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# Talent cultivation of Excellent Engineer Training Plan in Henan Polytechnic University

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**Abstract:** Excellent Engineer Training Plan is an important measure in a longer period in the future for China of higher engineering education reform, and the Plan is a new quality engineering to promote the training of top talents for colleges and universities in meeting the needs of social and economic development. A brief overview of talent cultivation of Excellent Engineer in China is presented firstly, including the begin phase, the traits and strategic keynotes of the Plan. Then the talent cultivation of Excellent Engineer in Henan Polytechnic University is discussed in detail. The automation specialty of the University is taken for example, its detail training program is given, including the training target, main disciplines, main courses, course platform and credit ratio, the length of schooling year, the graduation requirements of credit and grant degree, etc.. At last, some suggestions are given for the Plan to be carried out effectively.

**Keywords:** Higher Education, Engineering Major, Talent Cultivation, Excellent Engineer Training Plan, Henan Polytechnic University, Automation Major

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## 1. Introduction

Innovative talent in engineering of science and technology is a new creator of new technology, new knowledge and new industry, and is the decisive factor that affects the competitiveness of a country. Higher education bears the important task of cultivating talents, developing trained environment of science and technology, and promoting socialist modernization construction. Improving quality is the core task and basic requirement of the development of higher education [1] [2]. Therefore, the importance of effective reform of higher education is becoming more and more obvious, and more attention should be paid on the subject.

Excellent Engineer is a contraction of Excellent Engineer Training Plan of China. The Plan is used to implement the reform project of 《Outline of the National Program for Medium - and Long - Term Educational Reform and Development (2010-2020)》, and 《Outline of the National Program for Medium - and Long - Term Talent Development(2010-2020)》, and also the major initiative to promoting the country heading toward to powerful engineering education. The aim of the Plan is to train and bring up a large number of various types of engineering and

technical personnel, which have traits of innovative personality, and suit with socioeconomic development and high quality, and so on [3] [4] [5].

As of 2010, there are 10003 full - time common undergraduate colleges setting up engineering major, accounting for 90% of the total number of undergraduate colleges [4]. The number of higher education of engineering undergraduate students reaches 3710000, and the number of graduate student reaches 470000 [4]. The Plan has important functions of demonstration and guidance in promoting the personnel engineering education of higher education to meet needs of the community, strengthening quality of talents training of engineering education at all levels [6] [7].

There are 61 colleges and universities for the first batch of the Excellent Engineer in China. And there are 133 pilot colleges and universities are included in the second batch of the Plan in 2011. And for the third batch of the Plan in 2013, the number is reaching 153 [4]. As a century - old university of coal industry, Henan Polytechnic University has been taken the cultivation of innovative talents in engineering science and technology as an important educational mission, and put into effect the unremitting exploration. Henan

Polytechnic University is one of the pilot colleges of the second batch, and the Plan for the University will promote the reform of talent training mode and further enhance the training quality of excellence engineer. Based on the actual implementation of the Plan for Henan Polytechnic University from 2011 to 2014, the training scheme and practical measures are discussed in this paper.

The rest of the paper is organized as follows. In Section 2, a briefing overview of talent cultivation of Excellent Engineer in China is presented. In Section 3, the concrete application of Excellent Engineer for talent cultivation in Henan Polytechnic University is given. In Section 4, the talent cultivation of Excellent Engineer for automation specialty is discussed in detail. In Section 5, several suggestions are presented for the Plan to be implemented effectively. Finally, in Section 6, the paper is completed with a conclusion.

## 2. Brief Overview of talent Cultivation of Excellent Engineer in China

To drive the Excellent Engineer Training Plan of China, in September 2010, 《China - EU Memorandum of Understanding on Cooperation for Higher Education of Engineering》 is signed to promote the cooperation with engineering education of European. The number of the first batch of the cooperative colleges and universities is 13, such as Royal Institute of Technology in Sweden, Universite Catholique De Louvain in Belgium, Polytechnic University of Turin in Italy, and so on. The number of the corresponding colleges in China is 18, such as Shanghai Jiao Tong University, Harbin Institute of Technology, and so on.

