

A Case Study on Data Educational Program for Non-major Trainees

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Abstract

Due to technological advancements, the data industry is growing, leading to a demand for data professionals in the market. Job seekers interested in data-related positions include not only those with relevant majors but also non-majors. Therefore, this study aims to identify effective educational methods for non-majors lacking data knowledge and skills to develop both data and business competencies.

This research focuses on 28 trainees who participated in the "Data Youth Campus" program conducted by K-institution. The program spanned 10 weeks and was structured into three phases: fundamentals, practical training, and projects, systematically enhancing trainees' capabilities. The effectiveness of the curriculum and trainee management was verified by measuring and analyzing improvement of competencies and satisfaction with the program. This study offers valuable insights for the design and implementation of data education programs tailored to non-majors.

Keywords : Data Education Program, Non-major, Curriculum, Career Change, Competency

1. Introduction

Due to rapid technological advancements, countries worldwide are actively preparing for future societal changes by nurturing promising talents and formulating strategies in relevant technologies. With the exponential growth of the data industry and markets, the significance of big data is gaining prominence and it is required to cultivate talented people to meet market demand accordingly. In the case of South Korea, it was revealed that there was a 29.4% shortage of professionals related to the Fourth Industrial Revolution in 2020, and this shortage is expected to remain at 28.3% in 2025 [Korea Labor Institute, 2019; National Research Council for Science & Technology, 2018]. Consequently, various big data educational programs are being developed and operated by public agencies, government institutions, research institutes, and local governments, with universities also implementing continuous innovation in their education content and methods [Jo and Yu, 2018]. As data educational programs become more diverse and numerous, comparative studies on domestic and international data education and curriculum development are also being conducted [Jung and Do, 2019]. However, there is limited research within Korea that focuses on improving the quality of educational programs through practical operational cases of Data Educational Programs. Furthermore, there is a dearth of research on how to deliver such education to graduates from non-related majors seeking to transition careers without prior knowledge in data-related domains. Therefore, it is essential to conduct research aimed at en-

hancing the quality of data-related education, taking into account the characteristics of students.

The purpose of this study is to provide practical guidance and motivation strategies for non-major students in the context of Data Educational Programs. Despite the growing number of educational programs, there is a notable lack of research on effectively conducting such programs for non-major students and addressing the challenges faced by trainees, operators, and instructors. This research aims to offer valuable insight for the design and implementation of educational programs based on a 10-week Data Educational Program, serving as a valuable resource for future similar initiatives.

2. Current Status of Data Educational Program Operations

2.1 Domestic Status of Data Educational Program Operations

A comparison of 157 data-related departments in universities and 25 public and private institutions offering data-related education was conducted with data retrieved from the Ministry of Education's "Higher Education in Korea Service." The findings revealed disparities in operational direction and characteristics. In universities and graduate schools, data education primarily centers around technology. The rise of the Fourth Industrial Revolution has led to a surge in data-related majors in universities, increasing from 14 in 2015 to 157 in 2021 [Higher Education in Korean Service, 2021]. Undergraduate programs have established data-related majors, mainly within relevant

〈Table 1〉 Data-Related Major Program

2020		2021	
Category	Number of major Programs	Category	Number of major Programs
University (Undergraduate)	71	University (Undergraduate))	85
Graduate School	41	Graduate School	64
College / Technical College	4	College / Technical College	4
Cyber university	1	Cyber university	1
		Korea National Open University	1

universities, encompassing natural sciences, engineering, and social sciences. These programs often employ linked or integrated majors, incorporating data-related content into foundational subjects. Graduate programs are primarily developed through collaborative efforts between two or more departments or majors. They jointly establish or operate programs (〈Table 1〉).

Education programs led by public agencies, such as the Ministry of Employment and Labor and the Ministry of Science and ICT, are notably demand-driven and primarily prioritize industry collaboration and employment-oriented structures. The related ministries select operating agencies and actively foster data experts to meet the demands of the Fourth Industrial Revolution. Specialized education programs are emerging not only for general AI education but also for handling specific data tailored to achieve particular goals, such as local information. These programs aim to cultivate specialized talent within their respective fields, offering customized training courses in alignment with local industry characteristics. The objective is not only to attain quantitative outcomes like graduation and employment rates but also to create positive effects within local communities. The ultimate goal is to rectify labor market im-

balances among regions through tailored training that caters to local industry needs.

