

The Education of Contemporary College Student on Technology and Policy Management of Low-carbon^{*}

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Abstract - Higher education will provide a good platform for the goals of constructing the Resource-economized Society and sustaining economic growth and controlling greenhouse gas emissions. By initiating a new course of Technology and Policy Management of Low-carbon, the course content and the teaching way in local university were studied, and the prevalence of low-carbon policy, CCS technology and low carbon information/knowledge has been promoted. More importantly, the environmental protection awareness of contemporary college students in low-carbon economy and sustainable development have been increased, and it can provide instructions in the professional field engaged in the future.

Index Terms - low carbon, free optional course, design of course content, Environmental education of high school, environmental awareness

1. Introduction

Technology and Policy Management of Low-carbon, as a free optional course/a public elective course, was designed primarily for all students in Beijing Jiaotong University in 2009. This elective course aims to help the contemporary college students to understand the basic and professional knowledges about greenhouse effect, low carbon technology, policy management mode and low carbon economy, and increase the environmental protection awareness in low-carbon economy and sustainable development, and build the innovative sense and engineering attitude. we hope it can provide instructions to students in the professional field engaged in the future.

2. Background and Significance of the Course

The global warming issue is one of the most important in the world that we have to face today. Against the backdrop of growing Global Warming, low carbon has attracted increasing attention. China has participated in the various Accords to hold the increase in global average temperature below 2°C above preindustrial levels. China will endeavour to cut carbon dioxide emissions per unit of GDP by a notable margin by 2020 from the 2005 level. From a Chinese perspective, this would be a big challenge, with a need to make CO₂ emissions peak before 2025, to be followed by a rapid decline after 2030. The climate change and energy problems are making urgent demands on all countries in the world for low-carbon development. Education, as a typical higher effective method

of knowledge or technology distribution, will play a key role in the need to introduce clean energy options and to develop a low carbon urban economy, it is necessary to develop some courses about low-carbon technology and policy during the development of higher education in China, it is a new challenge to the environmental education of high school all over the world.

High school (university/college) is the training base for personnel training and promoting the progress of science and technology. Education will train the necessary manpower and provide opportunities of scientific and technological activity for the development of low carbon economy. College students can spread and practice the low carbon idea in their professional field, and enhance the whole nation's low carbon consciousness. It is helpful for training of creative thinking of students.

The development of low-carbon economy open up new avenues of employment, it will provide college students with opportunities to start an undertaking, such as more prospective venture projects. Our country government will vigorously develop low carbon education in promoting the development of low carbon technology. Under such a background, in the entrepreneurship education we should focus on the subject of low-carbon economy, promote the publicity of policies and low-carbon projects, adjust the course setting, introduce low-carbon education into the course system, advocate low-carbon consumption, implement low-carbon management and strengthen the education on college students in social responsibility and creative thinking.

3. Contents of Course

This course is designed for college students to broaden the knowledge and to understand the development trends in Technology and Policy Management of Low-carbon. This course mainly introduce the basic knowledge involves in low carbon, the main contents of this course are: the basics of the greenhouse effect and low-carbon mechanism, policy of carbon emission and reduction, techniques and methods for GHG emissions reduction and CO₂ utilization and low-carbon

^{*}This work is partially supported by the Fundamental Research Funds for the Central Universities, NO.2013JBM064 Study on membrane contactors system for separation of CO₂ from flue gas based on the modified amine-type liquids, and TA8001-PRC Study on Carbon Capture and Storage (Asian Development Bank and Datang International Power Generation CO., LTD.).

lifestyle. The emphasis will be on basic/foundation rather than theoretical discussions. And this course focuses on implementation of the idea of cleaner production and recycling economy in industry. Through the study of this course, students should have a systematic understanding of low carbon

technology, policy, lifestyle and recycling economy.

This course need a total of 32 class hours (2 Scores), including 4 hours of practice. The contents and basic requirements see Tab 1.

