

A Study on the Development of Disaster and Safety Specialists

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ABSTRACT

As disasters become larger and more complex, the direction and demand of disaster management specialists are changing. This study attempted to derive implications for the systems and plans for cultivating human resources in the disaster and safety field by investigating and analyzing related systems. The number of departments including words related to disaster and safety in the name of the graduate school was investigated, and the trend of the number of departments was analyzed. Through this, it was confirmed that the perception and demands of society have changed in the field of disaster and safety. In addition, this study drew five implications regarding the plan to cultivating human resources. First, it is necessary to establish a basic plan. Second, it is necessary to review the higher education management system in connection with the needs of society. Third, it should be considered to standardize knowledge and work ability in connection with industrial needs. Fourth, it will be necessary to expand of national technical qualifications. Finally, it is necessary to cooperate with various organizations related to cultivating human resources in the disaster and safety.

Key words: cultivating human resources; national technical qualifications; National Competency Standards (NCS)

1. Introduction

In a disaster site with a significant ripple effect, such as COVID-19, rapid decision-making and response are required, and the expertise of disaster and safety management personnel is being emphasized [Choi, H & Kim, K, 2020]. In the past, Korea's disaster and safety management can be classified into disaster prevention and safety management.

First, construction engineers such as civil engineering, construction, and urban planning began to train disaster prevention specialists in the disaster prevention field with the revision of the Countermeasures Against Natural Disasters ACT in 2005. The National Disaster Prevention Education Research Institute was established in 2006 and the overall disaster prevention curriculum was opened [Kim, Y, 2016]. In other words, disaster prevention experts were trained by focusing on activities to prevent and recover disasters caused by natural phenomena such as wind and flood.

On the other hand, safety management is a term commonly used in industrial sites [Choi, H & Kim, K, 2020]. The Occupational Safety and Health Act was enacted in December 1981 to prevent industrial accidents and to improve the working environment

so that workers are safe and healthy, and stipulated that employers must have a person in charge of safety and health management. In 1984, Occupational safety departments were established at Chungbuk National University and Gyeonggi Technical Open University, and began to produce personnel related to industrial safety [Lee, C, 1985].

Disaster has inherent properties of risk and uncertainty, and it is disaster management that manages these risks and uncertainties [Lee, J, 2018]. In previous studies, disaster safety management is a management activity that prevents, reduces, and responds to human and material damage of disasters and accidents, and the expertise of disaster and safety management is defined as the ability to identify, analyze, and solve problems in the disaster and safety field. In addition, disaster and safety expertise is the analysis and resolution ability of professional personnel to successfully perform disaster and safety management activities [Choi, H & Kim, K, 2020].

And then Article 65-2 of the Countermeasures Against Natural Disasters Act stipulates that the state and local governments shall take measures necessary to nurture professional human resources for disaster prevention in accordance with the up-

grade and specialization of policies on disaster prevention. And the Minister of the Interior and Safety may designate a school as an institution for nurturing professional human resources and authorize it to provide necessary education and training.

Therefore, In 2014, Regulations on the management and operation of nurturing professionals in the field of disaster prevention were announced. And master and doctorate professionals have been nurtured. In the field of corporate disaster management has also been nurturing professional manpower based on the Act on Assistance to the Autonomous Activities of Enterprises for Disaster Mitigation. In the wake of the 2017 Gyeongju earthquake, experts in the earthquake disaster field were added to support the development of master and doctorate professionals [Ministry of the Interior and Safety, 2018].

According to the Ministry of Education, the budget for this project is 0.03% of the total budget for human resource development projects budget,

accounting for a very small portion [Ministry of Education, 2022].

This study analyzing the current status of workers in the disaster and safety industry as well as trends in graduate school departments related with. Also this study reviewed the system applicable to disaster safety professionals and attempted to contribute to the prevention and reduction of disasters and accidents.