In private institutions, the primary focus is on creating employment-ready portfolios and nurturing skills that facilitate immediate integration into practical workplaces. They offer educational programs that leverage actual work environments and data, with a key emphasis on portfolio development for employment purposes. These institutions prioritize education in high-demand fields like market-oriented big data analysis and frequently provide short-term, market-driven educational curricula. Furthermore, the difficulty level of the educational content is clearly defined, enabling customized instruction according to learners' preferences.

2.2 International Status of Data Educational Program Operations

In the United States, data talent is categorized into specialized domain expertise and technical data proficiency, with the characteristic feature that all federal agencies collaborate on talent development. In Europe, a high level of governance was found in talent development as specific institutions regulate related policies and expenditures. France and Germany, in par-

ticular, aim to cultivate versatile talent applicable across various disciplines, encouraging professionals from diverse academic backgrounds to acquire data-related expertise. Japan's model involves collaboration between the private and public sectors for data

talent development. Despite starting data talent development later than South Korea, China emphasizes a nationally driven approach in shaping policies for workforce development, displaying clear governance in these policies.

〈Table 2〉 National Workforce Development Policies and Programs

Ministry / Agency	Policy	Nation	Target Audience	Content
Department for Education	Skills Boost camps	UK	Workers Job Seekers	- Up to 16 weeks of free job-oriented education for adults - Numerous programs related to database design and development for developers
Ministry of Human Resources and Social Security	Digital Technology Enhancement Plan (提升全民數字技能工作方案)	China	Workers Students	- Enhancement of job skills training and training materials for digital technologies - Promotion of online platform-based vocational skills training models - National foundational vocational training packages
Ministry of Human Resources and Social Security	Tech China Movement (技能中國行動)	China	Workers Students Job Seekers	- Training 40 million skilled professionals over 5-years - Enhancing the lifelong career skills development system and reinforcing training in digital technologies - Implementing industry-academia collaboration programs (internships at companies after university admission) - Nurturing talent in advanced technologies
U.S. Department of Labor	WIOA (Workforce Innovation and Opportunity Programs)	USA	Job Seekers	- Provision of services such as job training recommendations, career counseling, and job listings at 2,400 American Job Centers (One-Stop Centers) - Enrollment available for digital workforce training programs
Department for Work and Pensions	Digital apprenticeships	UK	Job Seekers	- Acquisition of digital skills like API, AI, cybersecurity, data modeling, and big data analysis during the apprenticeship - Salary payment during the apprenticeship period - One-on-one mentorship and retraining opportunities

〈Table 3〉 Workforce Development Strategies and Programs in Europe

Strategy / Program	Ministry / Agency	Content
Digital Decade (2021~)	EU Executive Commission	· Providing education to enhance digital competencies for EU citizens and secure ICT experts
National AI Strategy (2018~)	French Government	· Investing in improving data accessibility and nurturing AI talent
National Data Strategy (2021~)	German Government	· Conducting training for over 330 relevant professions and promoting data literacy education.
National Data Strategy (2021~)	UK Government	· Supporting data literacy education

3. Data Educational Program for Non-majors

3.1 The Necessity of Data Educational Program for Non-majors

Despite a strong emphasis on education in Korea, where approximately 70% of high school graduates enroll in universities, post-graduation unemployment rates are alarmingly high, with 26.8% unemployment among university graduates in the same age group as of 2019. Moreover, an OECD survey revealed that 50% of wage workers aged 25-34 with tertiary education (associate degree or higher) experience a mismatch between their major and occupation, making Korea the country with the highest mismatch rate among surveyed OECD nations [Han, 2020]. This issue is even more prominent among those majoring in arts and sports education. These individuals have long prepared for specific domains and aspire to generate income while enhancing their capabilities in their chosen careers, but the narrow pathways to their desired careers present significant challenges.

According to Gottfredson's theory of circumscription and compromise [1981], individuals naturally impose limitations and make compromises as they navigate their career development. Essentially, they set boundaries within the broader domain they prefer, which helps them identify specific occupational areas. Graduates with arts and sports education majors, who face challenges pursuing their desired careers directly, often resort to career compromises by seeking employment in related fields. Among these arts and sports education sector graduates, there are students who re-

quire Data Educational Programs to adapt to changing times and find job opportunities in alignment with societal shifts.

