Korean Women's Development Institute

KWDI ISSUE PAPER

Publisher : Korean Women's Development Institute
Publication Date : June 30, 2021

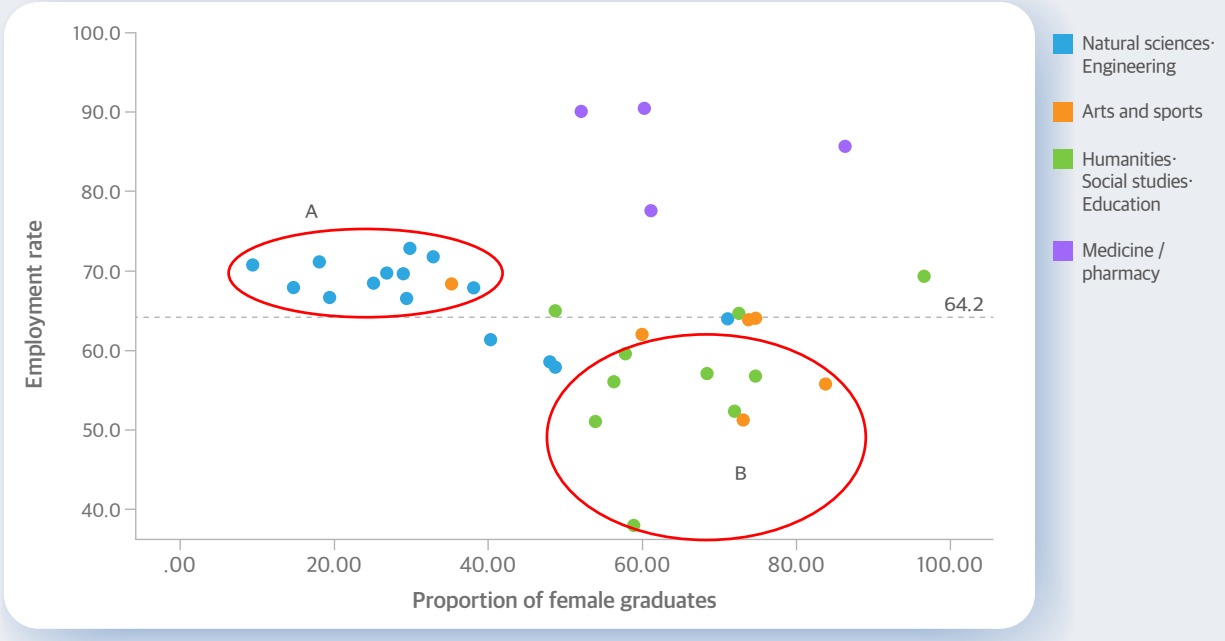
Research Title Development of Strategies by Sector for Reducing the Gender Gap in the Labor Market (III): Focusing on Gender Segregation across Fields of Study
Researcher Shin Seon-Mee Senior Research Fellow (Tel: +82-02-3156-7125 / E-mail: seonshin@kwdimail.re.kr)

Measures to Reduce the Gender Gap in the Labor Market as a Result of Gender Segregation across Fields of Study

Abstract

- This study analyzed how gender segregation by major in higher education affects the gender gap in the labor market, and thereby proposed policy tasks on career path approaches, higher education policy, and youth vocational training for female students in order to reduce the gender gap in the youth labor market.
- The gender gap in education attainment levels between young women and men has been reducing, but the distribution of college majors varies greatly according to gender. Among new college graduate employees, gender segregation across majors can act as the main factor leading to occupational segregation, and gender segregation across occupations has a significant effect on wages. In other words, people who are employed in male-dominant occupations or gender-mixed occupations tend to earn significantly higher wages than those employed in female-dominant occupations.

Scatter plot showing the employment rate of the graduates from four-year university majors (35 types) and the ratio of female graduates (graduates in 2018)



Note) The majors were divided into 35 categories according to the middle-level classification of majors.
Source: The school-major data set of higher education institutions, the Korean Educational Statistics Service website, Korean Educational Development Institute (2018); Data from The Ministry of Education and the Korean Educational Development Institute (2019), 「2018 Statistical Yearbook for Employment of Higher Education Graduates」, pp. 138-147

KWDI ISSUE PAPER

Please cite this issue paper as below.