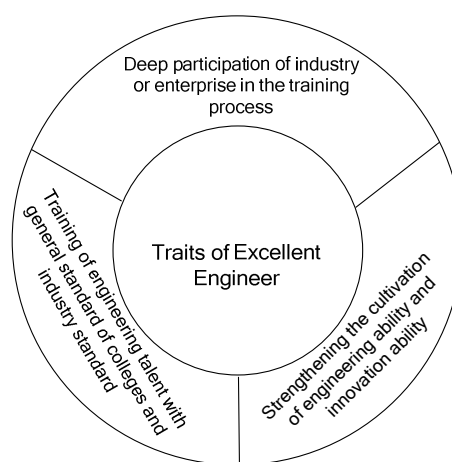
At present, China is in the key stage of building national innovation system, raising international competitiveness, and accelerating industry to upgrade with transition. The economic development of society needs a lot of senior engineering and technical personnel. Excellent Engineer is started in China in June 23, 2010. The kick - off meeting of the Plan organized by Ministry of Education is shown in Figure 1 [4], which is held in the city of Tianjin. It has three levels of implementations, including engineering undergraduate, engineering master and engineering doctor.



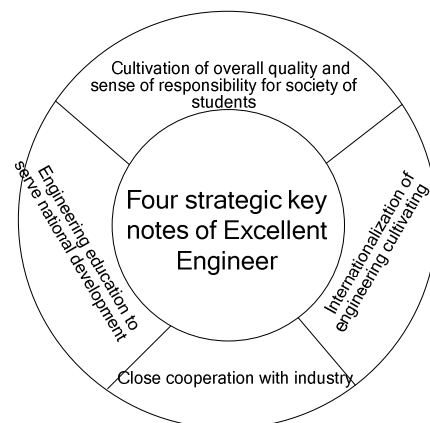
**Figure 1.** The kick - off meeting of the Excellent Engineer Training Plan in China

The Plan of Excellent Engineer is in the form of college and enterprise joint cultivation mode. And the cultivation of engineering practice ability and innovation ability is emphasized for students. For the part of the time in the school for student, the Plan divides the school time into two parts, enterprise learning time and school learning time. In the whole four years of undergraduate study, the study time in the enterprise must be accumulated to 1 year at least. The study in enterprise of the Plan is different from the past enterprise internship program. With regard to engineer personnel training, the essence of the Plan depends on the compact cooperation mode of production and education.

The Plan has three traits, as shown in Figure 2. And in the process of the training of the Plan, four strategic keynotes should be emphasized, as shown in Figure 3.



**Figure 2.** Traits of the Excellent Engineer Training Plan



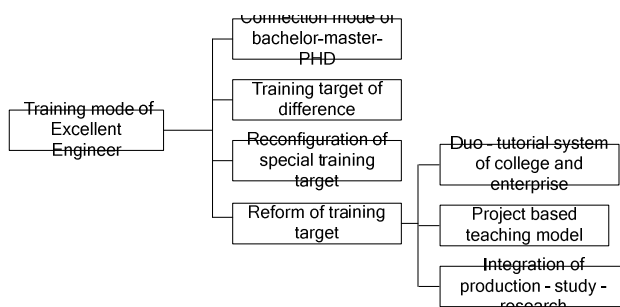
**Figure 3.** Four strategic keynotes of the Excellent Engineer Training Plan

At present, hundreds of colleges and universities have carried on the Excellent Engineer Training Plan in China. Parts of the detailed name list of the relevant colleges and universities are as shown in Appendix at the end of this paper.

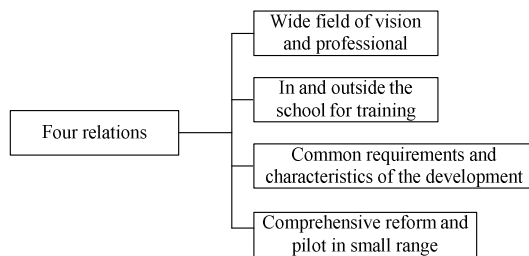
Compared with countries such as the US and Europe, the trend of reason and planning is becoming more and more obvious for current cultivation mode of engineering talent of China. The measures to deepen the reform of professional talent training mode of engineering specialty

relates to the following several respects, such as how to take the social demand as the guidance, how to take an actual engineering as background, how to take the engineering technology as the main line, and so on. And all the above methods have been attracted much attention from the field of higher education [8].