3.2 Research Methods

The researcher conducted a case study as part of a data workforce development program supported by K-Institution. The research subjects are individuals who have obtained a bachelor's degree in arts and are currently enrolled in a master's program in cultural arts management. The study was designed to investigate an educational program aimed at students who aspire to work in arts-related businesses or organizations. Case studies are considered suitable for research with a weak academic foundation or in the early stages of exploring a new field [Eisenhardt, 1989]. Additionally, the study adopted the case study research method as it aims to explore the operational processes of data workforce development educational programs and collect contextual information about the educational environment. This methodology is well-suited for in-depth understanding and analysis of particular phenomena or events [Yin, 2013].

The subjects of this study consisted of 28 trainees, 8 instructors, and 3 education administrators who participated in K-institution's "Data Youth Campus" program. The education program spanned 10 weeks, consisting of 6 weeks of foundational practical training and 4 weeks of group project work. The education sessions were conducted 5 days a week, with 7 hours of instruction each day, totaling 260 hours of training. To assess the effectiveness of the education, surveys were administered to the trainees twice, evaluating their competency

improvement and satisfaction with the education. In order to ensure the reliability of the research, data sources included survey results, educational operation logs and reports, as well as interview transcripts.

3.3 Educational Program

3.3.1 Curriculum Design

The primary goal of this educational program was to cultivate fundamental data collection and analysis skills while enhancing understanding of the cultural arts industry and business. To accomplish this, a 6-week foundational course focusing on data technology competency and cultural arts business competency was designed, followed by a 4-week practical training component involving real-world case studies (Figure 1). The instructors for the foundational course were experts with extensive teaching experience, a profound understanding of the students, and specialized knowledge in both business and data fields. In the practical training phase, mentors with a strong grasp of business strategies

and data were assigned to provide further guidance to the trainees in their hands-on experiences.

The 4-week practical training course, which follows the 6-week foundational educational program, involves trainees working on projects that simulate real-world research and business planning processes. This training phase aims to deepen the understanding of the educational content. To maximize the effectiveness of practical training, program coordinators conducted individual interest interviews to create teams of 4-5 trainees with similar interests upon completing the foundational course. Each team was assigned a business strategy mentor and a data expert to assist them in exploring data-driven topics within the cultural arts industry and carrying out their projects. Regular check-ins and feedback sessions were conducted throughout the project to enhance the quality of the projects. Additionally, support for data source acquisition methods and associated costs was provided when necessary to improve the project's quality.

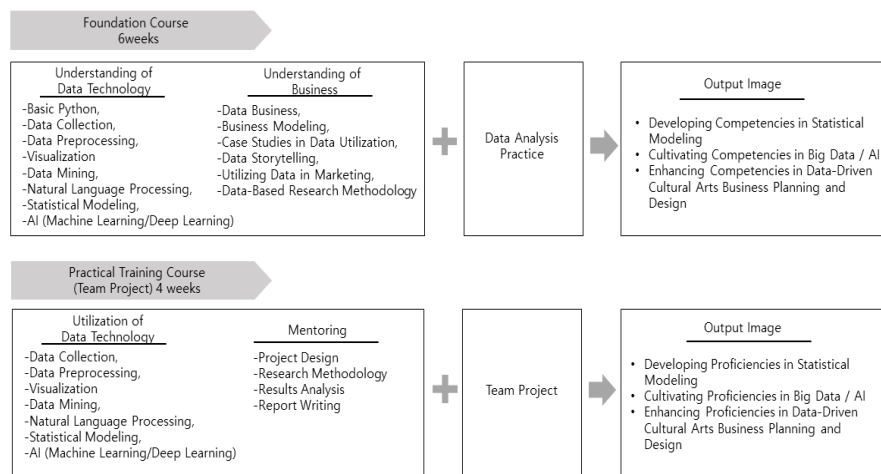


Figure 1 Curriculum Overview

3.3.2 Trainee Management

From the initial planning phase of the educational program, an educational operations team was established, responsible for overseeing all aspects of trainee and curriculum management. Firstly, for trainee management, at least one dedicated full-time staff member was assigned to the training venue to ensure the smooth progress of education. To minimize dropouts, all trainee-related matters, including attendance, counseling, inquiries, and complaints, were meticulously recorded in journals. Reviewing the recorded data allowed for immediate counseling of any trainee with more than two unexcused absences. Regular meetings with team leaders were held to address trainee grievances and difficulties, with solutions devised during operational team meetings.

Secondly, to facilitate learning convenience, classes were simultaneously conducted online in cases where trainees couldn't attend in-person class due to personal reasons. Recorded online lecture materials were made available

on a YouTube channel for trainees to use for review. To streamline the sharing of course materials, a Google Drive was established to enable the download of textbooks and course-related data.