Shin Seon-Mee, Kim Jongsoog, Lee Sunhaeng, Kim Hyokyung, Kang Kyungju, Yoon Hea Jun (2020). Development of Strategies by Sector for Reducing the Gender Gap in the Labor Market (III): Focusing on Gender Segregation across Fields of Study. Seoul: Korean Women's Development Institute.

1. Issues and Background

- The gap in employment rate is about 5% between male and female higher education graduates from four-year universities or above (Ministry of Education, 2020). The difference is observed not just in terms of simple employment rates, but the gender gap is even wider in terms of regular or decent jobs (Shin Seon-Mee et al., 2013). This study explores if the gender gap in the labor market performance of new college graduates is attributed to the difference arising from gender segregation in majors. In doing so, this study regarded the concentration of female or male students in specific majors as gender segregation in majors, and analyzed how this affected college graduate women's participation in economic activities and entry into decent jobs.
- Previous studies on college majors and success in the labor market suggested that people previously tended to avoid studying science and engineering and that science and engineering graduates' performance in the labor market was not good (Huh Shik, Lim Jin-woo, 2003; Ryu Jae-woo, 2011). However, since the 2010s, many studies demonstrated that college graduates who majored in humanities and social sciences displayed low levels of success in the labor market (Shin Seon-Mee et al., 2013; Yoon Soo-kyung, Han Yoo-kyung, 2014; Oh Ho-young, 2015; Lee Jae-sung, 2016; Ahn Young-eun, Min Yoon-kyung, Moon In-young, 2017). This study explores the ways gender segregation in majors can lead to the gender gap in the labor market and the underlying factors of gender segregation in majors.
- According to WEF's 「Global Gender Gap Report 2020」, South Korea's Gender Gap Index ranks 108th out of 153 countries around the world, and the gender gap was especially wide in terms of participation in economic activities and opportunities (ranked 127th) (WEF, 2019: 12-13). OECD and ILO (2015) suggested that in order to expand women's entry into quality jobs, it is important to increase opportunities for higher education and the choice of engineering majors. In most OECD countries, female students are less likely to choose engineering majors but more likely to choose majors in education, humanities and social sciences, and health and welfare.

<Table 1> The proportion of women enrolled in higher education by major in OECD countries (Unit: %)

Country	Education	Arts and humanities	Social sciences, journalism and information	Business, administration and law	Natural sciences, mathematics and statistics	Information and communication technologies	Engineering, manufacturing and construction	Health and welfare
Austria	78	67	63	57	49	17	23	69
Germany	80	69	65	54	46	21	22	71
Japan	71	66	51	35	25	21	13	63
South Korea	**77**	**64**	**59**	**48**	**45**	**28**	**21**	**68**
Spain	79	59	63	55	49	12	24	72
United Kingdom	76	63	63	53	53	16	25	77
OECD Average	78	63	64	54	50	19	24	76
G20 Average	72	61	57	48	48	24	23	68

Note: Japan's data on ICT includes short-term higher education programs, and data on ICT at other levels of education were included for other major fields.

Source: OECD(2017). *Education at a glance 2017*. p.282.