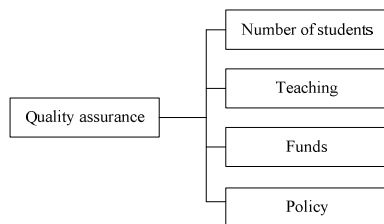
The two stage mode of blank - comprehensive quality training after reemployment of American and the occupation elite training mode of Europe country are not suit for China. The training of Excellent Engineer in China has its own characteristics, including the training rules in the cultivation objective orientation, quality specifications, training program, curriculum content, teaching, training and other aspects. At present, the following several aspects are the main focal points of the Excellent Engineer in China, as shown in Figure 4, Figure 5 and Figure 6 [8].



**Figure 4.** Training mode of Excellent Engineer Plan



**Figure 5.** The stressed four relations of Excellent Engineer Plan



**Figure 6.** Quality assurance of Excellent Engineer Plan

### 3. Talent cultivation of Excellent Engineer in Henan Polytechnic University

#### 3.1. The Excellent Engineer Training Plan in Henan Polytechnic University

The specialties of Henan Polytechnic University are shown in Table. 1.

**Table 1.** Specialties of Henan Polytechnic University

Specialty Type		Number of Specialty
Undergraduate		75
Mater	First Grade Discipline	18
	Second Grade Discipline	81
Doctor	First Grade Discipline	4
	Second Grade Discipline	26
Center for Post-doctoral Studies		4
Fields of Master of Engineering		17
Combined Bachelor- Master's Degree Program		4

The University is approved as pilot colleges and universities of Excellence Engineer Training Plan by the Ministry of Education of China in 2011. There are six undergraduate professional selected, Mining Engineering, Mineral Processing Engineering, Geomatics Engineering, Safety Engineering, Automation and Geological Engineering, as shown in Table 2. In addition, the University maintains good relations of cooperation with several large coal groups, which provide a good platform for the Plan to be carried out smoothly.

**Table 2.** Approved Specialties of the Plan of Henan Polytechnic University

Specialty Type	Approval Year	Supporting Institution
Mining Engineering	2012	School of Energy and Engineering
Mineral Processing Engineering	2012	School of Material Science and Engineering
Geomatics Engineering	2012	School of Surveying and Land Information Engineering
Safety Engineering	2012	School of Safety Science and Engineering
Automation	2013	School of Electrical Engineering and Automation
Geological Engineering	2013	School of Resources and Environmental Science

### 4. Talent Cultivation of Excellent Engineer for Automation Specialty

#### 4.1. Training Target

The professional aims to train engineer talent of automation in an all - round development mode for knowledge, ability, quality, etc., with the traits of broad extension, high quality and compound technical personnel. The engineer talent would master the basic theory, expertise and professional skills of automation field, and would be engaged in related motion control, process control, manufacturing automation, automation instruments and equipment, robot control and other aspects of engineering design, technology development, system operation management and decision-making, management, scientific research, in the field of industrial and mining enterprises, scientific research institutes, etc..

#### 4.2. Main Disciplines, Main Courses, Course Platform and Credit Ratio

Main disciplines: Control science and engineering, electrical engineering, computer science and technology.

Main courses: Circuit theory, electronic technology, computer theory, single chip interface technique, power

electronics technique, motor and electric drive, automatic control theory, microcomputer control technology, modern control theory, detection technology and automation instrumentation, motion control, process control, digital mine technology, etc..

The course platform and credit ratio are set up as shown in Table.3.

*Table 3. Course Platform and Credit Ratio*

Course Platform	Course Module	Course Property	Credit Requirement	Ratio of Whole Credit
General Education Platform	Compulsory Course Module	Compulsory	77	40.1%
	Elective Course Module	Elective	3	1.5%
Academic Foundation Platform	Applied Course Module	Compulsory	22.5	11.7%
Professional Education Platform	Compulsory Course Module	Compulsory	37.5	19.5%
	Sub-total		140	72.9%
Practical teaching Platform	The Centralized Practice Step	Compulsory	42	21.9%
	Separate and Tailor-made Experimental Course Module	Compulsory	5.5	2.9%
	In Class Experiment Course Module	/	184 Class Hour	/
Quality Development Platform	Quality Development Course Module	Compulsory	5	2.6%
Total			190	/

#### 4.3. The Length of Schooling, Graduation Requirements of Credit and Grant Degree

(1) Length of schooling: 3-6 years.