2. Trends in Manpower in the Field of Disaster and Safety

2.1. Analysis of the Status of Workers in the Disaster and Safety Industry

In this study, the current status of workers in the disaster and safety industry and the trend of manpower demand in the industrial field were analyzed. According to the Disaster and Safety Industry Survey from 2017 to 2020, the total number of workers in the disaster prevention industry in-

<Table 1> Number of employees by industry in the last 4 years

Classification of Industries	2017	2018	2019	2020	The Growth Rate in 2020 Compared to 2017
Disaster-related education, Counseling, and Consulting business	25,361	11,034	8,219	7,565	-70.2%
Disaster response medical and Quarantine related industries	63,974	28,358	14,408	27,058	-57.7%
Traffic accident-related social disaster prevention industry	24,658	21,071	18,874	16,351	-33.7%
Disaster-related safety facilities management, Storage of dangerous goods, Security business	17,856	17,691	16,747	16,551	-7.3%
Other natural disasters (yellow dust, heavy snow, heat waves, etc.) prevention industries	8,679	8,668	6,798	8,289	-4.5%
Search and rescue and emergency support industries in disaster areas	29,551	37,148	40,965	31,005	4.9%
Disaster-related system development and management business	9,001	8,375	11,663	9,757	8.4%
Other safety accidents prevention industries (industrial accidents, crimes, security, etc.)	19,144	21,936	20,426	22,061	15.2%
Disaster site maintenance industry	14,550	8,324	9,959	17,734	21.9%
storm and flood-related natural disaster prevention industry	11,995	14,797	15,066	15,123	26.1%
Earthquake and volcanic-related natural disaster prevention industry	10,633	9,963	12,691	13,807	29.9%
Fire, explosion, and collapse-related social disaster prevention industry	25,878	33,516	46,802	41,939	62.1%
Disaster situation management industries	23,898	36,980	44,027	39,484	65.2%
Facility recovery industry	18,256	40,836	36,721	30,254	65.7%
Infectious diseases, chemical and environmental pollution related industry	2,795	3,163	3,183	5,475	95.9%
Disaster Insurance service industry	5,357	7,851	9,846	12,837	139.6%

creased by 1.19% over the past 4 years, but the number of workers in the disaster insurance service industry increased by 139.6% and infectious disease, chemical, and environmental pollution related industry increased by 95.9% [Ministry of the Interior and Safety, 2020].

On the other hand, the number of workers in disaster-related education, counseling and consulting industries and traffic accidents-related social disaster prevention industries decreased for four consecutive years. In addition, the number of workers in the disaster response medical and quarantine industries decreased from 63,974 in 2017 to 14,408 in 2019, but increased to 27,058(87.8%) in 2020, which is thought to be due to increased demand for manpower due to the spread of COVID-19.

In 2020, the number of workers was in the order of 41,939 in the social disaster prevention industry related to fire, explosion, and collapse, 39,484 in the disaster situation management industry, and 31,005 in the disaster situation management industry. This can be compared with infectious diseases, large fires in multi-dense facilities, and large marine vessel accidents that caused the greatest loss of life and livestock diseases, forest fires, and large fires in multi-dense facilities that caused the greatest damage to property among social disasters in the past 10 years [Ministry of the Interior and Safety, 2020]. The number of workers in the social disaster prevention industry related to fires, explosions, and collapse was the largest, and the recent spread of COVID-19 has significantly increased the number of workers in the social disaster prevention industry and disaster response medical and quarantine industry.

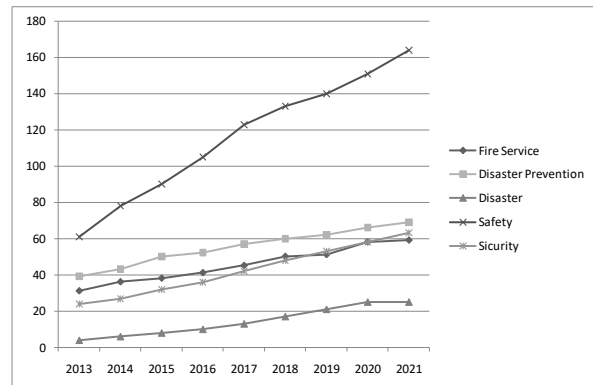
2.2. Analysis of trends in related departments in the field of disaster safety

Since the establishment of the Department of Industrial Safety at Chungbuk National University and Gyeonggi Technical Open University in 1984, the number of universities providing education in the field of disaster and safety has increased significantly as of 2021. As a result of analyzing the standard classification information investigated annually by the Korean Council for University Education, a total of 164 departments used the word related with disaster and safety as of 2021.

The departments in the field of disaster and safety are divided into natural sciences, engineering and natural sciences, and the subdivisions are divided into 32 categories, including architectural engineering, business administration and international regional studies etc. The Table 2 shows the trend in the number of departments in the subdivisions over the past 10 years.