2. Main Results

① Classification of the majors of four-year university graduates

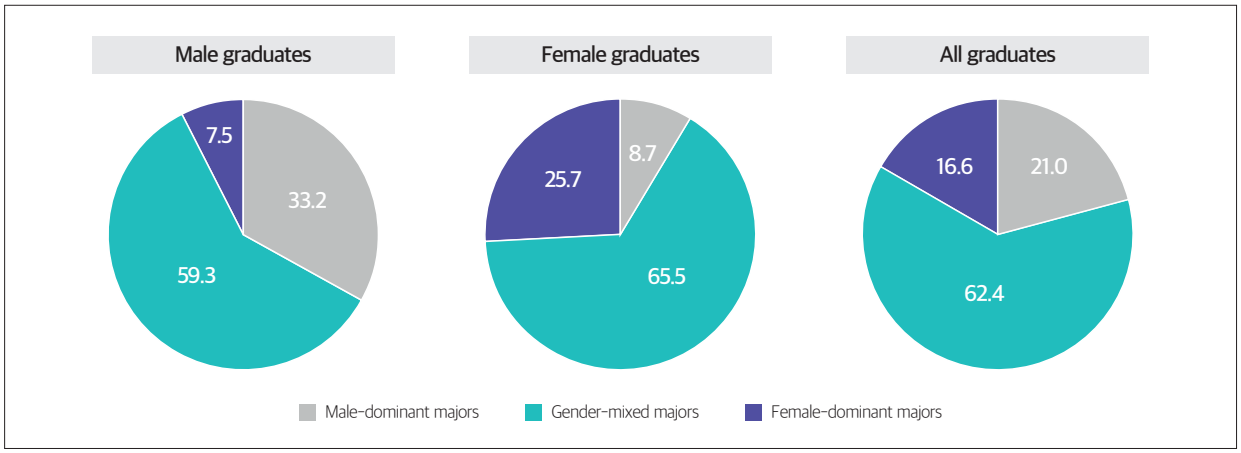
▶ This study adopted the method proposed by Hakim (1993; as cited in Argouarc'h & Calavrezo, 2013:3) to classify majors into three categories: male-dominant majors if at least 70% of all graduates are males; female-dominant majors if at least 70% of all graduates are females; and gender-mixed majors for the rest. In 2019, 44.9% of four-year university male graduates opted for male-dominant majors, 48.6% opted for gender-mixed majors, and 6.5% opted for female-dominant majors, while 6.0% of their female counterparts opted for male-dominant majors, 60.9% opted for gender-mixed majors, and 33.1% opted for female-dominant majors.

<Table 2> Classification of the majors in four-year universities according to the gender ratio of graduates

Male-dominant majors (10 types)	Gender-mixed majors (14 types)	Female-dominant majors (11 types)
Architecture, Transportation / freight, Machinery / metal, Others, Industry, Materials / ingredients, Electricity / electronic, Precision / energy, Computer / communication, Civil engineering / urban	Business administration / economics, Agriculture / forestry / fishery, Dance / sports, Law, Social science, Biology / chemistry / environment, Mathematics / physics / astronomy / geography, Pharmacy, Drama / cinema, Medicine, Human science, Secondary education, Therapy / health care, Chemical engineering	Nursing, General education, Design, Art / sculpture, Life science, Language / literature, Early childhood education, Music, Applied art, Elementary education, Special education

Note: There is a total of 35 majors.

<Figure 1> Distribution of four-year university graduates by major (Unit: %)



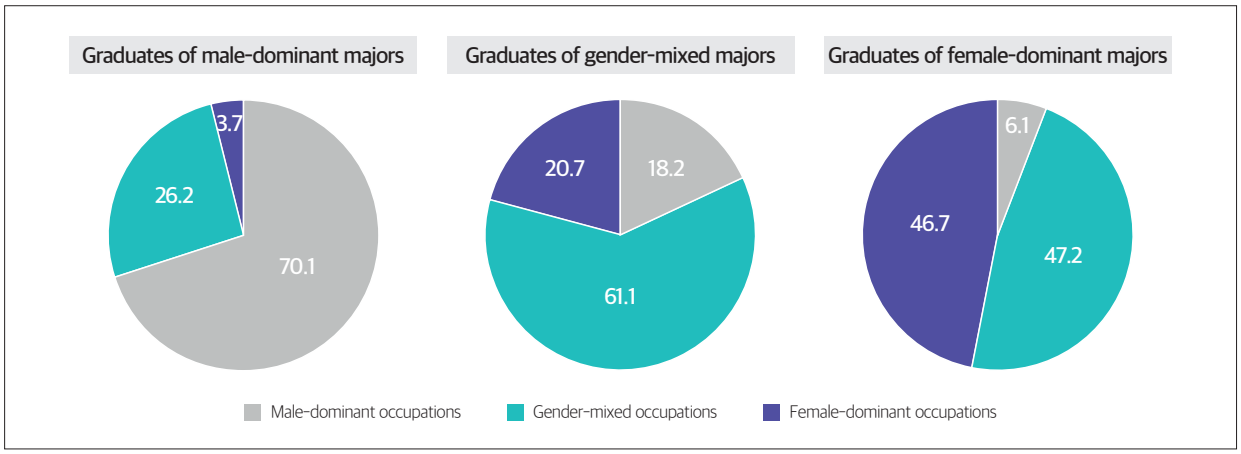
Source: The school-major data set of higher education institutions, the Korean Educational Statistics Service website, Korean Educational Development Institute (2019).