Thirdly, to promote class participation and motivate trainees in their project work, lunch vouchers were provided to trainees attending in-person classes, and self-awards were given for their practical outcomes.

4. Performance of the Educational Program

4.1 Overall Operational Performance

This educational program aimed to provide individuals with limited basic knowledge and experience in data the necessary data skills and business competencies for real data analysis and utilization. The primary focus was on enhancing trainee participation and comprehension. Comprehensive performance evaluations were carried out across various dimensions, and in numerous aspects, the program surpassed the

〈Table 4〉 Performance Indicators and Achievement

	Item	Objective	Result (Achievement Rate)	Measurement
1	Number of Trainees	Recruitment Target Number 25	Final Enrollment 28 (112%)	- Applicant Documents - Admission Records -Attendance Records (Online and Offline Records)
2	Number of Graduates	Target Graduation Rate 80%	Final Graduates 26 (92.8%)	- Attendance Records (Online and Offline Records) - Practice Records, - Team Project Records
3	Total Duration	- Foundation Course 6 weeks (4 H/D) Project 4 weeks (7H/D)	Total 10 weeks, 260 hours (100%)	- Lecture Records (Online and Offline Records), - Q&A Records
4	Textbook	Two Main Textbooks	Two Main Textbooks (100%)	- Lecture handouts
5	Project Result	One per Team	One per Team (100%)	- Team Project Documents
6	Achievement of Competencies	Improvement in Attitude, Knowledge, and Skills (significant difference, all three aspects)	Average of 23.2% Improvement (significant difference, all three aspects)	- Two Surveys, Results Analysis
7	Satisfaction with the educational program	70%	1st Survey: 80.8% 2nd Survey: 87.4%	- Two Surveys, Results Analysis

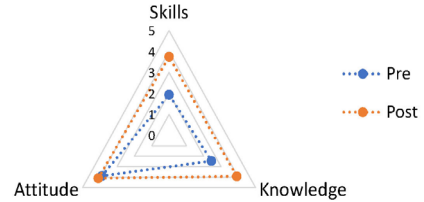
predefined project goals (<Table 4>).

4.2 Enhancement of Trainee Competencies

Upon the completion of the 10-week education, we assessed whether the trainees' motivation to enter the data-related industry and their required knowledge and skills had improved. The evaluation criteria encompassed two primary categories: the achievement of target competencies and satisfaction with the educational program.

Competency attainment was evaluated using two methods: assessment by instructors and mentors, and self-assessment by trainees. Instructors and mentors assessed the outcomes of ongoing assignments during the foundational educational program as either "PASS" or "FAIL" as the first evaluation method. The second method involved evaluations during the practical project phase, which considered mentor feedback, team final presentations, final reports, conference and seminar participation, and submissions for competitions. Trainees' self-assessment was conducted through surveys administered before and after the educational program, addressing aspects related to attitude, knowledge, and

skills (<Figure 3>, <Table 5>).



<Figure 3> Achievement of Competencies

<Table 5> Achievement of Competencies

	Attitude	Knowledge	Skills
Pre (Out of 5 points)	3.88	2.45	1.94
Post (Out of 5 points)	4.09	3.91	3.75
Achievement of Competencies	0.21 (4.2%)	1.46 (29.2%)	1.81 (36.2%)

The evaluation, consisting of a total of 15 items, with five items for each of the three domains - attitude, knowledge, and skills, revealed an enhancement in competencies across all areas. Particularly, the most notable improvement was observed in the domain of data-related skills. Trainees, while lacking in foundational knowledge and skills, demonstrated a strong sense of the importance of data analysis and utilization

Team Project: A Study of Marketing Strategies for Multicultural Spaces Using Instagram Hashtags: Using Association Rule Analysis

4. 연구결과

5년 전제 빈도분석

N	Hashtag	Freq.	Weight	N	Hashtag	Freq.	Weight
1	유지할	8140	0.1370	16	산악속	1099	0.0185
2	예술의전당	7333	0.1234	17	연사회	1095	0.0184
3	세이	3454	0.0566	18	고운성	1032	0.0174
4	충무아트센터	2890	0.0466	19	광연	988	0.0166
5	세종문화회관	2478	0.0417	20	뮤지컬테스트	916	0.0154
6	테스트	2442	0.0411	21	홍양호	816	0.0137
7	백석옥	2084	0.0337	22	윤지영테스트	796	0.0134
8	일상	1710	0.0288	23	609	782	0.0132
9	문화생활	1556	0.0253	24	국립합창단	752	0.0127
10	김준수	1458	0.0245	25	테오코리안어	738	0.0124
11	홍순남아	1397	0.0235	26	양은아	730	0.0123
12	유수현	1346	0.0227	27	서정수	685	0.0115
13	한지영테스트	1206	0.0203	28	일일일	684	0.0115
14	김준수	1189	0.0197	29	테스트중국어	659	0.0111
15	요승우	1111	0.0187	30	민정희	628	0.0107