The subdivision with largest increase in the past decade was health science, which increased by

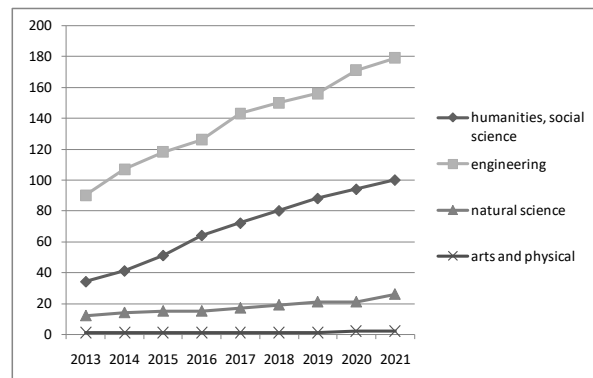
1100% from 1 to 12, and military, defense, and security have increased from 0 to 12.



<Figure 1> Trends in the number of departments by words

<Table 2> Trends in the number of departments in the last 5 years

	Fire Service	Disaster Prevention	Disaster	Safety	Security
2017	45	57	13	123	42
2018	50	60	17	133	48
2019	51	62	21	140	53
2020	58	66	25	151	58
2021	59	69	25	164	63



<Figure 2> Trends in the number of departments by subdivisions

<Table 3> Trends in the number of departments by subdivision in the last 5 years

	Social science	Engineering	Natural science
2017	72	143	17
2018	80	150	19
2019	88	156	21
2020	94	171	21
2021	100	179	26

Next, it can be seen that the departments of mechanical engineering, N.C.E (not classified department, Not Classified Elsewhere: N.C.E), business administration, administration, and safety engineering have increased.

In the past decade, the graduate school in disaster and safety has changed to national security, health, management and administration in Korea.

3. Management System of Specialized Personnel

In this study, the current status of nurturing professionals was analyzed by dividing it into education, public, and private sectors. And then the future policy directions were considered.

3.1. Standard Classification System for Education

Graduate schools are divided into five major categories: humanities, social science, arts and physical, natural science, engineering and medicine specified according to the Regulations for Establishment and Operation of Universities under the Presidential Decree in Korea.

Standard Classification for Education system consists of large, medium, and small-categories by applying these five major categories(humanities, social science, arts and physical, natural science, engineering and medicine) to provide education information to education consumers by investigating the current status and history of education institutions. It is divided into five large categories, 27 middle categories, and 157 small categories, and the survey began in 2013.

Under the Standard Classification System for Education, departments related to disaster and safety can be classified into engineering in large category, industrial safety for the middle category, category and industrial engineering, safety engineering, disaster prevention engineering, and N.C.E for the small category.

<Table 4> Standard Classification for Education in the disaster and safety

Large Category	Middle Category	Small Category
Engineering	Industrial Safety	Industrial Engineering
		Safety Engineering
		Disaster Prevention Engineering
		N.C.E

3.2. National Competency Standards(NCS)

The National Competency Standards (NCS) is a systematic standardization of the ability to perform duties at the national level. The main purpose of introducing NCS is to cultivate field-oriented specialists, and it has already been introduced in major developed countries.

NCS is classified into 24 large categories, 81 middle categories, 269 small categories, and 1,064 subdivisions(duties), and the subdivisions are again composed of competency units. The categories related to disaster and safety can be classified into environmental, energy, and safety for large categories, industrial safety for middle categories and industrial safety management, industrial health management and non-destructive tests for small categories.

However, what is noteworthy in NCS is that the contents related to disaster and safety can be checked at various competency units.

<Table 6> National competency standards in disaster and safety field

Large Category	Middle Category	Small Category	Sub Category
Environmental ·Energy· Safety	Industrial Safety	Occupational Safety Management	Occupational Safety Management general
			Machine safety management
			Electrical safety management
			Construction safety management
			Chemical safety management
			Gas safety management
			Radiation measurement evaluation
			Nuclear power plant decommissioning radioactive waste management
			Occupational health management
			Worker Work Environment Management
		Non-Destructive Testing	Non-Destructive Testing
			Radiation non-destructive testing
			Ultrasonic non-destructive testing
			self-destructive testing
			Penetration Non-Destructive Testing
			Eddy Current Non-Destructive Testing
Leakage non-destructive testing			
Special Non-Destructive Testing			

The general duties of industrial safety management according to NCS classification is to perform overall safety management to prevent risk that may occur in all industries, and to create a safe working environment by analyzing the causes of the accidents. In this regard, NCS-based recruitment information, qualification information, job information and training information may be linked and comprehensively used.

3.3. National Technical Qualification System

National Technical Qualification Systems are classified into 26 job fields, 511 technical and functional fields and 33 service fields in accordance with the National Technical Qualifications Act.