② Relationship between gender segregation in majors and segregation in occupations

Results of the chi-square analyses on majors and occupations according to gender ratio

▶ Our study used the data from the Statistics Korea's Regional Employment Survey (2018) to classify occupations into three categories: male-dominant occupations if at least 70% of all employees for the occupations are males; female-dominant occupations if at least 70% of all employees are females; and gender-mixed occupations for others. The study also used the Korea Employment Information Service's 2018 Graduate Occupational Mobility Survey (2017 GOMS) to analyze the occupations of four-year university graduates by major. The results showed that 70.1% of graduates of male-dominant majors were employed in male-dominant occupations, 61.1% of graduates of gender-mixed majors were employed in gender-mixed occupations, while 46.2% of graduates of female-dominant majors were employed in female-dominant occupations and 47.2% were employed in gender-mixed occupations.

<Figure 2> Difference in the occupations of four-year university graduates by major (Unit: %)



Source: 2018 Graduate Occupational Mobility Survey (2017 GOMS), Korea Employment Information Service

Analysis of the factors related to the labor market and majors in terms of the gender occupational division index

▶ Using the data of the 2018 Graduate Occupational Mobility Survey (2017 GOMS), our study calculated the Karmel and MacLachlan's index, which represents the occupational segregation by gender among four-year university graduates, and thereby grouped relevant factors according to those related to the majors and the labor market. The Karmel and MacLachlan's index was 0.2075, but the figure for the major-related factor (0.1556) was higher than the labor market-related factor (0.0950). The sum of the two factors (0.2506) was higher than the Karmel and MacLachlan's index (0.2075), which meant that the labor market-related factors and the major-related factors cancelled each other. It is believed that the major-related factors played a bigger role in gender segregation in occupations for the young college graduate job seekers compared to other age groups. This signified that gender segregation in majors is closely related to occupational segregation in the labor market for youth.

③ Relationship between gender segregation in majors and occupations / wages

▶ An analysis of the data for four-year university graduates from the 2018 Graduate Occupational Mobility Survey (2017 GOMS) revealed that the graduates of male-dominant majors were highly likely to transition to male-dominant occupations, while the graduates of female-dominant majors were less likely to transition to male-dominant occupations. Also, those employed in male-dominant occupations or gender-mixed occupations earned significantly higher wages than those employed in female-dominant occupations. Specifically, those employed in male-dominant occupations earned 24.3% more than those employed in female-dominant occupations, while those employed in gender-mixed occupations earned 16.3% more than those employed in female-dominant occupations.

④ Comparison of the majors in relation to the labor market performance of female college graduates

▶ In addition to considering if the majors were male- or female-dominant, the majors (the comparison was based on the arts and sports major) were used as an independent variable for regression analysis to analyze the effect of the majors on employment opportunities and job characteristics among four-year university female graduates. The results showed that the likelihood of employment was comparatively high for those who majored in medicine / pharmacy, social science, and engineering. The size of the business and the wages of the employees were both comparatively high for those who majored in humanities, social science, engineering, natural sciences, medicine / pharmacy, and education. Workplace satisfaction was comparatively high among those who majored in education and comparatively low among those who majored in humanities. The extent of the match between majors and job tasks was comparatively high for those who majored in engineering, medicine / pharmacy, and education, and comparatively low for those who majored in humanities. Overall, the results suggested that female college graduates in medicine / pharmacy and engineering had many job opportunities, and the quality of their jobs was better compared to those who majored in other subjects.

⑤ Factors that significantly influence female students' choice of college majors (summary results of logistic regression analysis)

▶ The study utilized the Korea Research Institute for Vocational Education and Training's Korean Education & Employment Panel Ⅱ survey data of the first year (2016) and the third year (2018) to analyze the factors that influenced female students' selection of male-dominant majors, female-dominant majors, and gender-mixed majors. The results are summarized below.

① Preference for subjects acted as an important factor, and in order for female students to choose male-dominant majors, their preference for science subjects was important, not mathematics.

② Career path education and activity satisfaction did not have a significant effect on female students' choice of male-dominant majors. Female students were more likely to choose male-dominant majors if they had low levels of abilities in leading their own career path exploration to overcome difficulties by setting and preparing long-term career plans in consideration of one's characteristics and environment.

③ Students in the second grade of high school with high academic achievements were less likely to choose male-dominant majors than those with medium academic achievements, and this seemed to be related to the tendency among top-performing female students to choose natural sciences with the aim of studying medicine / pharmacy.

