

Research on Disaster Prevention and Mitigation of Urban Underground Space Engineering Specialty Course Teaching

Guangbiao Shao

School of civil engineering, Shandong Jianzhu University, Jinan, China

sgbou@126.com

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Abstract. With the fast development of urban infrastructure construction in China, Urban underground space engineering become a newly emerging undergraduate major in recent years and belongs to the discipline of civil engineering. with the increasing of underground engineering, such as subway, people's air defence, the underground commercial street, underground engineering disaster prevention and mitigation of this course is of great significance. As a professional basic course, this paper discusses the necessity of the course, combined with disaster prevention and mitigation in civil engineering professional course teaching experience, teaching content and teaching method of disaster prevention and mitigation of the urban underground space engineering course are discussed. From stimulate students' interest, teaching content and teaching methods of the course construction of pioneering exploration and practice are made progress. Conducted effect shows that the teaching activities can motivate students interest in the course of disaster prevention and reduction, ideal result has been made in research on teaching activities, meaningful reference had been provided for related colleges and universities carry out disaster prevention and reduction of underground engineering courses.

Introduction

Urban underground engineering is the effective measures to modern city to ease restrictions of land used for urban expansion and population pressure. Construction of subway, underground commercial street underground garage and the underground pipe rack are conducted voluminously in China's major cities. With the increasing of underground engineering, bring us convenient, comfortable life at the same time, disasters and accidents what happened in the process of underground engineering construction and the applied process are often happened, such as land subsidence and building oblique caused by metro construction, landslides caused casualties induced by deep foundation pit construction, fires produce tragic accident in the operation of the metro. Therefor strengthen the underground engineering disaster prevention and mitigation of teaching to improve students' awareness of disaster prevention and mitigation, strengthen the consciousness of disaster prevention and mitigation is of great importance, for students in this major within career set up good disaster and safety consciousness provides a good foundation.

The Necessity of the Curriculum

Training Needs. Urban underground space engineering according to the trend of the development of the cities in our country are the ministry of education and the actual situation of the current urban underground engineering talent scarcity and set up a new major, major training can master engineering survey, planning, engineering materials, structural analysis and design, construction organization and project budget, project supervision and other aspects of the basic skills and knowledge, urban underground space engineering planning, design, research, development, utilization, construction and management ability of senior technical personnel.

Due to kinds of underground engineering, and also facing a variety of disaster, such as earthquake, fire, war, and the design and construction errors, etc., so the underground engineering curriculum setting of the disaster prevention and mitigation, should abide by the "heavy foundation, broad caliber, obscuring major" the education idea, make urban underground space engineering students understand and grasp the basic principles of disaster prevention and mitigation, control strategies and its type, common hazard, training students with the power of facing and processing power for all kinds of disasters in the future career.

Disaster Awareness. Improvement Disaster awareness is gradually into people's consciousness of the ideal, the ignorance of disasters is the biggest disaster of human existence. The national consciousness of disaster is one of the symbols of measure a nation's civilization and progress [1]. At present, Japan is the one of the best disaster education on the earth [2]. In many times of the earthquake, Japan continues to lower the number of casualties, from the side reflects the depth and thick of its national consciousness on disaster prevention and mitigation.

Our citizens disaster consciousness is weak, in daily life, damage to fire control facilities and rescue channel utilization will produce a great disadvantage of fire rescue. Cut corners and dereliction of duty are still existed in underground engineering construction, which cause accident of excavation engineering and the tunnel supporting. Offering a course of the disaster prevention and mitigation, therefore, has the vital significance to improve the students' consciousness of disaster.

Raising the Level of Comprehensive Disaster Prevention and Mitigation of Urban Underground Engineering. In urban underground engineering, disasters can be divided by man-made disaster disasters and natural disasters, and also can be divided into the construction process hazard and use process hazard, common disasters include fire, earthquake, explosion, collapse, water bursting and mud, etc.

Increasing of capacities of urban underground engineering comprehensive disaster prevention and mitigation need to thoroughly understanding of these disasters characteristics, grasping the reasons and prevention measures and treatment technology Now students are the future of urban underground space engineering managers, builders and designers, improve the students of the comprehensive disaster prevention and mitigation knowledge level, for the future of urban underground engineering disasters prevention, treatment and comprehensive disaster prevention and mitigation management system establishment promoting a positive role.