→ 공통 장소 : 뮤지컬 / 복합문화시설 : 예술의전당

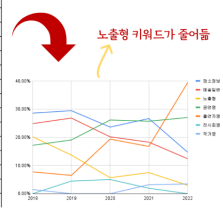


<Figure 2> Example of Project Result

4. 연구결과

2017년-2022년 추세변화

Rank	2017	2018	2019	2020	2021
1	예술의전당	예술의전당	유지할	예술의전당	유지할
2	뮤지컬	연사회	예술의전당	유지할	테스트
3	충무아트센터	세이	세이	테스트	예술의전당
4	일상	충무아트센터	홍양호	세종문화회관	세이
5	세종문화회관	일상	충무아트센터	세이	김준수
6	daily	문화생활	모자르프	유수현	충무아트센터
7	문화생활	국립합창단	세종문화회관	충무아트센터	윤지영테스트
8	광연	백그라운드	유수현	테오코리안어	고운성
9	테스트	musical	황일호	일상	홍양호
10	백석옥	한지영	일상	문화생활	세종문화회관
11	홍순남아	광연	문화생활	조지	홍순남아
12	musical	한지영테스트	유지할테스트	한지영테스트	유수현
13	위드클라우드	daily	신정수	이준수	김정희
14	소통	라이온팅	연사회	연사회	엑스칼리버
15	모자르프	연사회	백그라운드	국립합창단	일일일



both before and after the program, resulting in consistently high scores in the attitude domain. However, the post-education scores in knowledge and skills domains showed significant improvement, especially when compared to their relatively low pre-education levels.

To confirm the meaningful extent of competency improvement between pre-education and post-education, a dependent samples t-test was conducted, revealing significance levels of $p < 0.01$ ($p < 0.05$ for attitude). In essence, this indicates that the degree of competency enhancement achieved through the educational program is statistically significant. In conclusion, the program effectively met the students' needs and fostered competency development.

4.3 Trainee Satisfaction with the Educational Program

Satisfaction surveys regarding the educational program were administered at two points: during the 3rd and 9th weeks of the program. The survey encompassed a total of 13 items, comprising 3 items related to instructor satisfaction, 3 items concerning educational content and its utility, 4 items addressing operational support, and open-ended suggestions for enhancements. The

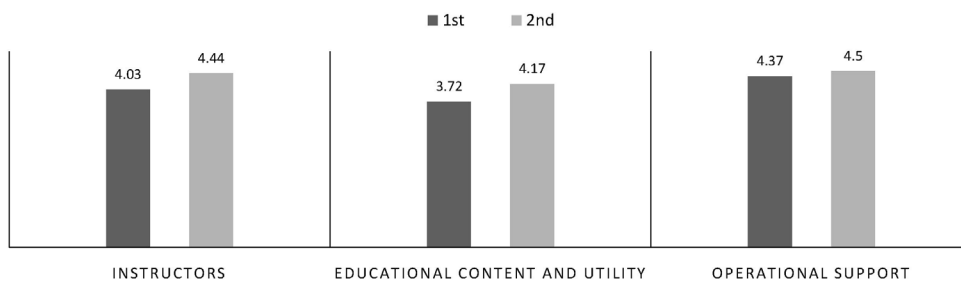
satisfaction analysis results are presented in <Figure 4>.

In both surveys, trainees exhibited a high level of satisfaction, scoring 4.04 out of 5 (80.8%) in the first survey and 4.37 out of 5 (87.4%) in the second survey. Importantly, as the education progressed, satisfaction increased across all three areas - instructors, educational content and utility, and operational support. The positive trend in satisfaction can be attributed to conducting the first survey in the 3rd week and subsequently incorporating the feedback into the ongoing educational program, resulting in further improvements.

It is also evident that students who initially lacked basic knowledge and skills in data had some initial concerns regarding the program's content and pace. However, as the educational program continued, their confidence in their skills grew due to the accumulation of knowledge and repetitive practical exercises, leading to increased satisfaction with both instructors and the educational content.