④ The results confirmed the significance of Conscientiousness as a variable among the Big Five personality factors. Conscientiousness includes key characteristics such as goal-orientation, sense of responsibility, self-discipline, planning, and organization. While the level of Conscientiousness among female students showed a negative relationship with their choice of female-dominant majors and male-dominant majors, it had a positive relationship with their choice of gender-mixed majors. Similarly, the utilization of memorization techniques in learning had a positive relationship with the choice of gender-mixed majors, but it had a negative relationship with the choice of male-dominant majors.

6 The results of the questionnaire surveys on college students' choice of majors, career development, and employment preparation

▶ A questionnaire survey was conducted to identify the obstacles for female students in choosing engineering majors, the experience of college education among female students majoring in engineering, and the difference between male and female students in terms of the match between the their majors and career plans after graduation. The subjects of the survey included 1,124 students enrolled in the third year or higher at four-year universities (The subjects included those who graduated from general high schools, autonomous high schools, and special-purpose high schools). Specifically, the survey included 203 male students in majoring engineering only, and 244 female students in engineering, 220 in natural sciences, 206 in medicine / pharmacy, and 251 in humanities and social science. Although the university locations were limited to the metropolitan area, the data for medicine / pharmacy majors included those from four-year universities nationwide.

① The reasons for choosing liberal arts or natural sciences in high school were mainly attributed to aptitudes and interests (35.1%) and future desired jobs (19.0%), but 16.6% of the respondents reported that the reasons were their favored subjects or grades. Some of the female students majoring in engineering (19.5%) or natural sciences (22.2%) were restricted from choosing college majors because they did not learn physics (II) subject in high school or received low grades. Also, female students majoring in engineering (23.6%) or natural sciences (20.7%) were more likely to report that they were unable to study physics (II) in high school compared to male students majoring in engineering (9.9%).

② Many female students reported that they did not receive counseling or career education in their high schools when choosing their college majors or did not get sufficient help even if they received the education (males majoring in engineering 27.1%, females majoring in engineering 40.5%, females majoring in natural sciences 37.3%, females majoring in medicine / pharmacy 33.5%, females majoring in humanities and social science 39.5%).

③ Most female students majoring in engineering reported that they considered job/employment prospects (36.1%) when choosing their majors, but female students majoring in natural sciences or humanities and social science tended to choose their majors according to their interest (37.3% of female students majoring in natural sciences, 47.8% of female students majoring in humanities and social science). Female students in medicine / pharmacy also strongly tended to choose their majors according to the job and employment prospects (44.7%).

④ Compared to male students majoring in engineering or female students majoring in other subjects, female students majoring in engineering were more likely to report that they thought their major subjects after the third year of study

became difficult. They also reported low confidence in their ability to successfully complete the major curriculum (males majoring in engineering 53.7%, females majoring in engineering 44.3%, females majoring in natural sciences 55.4%, females majoring in medicine and pharmacy 63.5%, females majoring in humanities and social science 59.3%).

⑤ Students were likely to opt for minors, linked majors, or double majors, if they were majoring in subjects that did not have good employment prospects (males majoring in engineering 26.6%, females majoring in engineering 33.2%, females majoring in natural sciences 45.9%, females majoring in medicine / pharmacy 8.3%, females majoring in humanities and social sciences 53.4%). In general, it is challenging to complete multiple majors than studying minor or linked majors, but the study found that many female students majoring in natural sciences (28.2%) or humanities and social science (36.3%) opted for double majors.

⑥ Students majoring in engineering and medicine / pharmacy were likely to desire employment/start-ups in their major-related fields (males majoring in engineering 75.9%, females majoring in engineering 72.3%, females majoring in medicine / pharmacy 81.8%), Only 57.0% and 51.8% of female students majoring in natural sciences or humanities and social science respectively desired employment/start-up in their major-related fields. The study also found that 81.8% of male students majoring in engineering who wanted to transfer or study further after graduation wanted to do so with the same major as their primary major, but only 59.3% of female students majoring in engineering wanted the same major.