(2) Credits for graduation requirements: A total of 190 credits are required.

(3) Degrees Conferred: Bachelor of engineering.

cooperation with more enterprises.

(3) The practice base in colleges and universities is less. The government should increase the investment of engineering education. More key platforms should be constructed for engineering education. Now more discipline platforms for engineer cultivation in the University are proposed to build.

### 5. Probable Suggestions for the Plan to be Better Implemented

After sustained practice of 2012-2014 and interrelated experiences summarization of the Plan in Henan Polytechnic University, some aspects should be paid more attention for the Plan to be well implemented effectively.

(1) Unreasonable structure of teachers in Colleges of Engineering, especially the young teachers. The young teacher is lack of engineering experience, and most of them have never had anything to do with the actual construction engineering in the practice. So, many institutions in the University carry out training programs of industrial practice, take School of Electrical Engineering and Automation for example, a document of temporary measure has been produced to encourage young teachers to participate in practice in June 20, 2013. The training and cultivation of young teachers for engineering practice should be strengthened.

(2) Outstanding engineers of enterprise have few opportunities to direct contact with the students. So the guide for the training of students is fewer. The cooperation mechanism between enterprise and school should be future improved. At present, the University has strengthened the

### 6. Conclusion

Excellence program brings great changes for personnel training. After graduation, the students who have taken part in the Plan, is not a truly professional engineer, but candidate for engineer. Time planning of spending on enterprise for students is a key issue. As a top-level plan for training of talents, the plan design for Excellent Engineer must not only conform to the law of growth of talent, but also meet the needs of social development.

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## Appendix

Name list of colleges and universities with Excellent Engineer Training Plan in China of the first batch is show in Table. I.

**Table I.** Name list of colleges and universities with Excellent Engineer Training Plan in China of the first batch

NO.	University Name	NO.	Name
1	Tsinghua University	32	Beijing Jiaotong University
2	Beihang University	33	Zhengzhou University
3	Beijing Institute of Technology	34	Zhejiang University
4	University of Science and Technology Beijing	35	Beijing University of Posts and Telecommunications
5	China University of Petroleum(Hua Dong)	36	Fujian University of Technology
6	Beijing Institute of Petrochemical Technology	37	Zhejiang University of Science and Technology
7	North China Electric Power University	38	Zhejiang University of Technology
8	Yanshan University	39	Jilin University
9	Jiangnan University	40	Fuzhou University
10	Jiangsu University	41	Hefei University
11	Ningbo University of Technology	42	HeFei University of Technology
12	Beijing University of Chemical Technology	43	Nanjing Institute of Technology
13	Taiyuan University of Technology	44	Tianjin University
14	Dalian University of Technology	45	Hunan University
15	Harbin Institute of Technology	46	Nanchang University
16	Harbin Engineering University	47	Shandong University
17	Heilongjiang Academy of Engineering	48	Shandong University of Technology
18	Hunan Institute of Engineering	49	Donghua University
19	Dongguan University of Technology	50	Nanjing University of Technology
20	Beijing University of Technology	51	Huazhong University of Science and Technology
21	East China University of Science and Technology	52	Wuhan University of Technology
22	Tongji University	53	Shantou University
23	Shanghai Jiao Tong University	54	Chang'an University
24	Shanghai University	55	Central South University
25	Shanghai University of Engineering Science	56	Xi'an Electronic and Science University
26	Shanghai University of Electric Power	57	Shenyang University of Technology
27	South China University of Technology	58	Xi'an University of Technology

NO.	University Name	NO.	Name
28	Xi'an University Of Architecture And Technology	59	Chengdu University of Information Technology
29	Sichuan University	60	Hohai University
30	Southwest Jiao Tong University	61	Southeast University
31	Xi'an Jiao Tong University	-	

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