5. Conclusion and Implications

In the current data-related industries, there is a demand for hybrid professionals with diverse domain knowledge and data



<Figure 4> Satisfaction with the educational program

technology skills. As general industries continue to digitalize, the demand for data professionals capable of practical problem-solving and issue identification is expected to grow even further.

This research was conducted to provide insights for the design and operation of future Data Educational Programs based on the analysis of the experiences of trainees, instructors, and operators. The key findings of this study are as follows:

First, trainees significantly improved their competencies in terms of attitude, knowledge, and skills related to data through the educational program. They advanced from a state of no prior knowledge or skills to the capability of choosing a topic, collecting data, analyzing it, and interpreting it through the project work. The instructional materials were thoughtfully designed to gradually advance from basic coding to in-depth assignments, facilitating a seamless transition from learning to the project phase. In addition, supporting both online and offline learning to enable sufficient review was shown to be effective. This approach enabled trainees to acquire knowledge and skills related to data and business effectively, ultimately strengthening their resolve to pursue data-related roles in their desired industries.

Second, trainees expressed high overall satisfaction with the educational program. They were pleased with the communication and proactiveness of most instructors, who delivered both theory and practice systematically. Practical experience with real-world data significantly boosted the trainees' confidence in utilizing data competencies upon program completion. The allocation of mentors with relevant expertise to each team

during project implementation enhanced the overall quality of the projects, contributing to high satisfaction. In particular, satisfaction with operational support received consistently high ratings from the first survey. The use of university facilities for theoretical and practical education likely contributed to the high satisfaction with the facilities. The management sector earned high satisfaction scores for providing prompt feedback and implementing improvements based on trainees' requests. Other factors such as lunch expenses, material purchases, continuous support, and encouragement for learning also played a role in the overall high satisfaction.

Based on the study's findings, the following implications for the design and operation of data workforce development programs can be outlined:

First, Data Educational Programs should combine both theoretical and practical education. To achieve this, a well-equipped educational infrastructure is essential.

Second, while access to online and offline education is becoming more widespread, it is critical to emphasize learning methods that involve practical data analysis and consistent feedback from experts, moving away from traditional theoretical education.

Third, educational programs should be designed to cater to trainees at different skill levels. Data analysis, particularly in the realm of big data, extends beyond basic coding and requires an understanding of domain knowledge for data preprocessing and proficiency in tools for big data analysis. Therefore, educational programs should systematically elevate trainees' skills in data processing and the utilization of data analysis tools to a level where they can ap-

ply them in real-world scenarios. The approach employed in this case, which involves a progression from basic courses to practical training and culminating in a project, presents a valuable alternative.

The study's findings indicate that individuals without prior specialization in data, possessing limited foundational knowledge, can potentially transition into data professionals through a structured and all-encompassing educational program. While this research may not offer definitive solutions for designing Data Educational Programs tailored for non-specialized students, it aims to serve as a foundational guide. In the future, with the input of educational experts and feedback from organizations and companies seeking data-related talent, these programs can be refined to become more practical and aligned with real-world demands.

References

- [1] Cho, W. and Yu, M., "Creating Value for Education through Big Data Analysis Education Programs", *The Korea Journal of BigData*, Vol. 3, No. 2, 2018, pp. 123-130.
- [2] Eisenhardt, K. M., "Building theories from case study research", *Academy of Management Review*, Vol. 14, 1989, pp. 532-550.
- [3] Gottfredson, L. S., "Circumscription and compromise: A developmental theory of occupational aspirations", *Journal of Counseling Psychology*, Vol. 28, No. 6, 1981, pp. 545-579.
- [4] Han, J., "Mismatches in the Graduate Labor Market from the Perspective of Major Selection and Improvement Directions", *KDI Focus*, 2020, No. 99.
- [5] Higher Education in Korea Service, University major list, Korean Council for University Education, Public Announcement of University Information, 2021, <https://www.academyinfo.go.kr>.
- [6] Jung, S. H. and Do, J., "A Case Study on Operation of Big Data Educational Program", *Journal of Education & Culture*, Vol. 25, No. 5, 2019, pp. 621-640.
- [7] Korea Labor Institute, "Analysis of the Labor Market in the Data Industry", 2019
- [8] National Research Council for Science & Technology, "Training Programs for Key Personnel in Emerging Sectors of the Fourth Industrial Revolution Era", 2018
- [9] Yin, R. K., "Case study research: Design and methods", London: Sage. 2013.

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