⑦ Many female students majoring in engineering reported that they had restricted college life or experienced inequality due to their gender (males majoring in engineering 9.4%, females majoring in engineering 25.4%, females majoring in natural sciences 16.4%, females majoring in medicine / pharmacy 16.5%, females majoring in humanities and social science 17.1%). Also, 42.4% of female students majoring in engineering desiring employment/start-up reported that employment opportunities were not equally open for males and females. Few male students majoring in engineering (6.0%) or female students majoring in other subjects (14-22%) reported such difficulties.

3. Policy Recommendations

① Plans to strengthen science education for female students to adapt to the future society

▶ In the past, even when women majored in engineering, which is considered a male-dominant subject, it was difficult for the women to obtain jobs in the male-dominant fields after graduation. However, jobs are now expected to increase for women to help them enter the leading technology fields of the Fourth Industrial Revolution. In fact, the use of female workforce in the ICT industry, which is the field that has grown rapidly since the 1990s, is now more active compared to the traditional manufacturing fields such as automobiles, steel, shipbuilding, etc. which used to be dominated by male workforce. It is necessary to strengthen science education for female students in order to expand women's entry into the fields where new jobs will be created thanks to the Fourth Industrial Revolution.

<Table 3> Plans to strengthen science education for female students to adapt to the future society

Policy task (Ministry in charge)	Main content
① Revise the Career Education Act Article 4 (Basic Directions of Career Education) (Ministry of Education)	• Add provisions that require the state to take active precautions through career education in order to prevent differences in educational opportunities by gender, religion, belief, race, social status, economic status, physical conditions, etc.
② Resolve gender differences in the opportunities to study science subjects (Ministry of Education)	• Substantially reduce the gender gap in the opportunities to study subjects that influence career choices (e.g., advanced science courses, etc. after the second year of high school).
③ Collect and prepare gender segregated statistics on high school elective subjects (Ministry of Education, Ministry of Science and ICT)	• Collect and prepare gender segregated statistics on the status of the launch of advanced science courses, the status of science teachers, etc. by high school type (boys' schools, girls' schools, co-ed schools). • Establish gender segregated statistics on mathematics / science courses and academic achievement.
④ Establish a content platform on science and technology hands-on experience activities for female students (Ministry of Science and ICT).	• Set up a career exploration platform for female students by using IT technology for the Ministry of Science and ICT's 'R-WeSET (Regional - Women Empowerment in Science, Engineering Technology)' to completely or partly support the transition from face-to-face contact activities to contact-free activities, and expand the comprehensiveness of the support contents and targets.

② Plans to strengthen career education in science and technology for female students

▶ Our study found that female students' interest in natural sciences and engineering majors as well as in science and technology jobs did not match their choices in university. The reason was that female students were much less likely to select natural sciences as their high school major filed (liberal arts, natural sciences) than male students, and even if they chose natural sciences, they ended up studying either medicine / pharmacy or natural sciences, so there were fewer female students majoring in engineering than male students. In order to increase the proportion of female students majoring in engineering, which shows relatively good labor market transition performance, more female students than male students should be encouraged to choose natural sciences (or science subjects).

<Table 4> Plans to strengthen career education in science and technology for female students

Policy task (Ministry in charge)	Main content
① Develop a standard high school curriculum for guiding the selection of mathematics-science field careers (Ministry of Education).	• Develop a standard curriculum for career education through the integration of science, mathematics, and technology curriculums. • Conduct an integrated curriculum career education training considering the gender characteristics of teachers in charge.
② Provide a gender-equal mathematics-science selection guide and video materials (Ministry of Education).	• To attract the attention and interest of female students, make the 'Guide for Selecting Subjects to Link Career Path and Academic Advancement' developed by the Ministry of Education and provided by Edunet into a video, and publish it on the Care Net.
③ Revive girls' youth activities in science (Ministry of Education, Ministry of Gender Equality and Family).	• As part of middle and high school career education, expand opportunities for female students to engage in mathematics-science club activities and support female students' club exchange activities nationwide (for example, high school girls' physics camp). • Conduct specific gender impact assessments on the support projects for natural sciences / engineering majors and science and technology career path exploration (e.g., the Science and Technology Talent Career Support Center, the projects by The Korea Foundation for the Advancement of Science and Creativity)

③ Innovation in engineering education for female students at engineering colleges

▶ Among engineering majors at four-year universities over the past 20 years, only chemical engineering and architecture have shifted its status from male-dominant majors to gender-mixed majors, and the proportion of women in other male-dominant majors (8 subjects) remains still less than 30%. In order to expand the pool of female talent in the engineering field, it is necessary to address the following difficulties experienced by female students majoring in engineering. First, our study found that compared to male students, female students were more likely to report that they chose majors according to their grades, or that their majors did not suit their aptitude and interest. Second, many female students experienced difficulties studying their major subjects after the third year (66.0% for males, 76.2% for females), and they reported low confidence in completing their major curriculums successfully. Third, female students (25.4%) were more likely to have experienced gender-discriminatory restrictions or inequality during their college life than male students (9.4%).

