning in life by understanding that society,

nature and the world are all connected together organically based on the basic knowledge of humanities, society, science and technology cultivated in a balanced way. To this end, educational experts from various fields should constantly communicate with each other and carry out joint research.

Teaching and learning facilities for convergence education

Although concrete and practical efforts are urgently needed to develop the convergence capabilities of middle and high school students in the Fourth Industrial Revolution, there is no suitable classroom application model related to teaching-learning facilities or curriculum that will support teachers' who are in charge of students' efforts to develop the capabilities related to the Fourth Industrial Revolution.

As a result, due to the lack of capacity of current teachers who are in charge of public education, some parents rely on private tutoring for convergence education, which is essentially a blockade of students' education opportunities related to the Fourth Industrial Revolution in difficult circumstances.

Currently, there are Maker Space and FAB Lab as various convergence education facilities across the country, but most of them are for young entrepreneurs and college of engineering students, so it is not enough to support the education activities for pre-service teachers and current teachers.

The KNUE has a plan to establish the "Future Education Experience Center" at the school from the viewpoint of realizing the urgent educational welfare and in terms of realizing the educational capacity of the pre-service and in-service teachers.

The Center consists of five areas: Future Career Experience Zone, Immersion Experience Zone, Future Classroom Zone, Maker Zone, and Research Support Zone. The Future Career Experience Center consists of career inspection and consultation, reference room for career experience, future career experience room as a space to foster teacher career guidance capacity and support students' own career design in the occupational world and society rapidly changing into the 4th Industrial Revolution.

The Immersion Experience Zone is a space that provides the opportunity to understand, experience and utilize the advanced technology according to the Fourth Industrial Revolution, to enhance the future education capabilities of pre-service and in-service teachers, and an advanced technology exhibition and experience space that visitors can participate in the exhibition which functions as a test bed of the Edutech technology business.

The Maker Zone consists of maker lounge, prototype room, wood design room, art design room, software room, research & support room which are the key elements of the maker space, as a test bed for promoting the "maker space movement" and presenting a standard model of the maker space education in the community and public education.

International Exchange and Cooperation

As Charles Dickens, British novelist of the Victorian age said, the best and the worst, wisdom and foolishness, faith and doubt, light and dark coexist when revolution rises. It is the only way for scholars and teachers in various fields to open their minds and have serious and keen discussions not to move in the wrong direction. Convergence Education Research Institute has been pursuing international cooperation with the LUMA Center of Helsinki University and the University of UPI in Indonesia for the past three years. In the future, it will expand and continue international cooperation to exchange ideas of convergence education with South America and Southeast Asia.

Establishment of a 5-year teacher education plan

The current four-year teacher training system has many problems in order to train teachers capable of linking and integrating curriculum. This is because there is a shortage of education period to build diverse knowledge and experience for the convergence education beyond the contents of one curriculum under the training system that operates the current compartmentalized curriculum. In addition, in order to teach convergence education, 8 weeks of practical teaching of the current system must increase to more than 15 weeks. A minimum of five years of teacher training is required to develop a teacher who can perform a new kind of convergence education well. The added one-year course can be used to foster the design ability of an integrated curriculum along with practical convergence capabilities by providing opportunities for various heuristic convergence education experiences for convergence and

expanded teaching practice opportunities.

The Korea National University of Education is closely consulting with the Ministry of Education, city and provincial education offices to seek change as a future five-year teacher education university and revision of related laws.