Research on Teaching Content

Teaching Content of Disaster Prevention and Reduction of Civil Engineering. Civil engineering as a first-level discipline of university education in our country, disaster prevention and reduction as undergraduate or graduate course has been opened for many years. Based on the own characteristics, the main content of the course of disaster prevention and reduction of domestic colleges and universities are performed combined with social and economic development and the construction situation. Some universities research content as follows [3]:

Tongji university: The earthquake resistance as the main direction, including the destruction mechanism of earthquake under the action of all kinds of engineering structure, suspension of disaster prevention and seismic strengthening technology, ground motion and seismic wave propagation characteristics, wind vibration control theory and applications of engineering structure, protection engineering and urban comprehensive disaster prevention and mitigation, etc.

Dalian university of technology: The school is given priority to with disaster reduction for earthquake resistance of engineering structures, including theory and model test of new technology for earthquake resistance of engineering structures, vibration control theory and technology, the seismic design of buildings, etc.

Southeast university: The main direction of the school for high-rise building aseismic theory and its application, building structure vibration isolation, vibration and vibration control, strengthening

for earthquake resistance of engineering structures and disaster prevention, structural health monitoring and safety evaluation, etc.

The PLA university of science and technology: this school was associated with a military disaster prevention and mitigation, and the destructive effect, civil air defense projects such as weapons of protection technology and application of new materials and control the electromagnetic mutilate, underground space environment protection engineering, etc.

Due to our country building structure seismic capacity and multiple earthquake caused heavy casualties, disaster prevention and reduction engineering and protective engineering is an important research topic of engineering structure seismic and vibration reduction, while less attention to underground engineering accident disasters, geological disasters. Therefore, urban underground space engineering undergraduates learn underground engineering teaching content of disaster prevention and mitigation, and can better improve the awareness of disaster.

Teaching Materials of Disaster Prevention and Reduction. At present, there are several corresponding courses teaching materials of civil engineering disaster prevention and mitigation, the main materials are shown in Table 1.

Table 1 High and low settings of predictor variables

No.	Editor-in-Chief	Name of the teaching material	Year of publication
1	JIANG Jianjing	Disaster prevention and reduction engineering	2005
2	ZHOU Yun	Introduction to civil engineering disaster prevention and mitigation	2005 [4]
3	CHEN Longzhu	An introduction to disaster prevention engineering	2006 [5]
4	ZHOU Yun	Disaster prevention and reduction engineering	2007 [6]
5	WANG Ru	Civil engineering disaster prevention and mitigation	2008 [7]
6	LI Xinle	Engineering disasters and disaster prevention and mitigation	2012 [8]
7	LI Yaozhuang	Disaster prevention and reduction engineering	2014 [9]

Teaching Content of Disaster Prevention and Reduction of Underground Engineering. In the teaching of civil engineering courses in disaster prevention and mitigation, their professional knowledge is broad and has strong discipline intersection line. Urban underground space engineering as part of the civil engineering discipline, teaching content has multi-discipline with civil engineering disaster prevention and mitigation. Such as underground engineering earthquake and fire resistance are part of the civil engineering related content, but there is no practical significance for wind engineering of underground engineering. Therefore urban underground space engineering disaster prevention and mitigation teaching content should be based on the characteristics of underground engineering, on the basis of disaster prevention and mitigation in civil engineering course, highlight their own characteristics, such as for underground engineering, the importance of its resistance to fire more important than the ground engineering.

Because of the urban underground space engineering was set up lately, there has yet to have official publishing textbooks for teaching, The existing teaching is modified based on disaster prevention and reduction in civil engineering teaching content. Such as underground engineering anti-seismic, no meaningful progress in its scientific research, and there are many differences between the mature underground structure seismic, in the course teaching, students need to fully understand the characteristics and difficulties of underground engineering seismic.

Unlike the ground buildings, underground engineering in the construction of face more unpredictable disasters, such as water inrush, sudden mud, pipeline leakage, therefore, the management is particularly important to the control of construction process of disasters. At present, the high correlation between underground engineering disaster prevention and mitigation course content and teaching materials have the book of tunnel and underground engineering disaster protection. In addition to the conventional fire protection, earthquake and war disaster protection, the textbook also have the content of the foundation pit engineering, mining method in shield tunnel, tunnel, method of immersed tube tunnel and freezing method construction in the process of disasters adequately discussed, combined with a large number of accident case, make the student fully to realize construction accident disaster.