<Table 5> Plans for innovating engineering education for female students at engineering colleges

Policy task (Ministry in charge)	Main content
① Operate programs to attract female students to the male-dominant field of engineering (Ministry of Science and ICT).	• Encourage engineering colleges to run their own programs to attract excellent female students by focusing on majors with very low proportions of female students in bachelor's programs (e.g., conduct mentoring for high school girls in the 2nd and 3rd grades to encourage them to enter engineering colleges). • For science and engineering colleges participating in government R&D projects, consider giving those colleges additional points or incentives for research funds to utilize female researchers.

Policy task (Ministry in charge)	Main content
② Diagnose the gender equality educational environment of engineering colleges (Ministry of Education, Ministry of Gender Equality and Family).	• Benchmarking the 'School Gender Equality Diagnosis Index' used in elementary and secondary schools, develop and distribute a tool called "Diagnosing Gender Equality Education Environment for Engineering Colleges" so that engineering colleges across the country can diagnose their gender equality educational environment on their own.

④ Plans to innovate humanities and natural sciences major curriculums to cultivate professionals

▶ Our study found that from the time of choosing a major, female students in humanities and natural sciences had little interest in their job or employment prospects after graduation and strongly tended to choose majors according to their aptitude, interest, and preference for subjects. Also, as students majoring in humanities and natural sciences were taught basic studies, those majors did not provide adequate training for professionals in specific occupational fields. Thus, in order to cultivate professionals, humanities and natural sciences colleges need to innovate their major curriculums to identify and respond to the demand for human resources in those fields.

<Table 6> Plans to innovate humanities and natural sciences major curriculums to cultivate professionals

Policy task (Ministry in charge)	Main content
① Expand the curriculum choice for college students (Ministry of Education).	• Reinforce students' right to choose curriculums in order to organize college curriculums so that they reflect students' career plans and needs in human resources (faculty system, change in major, minor subject, linked major, double major, dual major, majors designed by students, etc.)
② Organize the career path for each college major department and publish it on the department's website (Ministry of Education).	• Use the data accumulated in the student career development system for each college to categorize careers for each major department, and analyze the status of career paths from college admission to graduation by type. • Upload career information by career type on the college website so that students can use it to design their careers.
③ Produce statistics on gender gaps in education for secondary schools, colleges, and graduate schools (Ministry of Education, Ministry of Gender Equality and Family)	• Through the production of statistical analysis on the gender gap in subjects and majors in secondary schools, colleges, and graduate schools, related policy officials should identify problems and monitor the policy effectiveness to reduce the gender gap. • Through the Korean Educational Development Institute's Korean Educational Statistics Service website, school notifications, college notification boards, etc., provide statistical information on: gender differences in academic achievement among elementary, middle, and high school students; gender ratio in high schools for gifted students, science high schools, Meister high schools, and specialized high schools (industrial, commercial, etc.); gender differences in subject preference and the choice of elective courses; the gender ratio of students and teaching staff by major in colleges and graduate schools; differences in career paths after graduation for new college graduates by major. • As the key to evaluating middle/high schools and colleges, use gender gap indicators (proportion of women in college teaching staff, gender differences in academic achievement, gender differences in students' career paths after graduation, etc.).

⑤ Reducing occupational gender segregation in youth vocational training

▶ Our study found that the desired jobs of young job seekers were less segregated than those of the middle and old aged job seekers, but young female job seekers with low competitiveness in employment tended to limit their choices to female-dominant occupations (Oh Eun-jin et al., 2020), and this could solidify the gender gap in wages. Recently, with the progress of the Fourth Industrial Revolution, the traditional service industry in which female students used to engage in is now transforming into a digital technology-based service industry. Thus, it is necessary to support female students in humanities and natural sciences, which are the subjects associated with low employment rates, by increasing their job opportunities through vocational training in their non-major fields such as ICT while they are still attending college.