Among them, safety management is the 25th job field, and 27 qualifications are provided, including technicians, engineers, and industrial engineers etc. Industrial safety engineer qualification began with the mechanical, chemical, and electrical safety engineer in 1974. This changed into industrial safety engineer 1st grade in 1983, and became the current qualification in 1998. Recently a disaster prevention engineer qualification was established.

4. Conclusions and Considerations

This study analyzed trends in disaster and safety industry workers and graduate departments as a preliminary study to nurture specialists in the disaster and safety field, also investigated and analyzed related systems for cultivating human resources. As a result of the analysis of workers in the disaster and safety industry, it increased significantly in the disaster insurance service industry and the social disaster prevention industry related to infectious diseases, chemical, and environmental pollution. But the disaster-related education, counseling, consulting and traffic accident-related prevention industries have significantly decreased. In particular, since the start of the statistical survey, it was confirmed that while the number of workers in the disaster insurance service and prevention industry increased steadily, the number of workers related to disaster response medical treatment and quarantine decrease. It can be considered that the demand from the society to prepare for disasters through insurance or prevention has increased rather than responding to social disasters.

Next, the largest number of workers in the disaster and safety industry was fire, explosion, collapse-related industry, disaster situation management industry and facility recovery industry. It can be seen that there are many workers in industries related to types of disasters and accidents that occur frequently, such as fires, or industries that require large budgets and manpower for restoration works such as ports, waterways and buildings.

In this study, as a result of investigating the number of departments including words related to disaster and safety in the name of graduate school departments to identify trends in nurturing professionals in the field of disaster and safety, the number of departments including safety increased from 61 in 2013 to 164 in 2021. In addition to safety, all departments including related words such as fire service, disaster prevention, disaster and security have increased. the fact that the department of educating disasters and safety has increased over the past 9 years is thought to be related to the demands of society.

It is noteworthy that while the number of engineering departments doubled, the number of departments in the humanities and social sciences nearly tripled, and the number of public administration and business administration departments increased significantly in the sub-category. This means that, disaster and safety education was mainly conducted in engineering fields in the past. But in recent years, professionals are increasing in the humanities and social science fields of management and administration. In other words, it can be said that the perception of society has changed and the demands have changed.

This study analyzed the Standard Classification System for Education, National Competency Standards and the National Technical Qualification System which were thought to be closely related to the cultivating human resources in the disaster and safety field.

First of all, the National Technical Qualification System and the National Competency Standards had almost the same classification type. All three systems have in common that they are engineering sector and focus on industrial safety. It was difficult to contain contents related to a wide range of social disasters comprehensively, and it was a system to train professionals suitable for industrial sites. The difference was in the National Competency Standards(NCS), the biggest difference between NCS and others is that there are disasters and safety field in the humanities and social science sectors such as business, management.

Through this, the following implications for the development of disaster and safety specialists were drawn.

First, it is necessary to establish a basic plan and a mid-term to long-term plan to nurture professionals in the disaster and safety field. Since disaster and safety vary in type and scope, the expertise and work ability required may vary depending on the disaster or accident types. Therefore, it is necessary to establish goals and strategies for nurturing professionals by analyzing the current status of professional manpower, social issues, trends and areas where demand for professional manpower is predicted.

Second, it is necessary to review the education system in connection with the needs of society related to the disaster and safety field, and to diversify the fields of social advancement in the future. Currently, social demands related to social disasters, administrators and management are increasing. It will be necessary to review the direction of education by reflecting these trends.

Third, the National Competency Standards(NCS) is a system that trains human resources by standardizing the knowledge and abilities necessary in industrial sites. If the disaster and safety-related standards are systematically introduced, the expertise of disaster and safety personnel can be strengthened.

Fourth, although disaster prevention engineers are included in the National Technical Qualification System, it is insufficient to contain technical qualifications related to various disaster types. Therefore, it will be necessary to review the qualification of professionals by expanding the duties and types of National Technical Qualification System.

Fifth, it is necessary to cooperate with various organizations related to nurturing human resources in the disaster safety field. Disaster and safety are diverse in their fields, so each ministry has its own specialties. For example, the Ministry of Education has expertise in educations of graduate school and human resource training. Above all it can be said that the role of educational institutions that can directly cultivate professional manpower and companies that will utilize professional manpower is important.

Therefore, collaboration of various organizations with a consensus on the implementation of a safe society will be paramount.

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Profile

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