TABLE I Contents and Basic Requirements

Chap.	Topic	Key Knowledge	Requirement	Hours
1	The basics of the greenhouse effect and low-carbon mechanism	Concept and the basics of the greenhouse effect and low carbon economy	Master	6
		International Conventions and Practice for reducing carbon emissions, Development and prospect	Understand	
		GHGs emission scenarios and analysis	Understand	
		Emission trading mechanisms	Master	
		absolute duty of china and all member states	Understand	
2	Policy of carbon emission and reduction	Current situations about carbon emission, assement of CO ₂ emission scenarios	Understand	5
		the analysis on energy consumption structure	Know	
		the analysis on CDM mechanism	Understand	
		technology road map for low carbon	Master	
		low carbon Policies(Renewable Portfolio Standards, RPS, green power pricing, green power choices, Carbon Tax Policy, et al)	Understand	
Analysis on Energy Saving and CO ₂ emission reducing Measures	Understand			
3	Techniques and methods for GHG emissions reduction and CO ₂ Utilization	Carbon Sequestration, Pre-Combustion Carbon Capture technologies, post-combustion Carbon capture technologies, Oxyfuel Combustion	Master	8
		CO ₂ Capture Techniques and methods	Understand	
		CO ₂ Compression and Transport	Know	
		Geologic Carbon Sequestration, Potential storage site assessment and CO ₂ Storage	Know	
		Risk assessment for Capture,Transport and Storage	Know	
		CCS costs analysis	Know	
		CO ₂ Utilization	Know	
		commercial CCS demonstration projects, CCS-ready	Know	
	Practice	Visit: commercial CCS demonstration projects	Understand	2
4	The international Carbon trading system	carbon trading	Master	3
		Main carbon trading market	Know	
		Carbon trading system and operating mechanism	Understand	
5	CDM Project and international and domestic procedure of application	CDM Projects	Understand	2
		International and Domestic Procedure	Know	
6	The industrial development plan and employment direction	The industrial Development Plan	Understand	2
		Employment Status and Opportunity	Understand	
7	low-carbon lifestyle and Carbon Footprint	low-carbon lifestyle	Master	2
		Carbon Footprint and Calculator	Master	
	Practice	Discuss: Specialized Field	Master	2

4. Teaching Arrangement

A. Classroom Teaching

Teachers should give lecture in a systematic and organized way, and provide students the chances to discuss and press their statement. Object teaching and videos are suggested to be used in this course, and the visit to an commercial CCS demonstration project will be organized to enhance the understanding of CCS technology. Students should improve the innovation ability, analysis and solving problem ability, self-study ability and engineering application ability.

B. Practice teaching

The practice teaching includes the discuss about specialized field and a visit to CCS demonstration project.

C. Homework

Some comprehensive exercises are ranged in order to help the students managing the basic conception, operation and drawing skills. Students should complete an essay, with finding reading lots of information.

D. Self-study

Students are required to read some environmental journals and newspapers, and try to understand the new development of low carbon.

E. Examination and Grading

This course will be assessed by test, scoring in 5-grade.

Final grade = usually results (20%) + final examination (50%)+discuss(30%)

The usually results include the participation, classroom questioning and the quality of homework. The final examination should be written test or paper.

5. Teaching Achievements

As a general education, Low carbon education (course of Technology and Policy Management of Low-carbon) has been accepted and improved by more and more students in Beijing Jiaotong University. To this instructional attempt for the past 4 years, we get a bit of teaching achievements. Of course, we should continue to improve teaching means and instructional mode, do our best to gain much experience in teaching.

TABLE II Teaching Achievements

Teaching Achievements		
1	practical activity	Visit on CCS demonstration project in Daobeidian thermal power plant
		Visit on the laboratorial experimental facility of teacher's research project about CCS in environmental & engineering laboratory
2	Innovation ability	Constructing and practising of the system to develop innovative spirit and practical ability of undergraduate students
3	Paper and discussion	Professional study or review in every subject(environmental engineering, economy, architectural design, traffic communication and transportation,and so on)
4	questionnaire	Low carbon lifestyle
5	lecture	Low carbon economy and carbon dioxide capture and storage

Acknowledgment

This project was carried out in Department of Municipal and Environmental Engineering, School of Civil Engineering, Beijing Jiaotong University, that is supported by Beijing Jiaotong University, Datang power in china and Asian Development Bank.

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