<Table 7> Reducing gender segregation in occupations in youth vocational training

Policy task (Ministry in charge)	Main content
① Recommend reducing the gender imbalance of trainees in vocational training institutions (Ministry of Employment and Labor).	• In the field of science and technology, the 「Act on Fostering and Supporting Women Scientists and Technicians」 encourages science and engineering colleges with very low female student ratios to maintain appropriate proportions of female students. In the same way, for the field of vocational training, the gender imbalance of trainees should be reduced through the screening and evaluation of vocational training institutions, etc.
② Diagnose the gender-equal training environment in polytechnics and public training institutions (Ministry of Employment and Labor, Ministry of Gender Equality and Family)	• Understand the status of the gender equality awareness among training institutions' staff and instructors, gender awareness in training counseling activities, gender-sensitive teaching methods and follow-up management by training (including links to employment), etc., and thereby develop a training environment diagnostic tool and use it for self-diagnosis. • Create a gender-equal training environment by collecting self-diagnosis results and monitoring the gender-equal training environment of the training institutions.
③ Provide youth employment incentives to reduce gender segregation in occupations and jobs (Ministry of Employment and Labor).	• Provide additional employment incentives for young people and business owners when young women are employed in male-dominant occupations or when young men are employed in female-dominant occupations.

References

Ministry of Education (2020). Announcement of the results for the 2019 employment statistics survey on higher education graduates (morning press release on December 29, 2020).

Ministry of Education, Korean Educational Development Institute (2019). *2018 statistical yearbook for employment of higher education graduates.*

Ryoo Jae-woo (2011). Ability and labor market performance of science and engineering graduates: Korea and the U.S.. *Korea Review of Applied Economics*, 13(1), 27-53.

Shin Seon-mee, Min Moo-suk, Kwon So-young, Ko Hye-won (2013). *Effects of employment preparation activities and support measures for female college and university graduates*. Korean Women's Development Institute.

An Young-eun, Min Yun-kyung, Moon In-young (2017). Analysis of long-term employment stability by college major. *The Journal of Vocational Education Research*, 36(5), 73-94.

Oh Eun-jin, Shin Seon-mee, Jung Sung- mi, Kim Hyo-kyung (2020). *Current status of and improvement measures for gender segregation in vocational training and job placement*. Ministry of Employment and Labor.

Oh Ho-young (2015). Employment issues among college graduates in humanities. Korea Research Institute for Vocational Education and Training, *The HRD review*, November 2015.

Yoon Soo-kyung, Han You-kyung (2014). Analysis on factors influencing career outcomes. *The Journal of Economics and Finance of Education*, 23(4), 131-160. The Korean Society For The Economics and Finance of Education.

Lee Jae-sung (2016). Penalty for humanities majors?: Comparative analysis of labor market performance for those majoring in humanities compared to other majors. *2016 Employment Panel Academic Conference Presentation Data*, 532-551.

Heo Shik, Yim Jin-woo (2003). An empirical study on the wage differentials by subject of degree in Korean college graduates, *Korea Review of Applied Economics*, 7(1), 21-36.

Argouarc'h, J. & Calavrezo, O.(2013). La répartition des hommes et des femmes par métiers. DARES Analyses, décembre 2013, n° 079.

Hakim, C.(1993), Segregated and integrated occupations: a new approach to analysing social change. *European Sociological Review*, 9(3), 289-314.

OECD(2017). *Education at a glance 2017*.

OECD · ILO(2015). Monitoring progress in reducing the gender gap in labour force participation . Report prepared for the meeting of the G20 Employment Working Group Istanbul, Turkey, 7-8 May 2015.
https://www.oecd.org/g20/topics/employment-education-and-social-policies/Monitoring-progress-in-reducing-the-gender-gap-in-labour-force-participation.pdf.

WEF(2019). *Global gender gap report 2020*. http://www3.weforum.org/docs/WEF_GGGR_2020.pdf.

Ministries in charge:	Women's Policy Division, Ministry of Gender Equality and Family Gender Equality Policy Division, Ministry of Education Gender Equality Policy Division, Ministry of Employment and Labor
Relevant ministry:	Science and Technology Safety Support Team, Ministry of Science and ICT (Department in charge of fostering and supporting female science and technology personnel)