Teaching Reform and Practice

Stimulate Interest in Learning. A wide range of disasters, only in the classroom teaching to teaching of common multiple disasters, can't please everyone. Therefore, we should actively encourage the students in the learning course teaching content, simultaneously active use of the network and library resources, access to relevant literature, combined with the personal interest, selectively explores the basic principle of a disaster, causes, characteristics and its control countermeasures and measures.

Enrich the Teaching Content. Course content system construction is an important part of course construction, through the investigation and literature, formed the following teaching system: the basic principle and development trend of the disaster prevention and mitigation; geological disasters and their prevention and control; fire hazard and its protection; seismic disasters and seismic design; underground engineering waterproofing and drainage; war disaster protection; underground engineering accident disaster protection; disaster risk analysis and evaluation.

Due to which involves many different professional knowledge, by class time constraints, geological disaster, fire, underground waterproof engineering and engineering accident are emphasis when teaching, which explained by combined with the latest achievements and development trend of their respective fields and typical cases. When teaching, around the "disaster", from the source to the consequences of a disaster, and then to strategy, pay attention to the analysis of a variety of causal relationship between disaster, comparing the similarities and differences of different disaster causes and countermeasures.

Diversified Teaching Methods. In order to improve vitality and authenticity of disaster prevention and mitigation course, a lot of disasters images, video, etc. are involved. Using multimedia with blackboard writing teaching, in order to improve students learning interest. Teaching mode had been established by student-centered, teacher-dominated [10].

In the earthquake disaster, in combination with Yunnan earthquake cases in August 2014, interpretation of the seismic source, the collapsed building damage mechanism and the seismic disaster mitigation measures.

Combined with the research results through scientific research project, research and teaching process to promote each other. In the process of scientific research activity, the understanding of professional knowledge can be deepen; And through the teaching, the problems and research direction can be discovered.

Due to the need of the pictures, video, multimedia teaching process equipment, can release a lot of information, good teaching results has been achieved. In teaching materials accumulation of at ordinary times, forming a material library disaster prevention and mitigation, and includes all kinds of fire, the Wenchuan earthquake, Japan 3.11 earthquake, explosion, underground projects water leakage and the subway engineering, foundation pit collapse accident case, and some disaster movie. Through pictures, video and other disasters, vividly stimulate students' learning interest and enthusiasm. Teaching accident treatment methods, procedures, methods and experience, make students with basic ability of dealing with disasters and accidents.

Summary

The essential purpose of disaster prevention and mitigation of underground engineering course teaching is to make students of urban underground space master disasters professional course of formation mechanism and control countermeasure, and for the future of the underground space do a good foundation for the engineering design, construction and management, to adapt to the construction and development needs.

This article from the meaning of curriculum, teaching content, teaching methods, etc. must explore, looking forward to better achievements in the teaching of the course in the future, in order to promote underground engineering disaster prevention and mitigation the continuous improvement of the teaching content system and method.

References

- [1] JIANG Jian-jing, XU Zhi-sheng. Disaster prevention and reduction engineering [M]. Beijing: Mechanical industry press, 2005.
- [2] ZHENG Ju-huan, LI Yao-zhuang. The experience of Japan on education of disaster prevention and enlightenment to our country [J]. China Public Security, 2007, 9(2): 107-109.
- [3] CHEN Shi-hai. The disaster prevention and reduction engineering and protective engineering problems in engineering blasting [J]. Blasting, 2003, 20(S1):84-87.
- [4] ZHOU Yun. Introduction to civil engineering disaster prevention and mitigation [M]. Beijing: Higher education press, 2005.
- [5] CHEN Longzhu. An introduction to disaster prevention engineering [M]. Beijing: China building industry press, 2006.
- [6] ZHOU Yun. Disaster prevention and reduction engineering [M]. Beijing: China building industry press, 2007.
- [7] WANG Ru. Civil engineering disaster prevention and mitigation [M]. Beijing: China building materials press, 2008.
- [8] LI Xin-le. Engineering disasters and disaster prevention and mitigation [M]. Beijing: China building industry press, 2012.
- [9] LI Yao-zhuang. Disaster prevention and reduction engineering [M]. Wuhan: Wuhan university press, 2014.
- [10]ZHANG Qing-he, LIAO Shao-ming, HU Xiang-dong. Disaster protection of tunnel and underground engineering [M]. Beijing: China communication press, 2009.